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NEW RECORDS FOR PALAEARCTIC CERAMBYCIDAE FROM IRAN WITH ZOOGEOGRAPHICAL REMARKS (COL.: CERAMBYCOIDEA: CERAMBYCIDAE)

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ABSTRACT: The paper gives some new records (one tribus, three genera, one subgenus and three species) based on three new species for Palaearctic and Iranian Cerambycidae as *Dorysthenes* (*Baladeva*) *walkeri* (Waterhouse, 1840), *Pachyteria dimidiata* Westwood, 1848 and *Diastocera wallichi* (Hope, 1831).

KEY WORDS: Cerambycidae, Palaearctic region, Iran, New records.

The longhorned beetles or Cerambycidae are often classified together with Chrysomelidae and Bruchidae in the superfamily Chrysomeloidea. But, some authors including ourselves recognized Cerambycidae as a separate superfamily Cerambycoidea. Cerambycoidea Latreille, 1802 is a superfamily of the order Coleoptera (suborder Polyphaga, infraorder Cucujiformia). The concept of the subdivision of Cerambycidae into several families has prevailed recently. Cerambycidae divided into several subfamilies. These are Parandrinae, Prioninae, Lepturinae, Necydalinae, Aseminae, Spondylidinae, Dorcasominae, Cerambycinae and Lamiinae. All subfamilies are represented in Iran.

Most of the longhorned beetles are elongate and cylindrical with long antennae. The eyes are usually strongly notched. The fourth tarsal segment is small and concealed in the notch of the third segment. It is often very difficult to see. Both the Cerambycidae and Chrysomelidae have this type of tarsal structure, and these groups are sometimes diffucult to separate. The Cerambycidae are separated from Chrysomelidae by the presence of apical spines on the tibiae. Also, the Cerambycidae are separated from the closely related Bruchidae by the normally developed last segment of the abdomen. The pygidium is usually hidden under the elytra in Cerambycidae, but it is always large and prominent in Bruchidae.

All the members of longhorned beetles are xylophagous and phytophagous. Larvae of longhorned beetles develop in plant tissues. Most of the beetles are wood-boring in the larval stage and many species are very destructive to forests, fruit trees and to freshly cut logs. They have larval tunnels in the wood (both living and dead plants). The species attack various types of trees and shrubs. A few will attack living trees, but most species appear to prefer freshly cut logs or weakened and dying trees or branches. Larvae pupate either in host plants or in soil. Adults of the longhorned beetles can be found on flowers, leaves, wood, herbs etc.

Iran is bordered on the north by the Caspian Sea, Armenia, Azerbaijan and Turkmenistan, on the east by Afghanistan and Pakistan, on the south by the Persian Gulf and the Gulf of Oman, and on the west by Iraq and Turkey (Map 1). Its area is 1.648.000 square kilometers, of which 14% is arable land, 8% is forest, 47% is natural (i.e. non-arable) pastures and the remaining 31% is varied arid environments, including salt swamps, sand and gravel deserts and bare-rock high mountains. In general, Iran consists of a central plateau, 1000 to 1500 m above sea level. Two great deserts, Dasht-é Kavir and Dasht-é Lut frame most of the north-east and east of this area. The central plateau is surrounded by mountain ranges of varying heights. Most rivers drain into the Persian Gulf, the Caspian Sea and into some of the salty lakes of the interior. The Persian Gulf is 965 km long. Its easternmost section, east of the Strait of Hormoz is the Gulf of Oman (Hangay et al., 2005). In other words, Iran is situated in Southwest Asia, bordering the Gulf of Oman, the Persian Gulf, and the Caspian Sea, between Iraq and Pakistan.

The vast, arid, and physiographically complex tract stretching across North Africa, southwestern Asia, and northwestern India is home to a complex range of species, many of them distinct from those of sub-Saharan Africa, tropical Asia, and northern temperate Eurasia. Their relations at the generic and family levels are, however, for the most part with those of Eurasia, and they form part of the fauna classically termed Palaearctic. Iran is the most geographically complex area within this region and consequently has the greatest biological diversity for its size in southwestern Asia. Except for faunal elements shared with other regions, southwestern Asian species are distributed between two broad types of landscape. One is the region generally known as the Iranian plateau, stretching from the Anatolian highlands across Persia and Afghanistan to the Solayman range in the southeast. Species occupying this area have been labeled Irano-Turanian by most zoogeographers. Anderson (in Camb. Hist. Iran) divided them into Iranian elements, restricted to the uplands, and Aralo-Caspian elements, concentrated mainly on the plains and basins of Turkmenistan and neighboring republics of Central Asia. The second major landscape type, encompassing the low-lying desert areas along the southern margins of the Palaearctic from North Africa to northwestern India, is home to the Saharo-Sindian group of fauna. Within these regions are species and associations of species with much more restricted distribution. Considering the fauna of western Asia as a whole, various authors have introduced a confusing array of terms, attempting to systematize patterns of distribution within particular taxa. In addition to the labels already mentioned, there are Holarctic for the temperate and boreal latitudes of the northern hemisphere, including North America; Western and Eastern Palaearctic; Euro-Siberian for the northern latitudes of the Palaearctic; Eremian for Saharo-Sindian plus the arid portions of Irano-Turanian; Ethiopian or Afrotropical for sub-Saharan Africa; Oriental for southern and southeastern Asia, Paleotropical for Ethiopian plus Oriental; Mediterranean for southern Europe and the North African littoral plus the Levant; and various subdivisions that are more or less self-explanatory. Although some authors have used these terms descriptively, to others they have implied areas of origin. When used here they are simply descriptive (Anderson, 2007).

Anderson (2007) also stated that Iran has 13 faunal areas. These are as follows. The central plateau, The Urmia basin, The Sistan basin, The Caspian region, The Khuzestan plain and the Persian Gulf coast, Persian Baluchistan and the Makran coast, The Turkmen steppe, The Mogan steppe, The Zagros, The western foothills of the Zagros, The Alborz, The Kopet-Dag, Islands of the Persian Gulf.

According to Anderson (2007), the faunal area “Persian Baluchistan and the Makran coast” includes two main elements as Iranian elements and Saharo-Sindian elements. It is primarily in Baluchistan and the Makran that a few Oriental elements, wide-ranging species of broad ecological tolerance, exist in Iran. The faunal area “the western foothills of the Zagros” includes some species that are most closely related to species of highland Arabia, others to those of Baluchistan and Sind. The faunal area “Islands of the Persian Gulf” seems to represent the Saharo-Sindian group.

So it is known clearly that Iranian fauna includes some Oriental species. This work is another evidence of this status. On the other hand, three unknown species for Palaearctic region are recorded for the first time with this study. These oriental species are *Dorysthenes walkeri* (Waterhouse, 1840), *Pachyteria dimidiata* Westwood, 1848 and *Diastocera wallichi* (Hope, 1831).

More than 2,000 plant species are grown in Iran. The land covered by Iran’s natural flora is four times that of the Europe’s (Map 2).

The Persian fauna is known in piecemeal fashion from studies of various groups of animals, but there has so far been no coordinated effort to record the entire range systematically, as there has been for the Persian flora and for the fauna of the former Soviet Union, former British India, and the Arabian Peninsula. In Persia some invertebrate groups have been studied systematically, and studies have been undertaken for all vertebrate groups.

Insects constitute the largest segment of Persian fauna normally. Although there has been no comprehensive treatment, there is a large literature on individual species. An important series, "Contribution à la faune de l'Iran" has been published in Annales de Société Entomologique de France. Cerambycidae by Villiers (1967) was dealt with in part I of the works for Iranian fauna. Subsequently, Abai (1969) was given a list of Iranian Cerambycidae. Other previous works were either short notes on short-lived expeditions or about at most a province and its environment. Also, works including description of new taxons are sometimes encountered. As opposed to this, European fauna has almost been investigated entirely as mentioned in Sama (2002) and Russian fauna has also been given mainly in Danilevsky (2008).

Historically, the first list related with Iranian Cerambycidae was realized by H. Mirzayans (1950) with only 39 species. A. Villiers collected some species of Cerambycidae from Eastern and Southern parts of Iran until 1965. Then, he published it in 1967 as seen above. This study included 240 species and 15 subpecies. In which, 2 genera, 3 species and 1 subspecies were identified as new taxa. In 1969, M. Abai gave list of Cerambycidae family in Iran with 104 species and 4 subspecies. Recently, M. M. Awal (1997) also gave 199 longhorned beetles species in his study entitled “List of agricultural pests and their natural enemies in Iran”. In 2004, H. Borumand also presented a list of Cerambycidae in Hayk Mirzayans Insect Museum of Iran with 132 species and 4 subspecies.

Especially since the last century, works on Iranian longicorn beetles increased as chiefly faunistic and taxonomic works. Recently, they continue with an increased speed. E. g. Villiers (1960, 1967, 1970, 1973), Abai (1969), Holzschuh (1977, 1979, 1981), Danilevsky (1998), Sama & Rejzek (2001, 2002), Rejzek et al. (2003), Danilevsky (2004), Sama et al. (2005) and Danilevsky (2006) can state as the recent important works on Iranian Cerambycidae. Knowledge about Iranian longicorn beetles, however, is far from satisfactory.

Superfamily CERAMBYCOIDEA Latreille, 1802

The superfamily includes currently 4 family as Cerambycidae Latreille, 1802; Disteniidae Thomson, 1860; Oxypeltidae Lacordaire, 1869 and Vesperidae Mulsant, 1839 (incl. Anoplodermatinae Guérin-Méneville, 1840 and Philinae Thomson, 1860).

Family CERAMBYCIDAE Latreille, 1802

The Cerambycidae is one of the largest families of Coleoptera. Body lenght varies from 2.5 mm to slightly over 17 cm. It is distributed world-wide. The family that is commonly called long-horned beetles, longicorns, capricorns, timber beetles, round-headed borers, goat beetles (bockkäfer), sawyer beetles includes currently 9 subfamily as Parandrinae Blanchard, 1845; Prioninae Latreille, 1802; Lepturinae Latreille, 1802; Necydalinae Latreille, 1825; Aseminae Thomson, 1860; Spondylidinae Audinet-Serville, 1832; Dorcasominae Lacordaire, 1869; Cerambycinae Latreille, 1802 and Lamiinae Latreille, 1825 according to our approach.

Subfamily PRIONINAE Latreille, 1802

= Prioniens Latreille, 1804
= Prionida Leach, 1814
= Prionidae Samouelle, 1819
= Prionitae Thomson, 1860
= Prionides Lacordaire, 1869

The subfamily currently includes at least 18 tribes as Acanthinoderini Thomson, 1864; Acanthophorini Thomson, 1864; Aegosomatini Thomson, 1860; Anacolini Thomson, 1857; Callipogonini Thomson, 1860; Calocomini Galileo et Martins, 1993; Cantharocnemini Lameere, 1912; Erichsoniini Thomson, 1860; Eurypodini Gahan, 1906; Macrodontiini Thomson, 1860; Macrotomini Thomson, 1860; Mallaspini Thomson, 1860; Mallodontini Thomson, 1860; Meroscelisini Thomson, 1860; Nothophysini Lameere, 1912; Prionini Latreille, 1802; Solenopterini Lacordaire, 1869 and Tereticini Lameere, 1912. The fossil genus *Xyleoconites* Haupt, 1950 is Prioninae incertae sedis. The 4 tribes Acanthophorini, Aegosomatini, Macrotomini and Prionini are represented in Iran.

Tribe PRIONINI Latreille, 1804

= Prionites Fairmaire, 1864
= Titanitae Thomson, 1864 partim
= Psalidognathitae Thomson,1864
= Derobrachynae Pascoe, 1869
= Titanii Lameere, 1904 partim
= Prioni Lameere, 1919

The tribe includes currently 27 genera as *Apterocaulus* Fairmaire, 1864; *Braderochus* Buquet, 1852; *Brephilydia* Pascoe, 1871; *Callistoprionus* Tippmann, 1953; *Derobrachus* Audinet-Serville, 1832; *Dorysthenes* Vigors, 1826; *Emphiesmenus* Lansberge, 1884; *Guedesia* Ferreria & Veiga Ferreira, 1952; *Mesoprionus* Jakovlev, 1887; *Microarthron* Pic, 1900; *Miniprionus* Danilevsky, 1999; *Monocladum* Pic, 1892; *Neosarmydus* Fisher, 1935; *Orthosoma* Audinet-Serville, 1832; *Osphyron* Pascoe, 1869; *Paradandamis* Aurivillius, 1922; *Pogonarthron* Semenov, 1900; *Polyarthron* Audinet-Serville, 1832; *Polylobarthron* Semenov, 1900; *Prionacalus* White, 1845; *Prionomma* White, 1853; *Prionus* Geoffroy, 1762; *Priotyrannus* Thomson, 1857; *Psalidognathus* Gray et Griffith, 1831; *Pseudoprionus* Pic, 1898; *Psilotarsus* Motschulsky, 1860 and *Titanus* Audinet-Serville, 1832. The 15 species of 7 genera as *Prionus burdajewiezi* Bodemeyer, 1930; *Prionus coriarius* (Linnaeus, 1758); *Prionus sterbai* Heyrovský, 1950; *Mesoprionus angustatus* Jakovlev, 1887; *Mesoprionus asiaticus* (Faldermann, 1837); *Mesoprionus consimilis* (Holzschuh, 1981); *Mesoprionus lesnei* (Semenov, 1933); *Mesoprionus persicus* (Redtenbacher, 1850); *Mesoprionus petrovitzi* (Holzschuh, 1981); *Mesoprionus schaufussi* Jakovlev, 1887; *Psilotarsus brachypterus* (Gebler, 1830); *Pogonarthron minutum* (Pic, 1905); *Pseudoprionus bienerti* (Heyden, 1885); *Microarthron komarowi* (Dohrn, 1885) and *Monocladum iranicum* Villiers, 1961 are represented in Iran.

Genus *DORYSTHENES* Vigors, 1826
(New for Pal. Reg. and Iran)

= *Dissosternus* Hope, 1833 (Subgen. type: *Dissosternus pertii* Hope)
= *Cyrtognathus* Faldermann, 1835 (Subgen. type: *Prionus paradoxus* Faldermann)
= *Baladeva* Waterhouse, 1840 (Subgen. type: *Baldeva walkeri* Waterhouse)
= *Lophosternus* Guérin-Méneville, 1844 (Subgen. type: *Lophosternus buqueti* Guerin-Meneville)
= *Cyrtosternus* Guérin-Méneville, 1844 (Subgen. type: *Prionus indicus* Hope)
= *Paraphrus* Thomson, 1860 (Subgen. type: *Paraphrus granulosus* Thomson)
= *Opisognathus* Thomson, 1860 (Subgen. type: *Opisognathus forficatus* Thomson)
= *Prionomimus* Lameere, 1912 (Subgen. type: *Prionomimus pici* Lameere)

Type species: *Prionus rostratus* Fabricius, 1792

Dorysthenes Vigors, 1826, Zool. Journ., 2 (8), 514. (type-species : *Prionus rostratus* Fabricius, 1792). Subgenera: *Dissosternus* Hope, 1833: 64 (type species: *Dissosternus pertii* Hope); *Cyrtognathus* Faldermann, 1835: 431 (type species: *Prionus paradoxus* Faldermann); *Baladeva* Waterhouse, 1840: 225 (type species: *Baldeva walkeri* Waterhouse); *Lophosternus* Guérin-Méneville, 1844: 209 (type species: *Lophosternus buqueti* Guerin-Meneville); *Cyrtosternus* Guérin-Méneville, 1844: 210 (type species: *Prionus indicus* Hope); *Paraphrus* Thomson, 1860: 330 (type species: *Paraphrus granulosus* Thomson); *Opisognathus* Thomson, 1860: 330 (type species: *Opisognathus forficatus* Thomson); *Prionomimus* Lameere, 1912: 176 (type species: *Prionomimus pici* Lameere).

The oriental genus includes currently 23 species of 8 subgenera in the world. These subgenera are *Baladeva* Waterhouse, 1840; *Cyrtognathus* Faldermann, 1835; *Dissosternus* Hope, 1833; *Dorysthenes* Vigors, 1826; *Lophosternus* Guérin-Méneville, 1844; *Opisognathus* Thomson, 1860; *Paraphrus* J. Thomson, 1860 and *Prionomimus* Lameere, 1912. The genus is recorded for the first time for Iran and Palaearctic region.

Subgenus *BALADEVA* Waterhouse, 1840
(New for Pal. Reg. and Iran)

Type species: *Baladeva walkeri* Waterhouse, 1840

The subgenus known orientalic until now includes currently only two species as *Dorysthenes sternalis* (Fairmaire, 1902) occurs in China and Vietnam and *Dorysthenes walkeri* (Waterhouse, 1840). The subgenus is recorded for the first time for Iran and Palaearctic region.

Dorysthenes* (*Baladeva*) *walkeri (Waterhouse, 1840)
(New for Pal. Reg. and Iran) (Fig. 1)

= *Baladeva walkeri* Waterhouse, 1840 (Original designation)

This species was originally described by Waterhouse as *Baladeva walkeri* Waterhouse, 1840. It is recorded for the first time for Iran and Palaearctic region.

MATERIAL EXAMINED: Iran: East Azerbaijan province: Arasbaran, 13.07.2005, leg. M. Havaskary, 1 specimen.

DISTRIBUTION: Myanmar, Thailand, Laos, China, Vietnam (Map 3)

CHOROTYPE: Oriental + now SW-Asiatic (?)

Subfamily CERAMBYCINAE Latreille, 1802
= Cerambycitae Thomson, 1860

The subfamily currently includes at least 90 tribes as Acangassuini Galileo & Martins, 2001; Agallissini LeConte, 1873; Achrysonini Lacordaire, 1869; Alanizini Di Iorio, 2003; Anaglyptini Lacordaire, 1869; Ancylocerini LeConte, 1873; Aphanasiini Thomson, 1860; Aphneopini Aurivillius, 1912; Basipterini Fragoso, Monné & Seabra, 1987; Bimiini Lacordaire, 1869; Bothriospilini Lane, 1950; Callidiini Mulsant, 1839; Callidiopini Lacordaire, 1869; Callichromatini Blanchard, 1845; Cerambycini Latreille, 1804; Certallini Audinet-Serville, 1834; Childonini Waterhouse, 1879; Cleomenini Lacordaire, 1869; Clytini Mulsant, 1839; Compsocerini Thomson,1864; Curiini LeConte, 1873; Deilini Faimaire, 1864; Dejanirini Villiers, 1966; Diorini Lane, 1950; Distichocerini Kirby, 1818; Dodecosini Aurivillius, 1912; Dryobiini Linsley, 1964; Eburiini Blanchard, 1845; Ectenessini Martins & Galileo, 1998; Elaphidiini Thomson, 1864; Eligmodermini Lacordaire, 1869; Erlandiini Aurivillius, 1912; Eumichthini Linsley, 1940; Gahaniini Quentin et Villiers, 1969; Glaucytini Lacordaire, 1869; Graciliini Mulsant, 1839; Hesperophanini Mulsant, 1839; Hesthesini Kirby, 1818; Heteropsini Lacordaire, 1869; Holopleurini Chemsak & Linsley, 1974; Hyboderini Linsley, 1940; Ibidionini Thomson, 1860; Lissonotini Thomson, 1860; Luscosmodicini Martins, 2003; Macronini Lacordaire, 1869; Megacoelini Quentin et Villiers, 1969; Molorchini Mulsant, 1863; Nathriini Linsley, 1963; Navomorphini Thomson, 1860; Necydalopsini Blanchard, 1851; Neocorini Martins, 2005; Neostenini Pascoe, 1857; Obriini Mulsant, 1839; Opsimini LeConte, 1873; Oxycoleini Martins & Galileo, 2003; Paraholopterini Martins, 1997; Phalotini Pascoe, 1863; Phlyctaenodini Newman, 1841; Piezocerini Lacordaire, 1869; Platyarthrini Bates, 1870; Plectogasterini Quentin et Villiers, 1969; Pleiarthrocerini Lane, 1950; Protaxini Gahan, 1906; Prothemini Pascoe, 1869; Psebiini Lacordaire, 1869; Pseudocephalini Aurivillius, 1912; Psilomorphini Saunders, 1850; Pteroplatini Thomson, 1860; Pyrestini Lacordaire, 1869; Rhagiomorphini Newman, 1840; Rhinotragini Thomson, 1860; Rhopalophorini Blanchard, 1845; Smodicini Lacordaire, 1869; Spintheriini Thomson, 1860; Stenoderini Pascoe, 1869; Stenopterini Fairmaire, 1868; Strongylurini Pascoe, 1869; Sydacini Martins, 1997; Tessarommatini Newman, 1840; Thraniini Gahan, 1906; Thyrsiini Marinoni & Napp, 1984; Tillomorphini Lacordaire, 1869; Torneutini Thomson, 1860; Tragocerini Latreille, 1829; Trachyderini Dupont, 1836; Trichomesini

Pascoe, 1859; Tropocalymmatini Thomson, 1864; Typhocesini Pascoe, 1863; Uracanthini Lacordaire, 1869 and Xystrocerini Blanchard, 1845. Danilevsky (2007a) stated that "*according to personal communication of Zahaikevitch (1983), in Cerambycinae several supertribes could be criated: Cerambycites, Rosaliites, Callidiites, Clytites, Callichromites, Molorchites. The last supertribed is the most specialized one*". Anyway, the 15 tribes Anaglyptini, Callidiini, Callichromatini, Cerambycini, Certallini, Clytini, Graciliini, Hesperophanini, Hylotropini, Molorchini, Nathriini, Obriini, Stenopterini, Trachyderini and Xystrocerini are represented in Iran.

Tribe CALLICHROMATINI Blanchard, 1845

= Callichromini Thomson, 1860

The tribe includes currently 75 genera as *Agaleptus* Gahan, 1904; *Amblyonitum* Bates, 1879; *Anubis* Thomson, 1864; *Aphrodisium* Thomson, 1864; *Aromia* Audinet-Serville, 1833; *Aromiella* Podaný, 1971; *Asmedia* Pascoe, 1866; *Beaveriella* Napp & Martins, 2005; *Bradycnemis* Waterhouse, 1877; *Callichroma* Latreille, 1816; *Callixanthospila* Adlbauer, 2000; *Cataphrodisium* Aurivillius, 1907; *Chelidonium* Thomson, 1864; *Chloridolum* Thomson, 1864; *Chromazilus* Thomson, 1864; *Cloniophorus* Quedenfeldt, 1882; *Closteromerus* Dejean, 1835; *Cnemidochroma* Schmidt, 1924; *Compsomera* White, 1855; *Conamblys* Schmidt, 1922; *Cotychroma* Martins & Napp, 2005; *Dictator* Thomson, 1878; *Diotecnon* Schmidt, 1924; *Dubianella* Morati & Huet, 2004; *Embrikstrandia* Plavilstshikov, 1931; *Eugoa* Fahreus, 1872; *Euporus* Audinet-Serville, 1834; *Gauresthes* Bates, 1889; *Gestriana* Podaný, 1971; *Guitelia* Oberthür, 1911; *Helemaeus* Perroud, 1855; *Helymaeus* Thomson, 1864; *Huedepohliana* Heffern, 2002; *Hybunca* Schmidt, 1922; *Hylomela* Gahan, 1904; *Hypargyra* Gahan, 1890; *Hypatium* Thomson, 1864; *Hypocrites* Fahraeus, 1871; *Ipothalia* Pascoe, 1867; *Jonthodes* Audinet-Serville, 1834; *Jonthodina* Achard, 1911; *Leptosiella* Morati & Huet, 2004; *Linsleychroma* Giesbert, 1998; *Litopus* Audinet-Serville, 1834; *Mattania* Fairmaire, 1894; *Mecosaspis* Thomson 1864; *Mionochroma* Schmidt, 1924; *Monnechroma* Napp & Martins, 2005; *Osphranteria* Redtenbacher, 1849; *Oxyprosopus* Thomson, 1864; *Pachyteria* Audinet-Serville, 1833; *Paraguitelia* Quentin et Villiers, 1971; *Parandrocephalus* Heller, 1916; *Philematium* Thomson, 1864; *Phrosyne* Murray, 1870; *Phyllocnema* Thomson, 1860; *Phyllomaeus* Schmidt, 1922; *Plinthocoelium* Schmidt, 1924; *Polyzonus* Laporte de Castelnau, 1840; *Promeces* Audinet-Serville, 1834; *Psephania* Morati & Huet, 2004; *Psilomastix* Fahraeus, 1872; *Quettania* Schwarzer, 1931; *Rhopalizus* Thomson, 1864; *Rhopalomeces* Schmidt, 1922; *Scalenus* Gistel, 1848; *Schmidtiana* Podaný, 1971; *Schmidtianum* Podaný, 1965; *Schwarzerion* Schmidt, 1924; *Synaptola* Bates, 1879; *Tarsotropidius* Schmidt, 1922; *Thompsoniana* Podaný, 1971; *Turkaromia* Danilevsky, 1993; *Xystochroma* Schmidt, 1924 and *Zonopterus* Hope, 1843. The 5 species of 2 genera as *Aromia moschata* (Linnaeus, 1758); *Osphranteria coerulescens* Redtenbacher, 1850; *Osphranteria lata* Pic, 1956; *Osphranteria richteri* Heyrovský, 1959 and *Osphranteria suaveolens* Redtenbacher, 1850 are represented in Iran.

Genus *PACHYTERIA* Audinet-Serville, 1833 (New for Pal. Reg. and Iran)

Type species: *Cerambyx fasciatus* Fabricius, 1775

Pachyteria Audinet-Serville, 1833, Ann. Soc. Ent. Fr., 2: 553 (type species: *Cerambyx fasciata* Fabricius, 1775) loc. cit. - Gahan, 1906, Fauna British India, Col., 1: 194, Aurivillius, 1912, Coleopt. Cat., 39: 299.

The oriental genus includes currently 31 species in the world. The genus is recorded for the first time for Iran and Palaearctic region.

Pachyteria dimidiata Westwood, 1848 **(New for Pal. Reg. and Iran)** (Fig. 2)

= *Pachyteria scheepmakeri* Ritsema, 1881
= *Pachyteria oberthüri* Ritsema, 1888
= *Pachyteria sheepmakeri* Aurivillius, 1912 (incorrect subsequent spelling)
= *Pachyteria luteofasciata* Pic, 1946
= *Pachyteria timorensis* Hayashi, 1994

This species is recorded for the first time for Iran and Palaearctic region.

MATERIAL EXAMINED: Iran: Semnan province: Semnan, 19.09.2002, leg. H. Sakenin, 1 specimen.

DISTRIBUTION: Malaysia (Sarawak), Myanmar, Thailand, Vietnam, Laos, Indonesia (Sumatra), India, Borneo, Sumatra (Map 4)

CHOROTYPE: Oriental + now SW-Asiatic (?)

Subfamily LAMIINAE Latreille, 1825

= Lamiariae Latreille, 1825
= Clinocephalides Mulsant, 1839
= Lamiitae (Latreille) Thomson, 1860
= Lamiides (Latreille) Mulsant, 1863
= Lamitae (Latreille) Thomson, 1864
= Lamiens (Latreille) Planet, 1924

The subfamily currently includes at least 74 tribes as Acanthocinini Blanchard, 1845; Acanthoderini Thomson, 1860; Acmocerini Thomson, 1860; Acrocinini Thomson, 1860; Aderpasini Thomson, 1864; Aerenicini Lacordaire, 1872; Agapanthiini Mulsant, 1839; Ancylonotini Lacordaire, 1869; Anisocerini Thomson, 1860; Apodasyini Lacordaire, 1872; Apomecynini Thomson, 1860; Batocerini Lacordaire, 1869; Calliini

Thomson, 1864; Ceroplesini Dejean, 1835; Cloniocerini Dejean, 1835; Colobotheini Thomson, 1860; Compsosomatini Thomson, 1857; Crossotini Thomson, 1864; Cyrtinini Thomson, 1864; Desmiphorini Thomson, 1860; Dorcadiini Latreille, 1825; Dorcaschematini Thomson, 1860; Elytracanthini Lane, 1955; Emphytoeciini Pascoe, 1864; Enicodini Thomson, 1860; Epicastini Thomson, 1864; Eupromerini Galileo & Martins, 1995; Falsamblesthiini Gilmour, 1961; Gnomini Thomson, 1864; Gyaritini Breuning, 1956; Hemilophini Thomson, 1868; Homonoeini Thomson, 1864; Hyborhabdini Aurivillius, 1911; Lamiini Latreille, 1825; Laticraniini Lane, 1959; Mauesini Lane, 1956; Megabasini Thomson, 1864; Mesosini Thomson, 1860; Metonini Pascoe, 1862; Moneilemini Thomson, 1864; Morimopsini Lacordaire, 1869; Nyctimenini Thomson, 1864; Ocularìini Breuning, 1950; Onciderini Thomson, 1860; Onocephalini Thomson, 1860; Parmenini Mulsant, 1839; Petrognathini Blanchard, 1845; Phacellini Lacordaire, 1872; Phantasini Hunt & Breuning, 1957; Phrissomini Thomson, 1860; Phrynetini Thomson, 1864; Phytoeciini Pascoe, 1864; Pogonocherini Mulsant, 1839; Polyrhaphidini Thomson, 1860; Pretiliini Martins & Galileo, 1990; Proctocerini Aurivillius, 1921; Prosopocerini Thomson, 1868; Pteropliini Thomson, 1860; Rhodopinini Gressitt, 1951; Saperdini Mulsant, 1839; Stenobiini Breuning, 1950; Sternotomini Thomson, 1860; Tapeinini Thomson, 1857; Tetracopini Wollaston, 1873; Tetraopini Thomson, 1860; Tetropini Thomson, 1860; Theocridini Thomson, 1858; Tmesisternini Thomson, 1860; Tragocephalini Thomson, 1857; Velorini Thomson, 1864; Xenofreini Bates, 1885; Xenoleini Lacordaire, 1869; Xylorhizini Dejean, 1835 and Zygocerini Dejean, 1835. The 14 tribes Acanthocinini, Agapanthiini, Ancylonotini, Apodasyini, Apomecynini, Dorcadiini, Lamiini, Mesosini, Parmenini, Phytoeciini, Pteropliini, Saperdini and Tetropini are represented in Iran.

Tribe CEROPLESINI Thomson, 1860
(New for Pal. Reg. And Iran)

= Ceroplesitae Thomson, 1860
= Ceroplesides (Thomson) Lacordaire, 1872

The tribe includes currently 9 genera as *Analeptes* Gistl, 1847; *Ceroplesis* Dejean, 1835; *Cochliopalpus* Lacordaire, 1872; *Diastocera* Dejean, 1835; *Gnathoenia* Thomson, 1858; *Paranaleptes* Breuning, 1937; *Pterotragus* Chevrolat, 1856; *Pycnopsis* Thomson, 1857 and *Titoceres* Thomson, 1868. All genera are African except the oriental genus *Diastocera* Dejean, 1835. This tribe is recorded for the first time for Iran and Palaearctic region.

Genus *DIASTOCERA* Dejean, 1835
(New for Pal. Reg. and Iran)

= *Thysia* Thomson, 1860 (Type sp. *Lamia wallichi* Hope, 1831)
= *Thysiotes* Thomson, 1868 (Unnecessary replacement name for *Thysia* Thomson, 1860)

Type species: *Lamia tricincta* Duncan, 1835

Diastocera Dejean, 1835, Catal. Coléopt., ed. 2, 342 [n.n.]; Thomson 1857, Archives ent., 1, 183. (type species: *Lamia tricincta* Duncan, 1835) *loc. cit.* – Thomson, 1860, Essai d'une classification de la famille des cérambycides et matériaux pour servir à une monographie de cette famille, 96, - Thomson, 1868, XVII. Note rectificative. Physis Recueil d'Histoire Naturelle, Paris 2(6): 201.

The oriental genus is monotypic and it includes currently only 1 species with 3 subspecies in the world. The genus is recorded for the first time for Iran and Palaearctic region.

Diastocera wallichi (Hope, 1831)
(New for Pal. Reg. and Iran) (Fig. 3)

= *Lamia wallichi* Hope, 1831
= *Lamia tricincta* Duncan, 1835
= *Diastocera wallichi tricincta* (Duncan, 1835)
= *Ceroplesis tricincta* (Duncan, 1835) Laporte de Castelnau, 1840
= *Lamia trivittata* Gistl in Gistl & Bromme, 1850
= *Thysia tricincta* (Duncan, 1835) Pascoe, 1857
= *Thysia wallichi* (Hope, 1831) Thomson, 1860
= *Thysiotes wallichi* (Hope, 1831) Thomson, 1868
= *Diastocera wallichi tonkinensis* Kriesche, 1924
= *Diastocera savioi* Jen, 1932
= *Diastocera wallichi var. insularis* Fisher, 1935

This species is recorded for the first time for Iran and Palaearctic region. As commonly accepted that the species has 3 subspecies in the world. These are: - *Diastocera wallichi wallichi* (Hope, 1831) occurs in NE India (Assam), Myanmar, S China (Yunnan), NW Thailand, - *Diastocera wallichi tricincta* (Duncan, 1835) occurs in Malaysia, Borneo, Indonesia (Sumatra, Java, Celebes) and - *Diastocera wallichi tonkinensis* Kriesche, 1924 occurs in Thailand, China, Laos and Vietnam.

MATERIAL EXAMINED: Iran: Isfahan province: Najaf-Abad, 14.06.2005, leg. H. Rakhshani, 1 specimen.

DISTRIBUTION: India, Myanmar, China, Thailand, Malaysia, Borneo, Indonesia (Sumatra, Java, Celebes), Laos, Vietnam (Map 5)

CHOROTYPE: Oriental + now SW-Asiatic (?)

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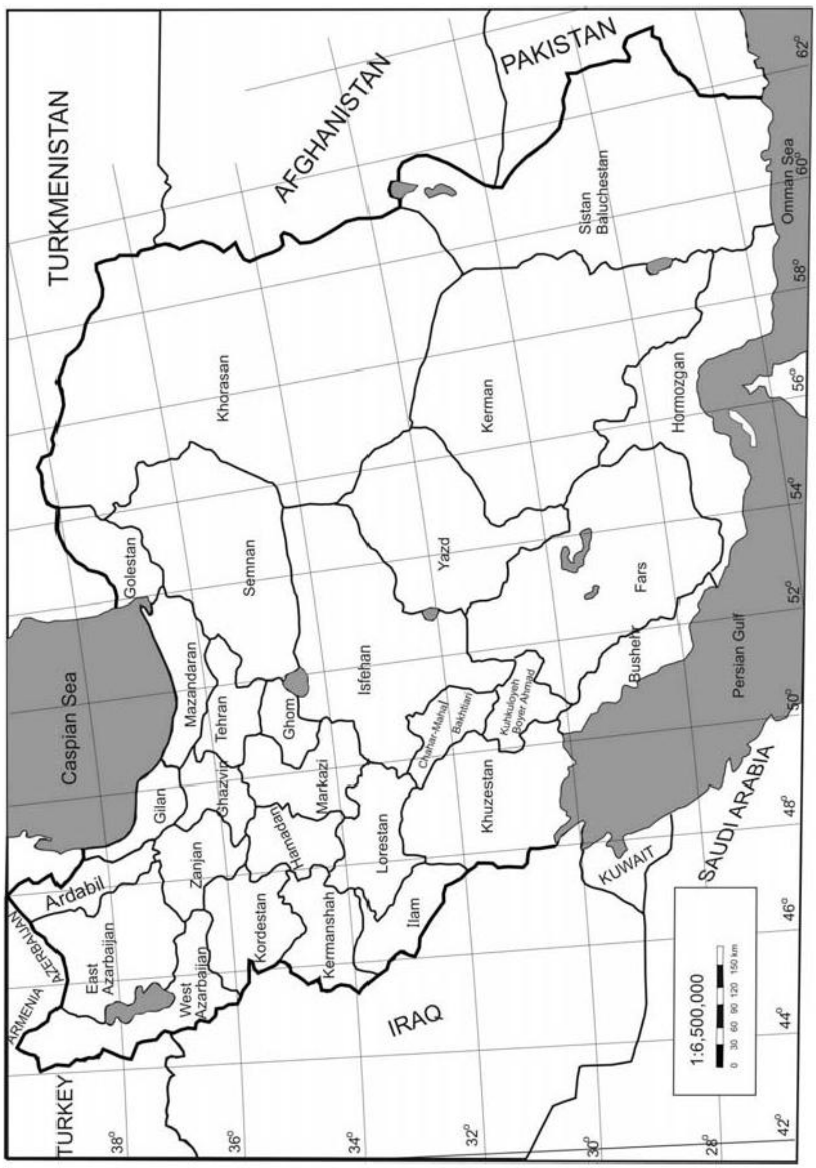
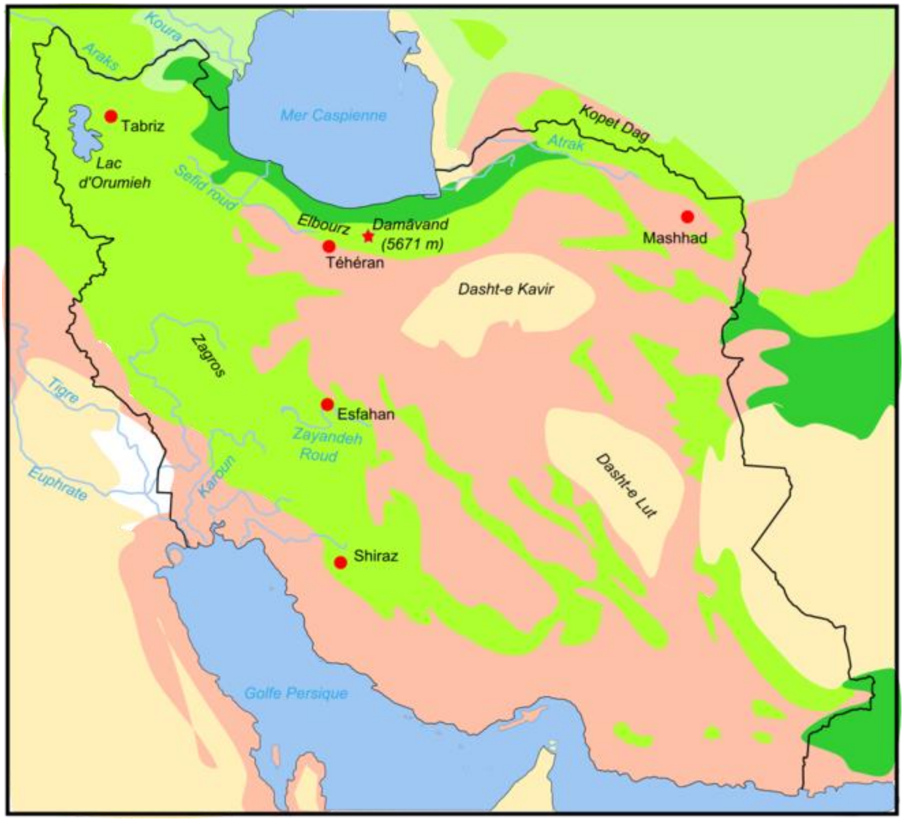
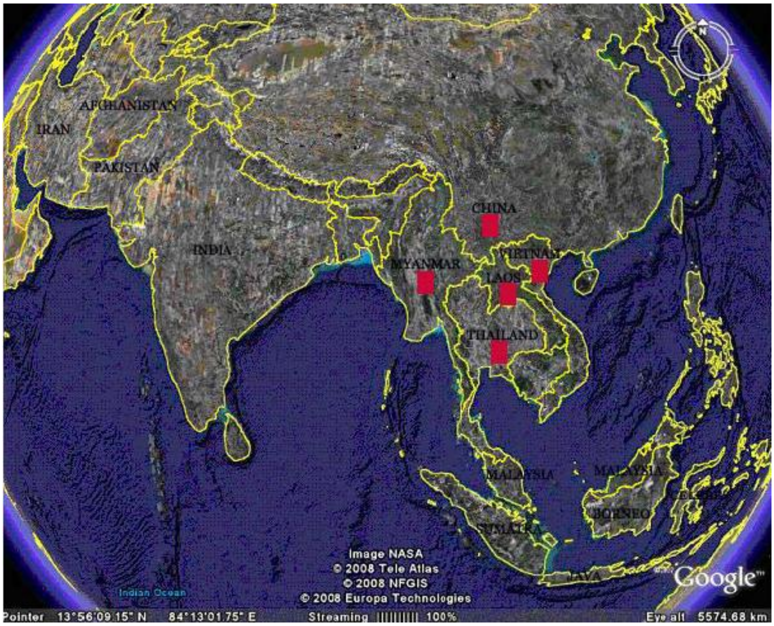


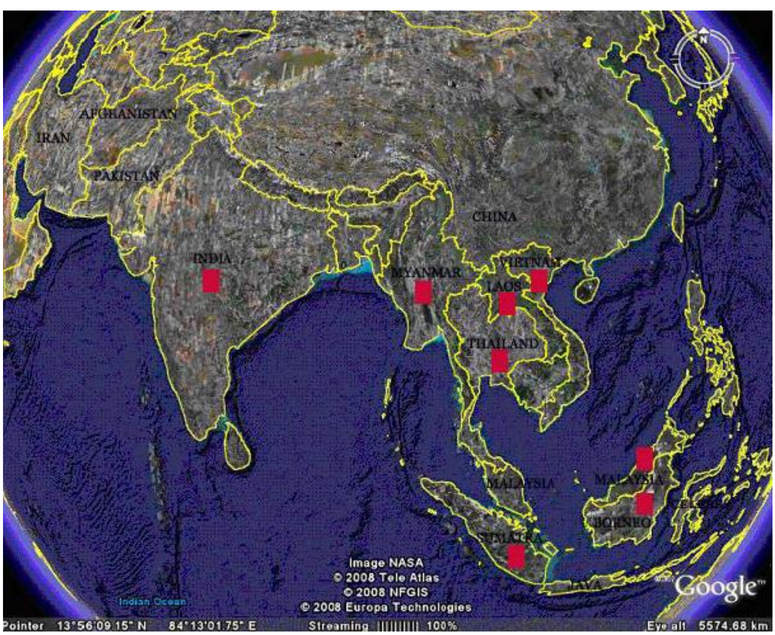
Map 1. The provinces of Iran.



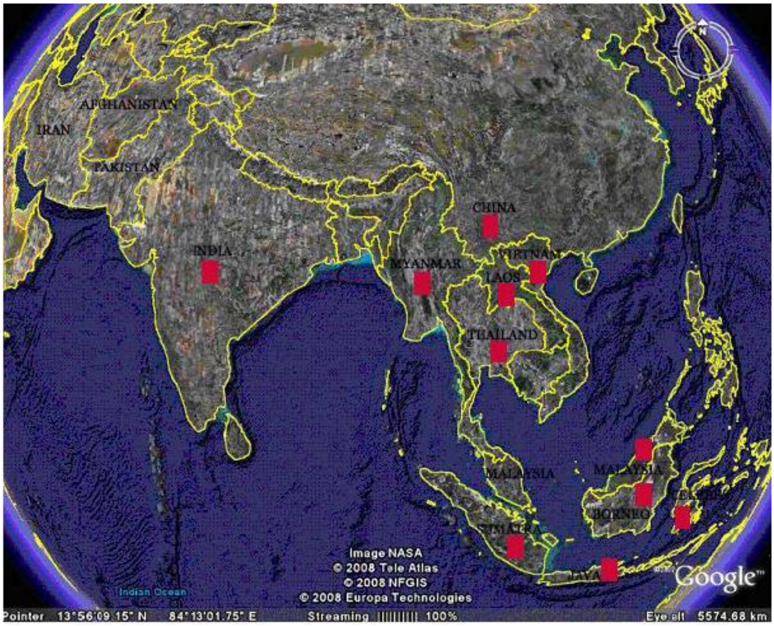
Map 2. Map of biotopes of Iran Forest steppe Forests and woodlands Semi-desert Desert lowlands Steppe Salted alluvial marshes (from Wikipedia, 2007).



Map 3. The known distribution of *Dorysthenes walkeri* (Waterhouse, 1840) (from Google Earth)



Map 4. The known distribution of *Pachyteria dimidiata* Westwood, 1848 (from Google Earth)



Map 5. The known distribution of *Diastocera wallichi* (Hope, 1831) (from Google Earth)

Figure 1. *Dorysthenes walkeri* (Waterhouse, 1840)

Figure 2. *Pachyteria dimidiata* Westwood, 1848

Figure 3. *Diastocera wallichi* (Hope, 1831)

AN INVESTIGATION ON SOME HETEROPTERA IN MARAND REGION (IRAN)

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[Hassazadeh, M., Pourabad, R. F. & Shayesteh, N. 2009. An investigation on some Heteroptera in Marand region (Iran). Munis Entomology & Zoology, 4 (1): 19-24**]**

ABSTRACT:During 2005- 2006 an investigation was carried out on Heteroptera fauna of Marand region and environs in East Azarbaijan province (located in the northwest of Iran).The specimens were collected from trees, weeds, fields of cereals, hibernating habitats, soil and water by sweep net, aspirator and light trap. All species are first records from the studied region**.**

KEY WORDS: Heteroptera, Marand, fauna, predator

The Heteroptera are very important from an agricultural point of view. In this suborder there are aquatic, semi-aquatic and terrestrial species some of which are serious agricultural and silvicultural pests. On the other hand, predacious bugs reduce the number of agricultural pests and may be used in biological control.Because of these reasons; identification of Heteroptera is important (Linnavuori & Hosseini, 2000).

The Heteroptera insects feed on plant juices or live as predators. Many of such insects that feed on the plant are known as serious plant pests (Safavi, 1973).

The damage caused by the insect as a result of sucking sap from food plants, is often increased by the salivary enzymes, which may considerably alter the quality of plant products such as the baking quality of wheat. On the other hand, many predators, catch other insects and Acarina, and very beneficial from an agricultural point of view (Linnavuori & Hosseini, 2000).

MATERIAL AND METHODS

Marand is notable for its agricultural products but no faunestic investigation on invertebrates has been carried out. This is the first report of Heteroptera fauna of the region.

The study carried out during 2005-2006, and Heteroptera insects of Marand and environ collected from different plant hosts by different methods.

Marand (38°, 17' - 38°, 53' N, 45°, 14' - 46°, 12' E) is located on the northwest of East Azarbaijan province of Iran.

The climate is cold, semidried with the annual rainfall of 280-440mm. Wheat, barley, apple and stone fruits are the usual crops in the region.

The visible specimens that weren't very swift were trapped by hand but small species were collected by aspirator, some of the bugs were collected by sweep net from weeds and some of them by light trap. The specimens were put into jars filled with 70% alcohol.

RESULTS

In this study 29 species belonging to thirteen families of the Heteroptera have been studied.

Family Corixidae Leach, 1815

Corixa punctata (Illiger, 1807)

Material examined: Yekan dizaj: 4 specimens, June 2005. From water.

Family Notonectidae Latreille, 1802

Notonecta glauca Linnaeus, 1858

Material examined: Bangi: 2 specimens, July 2006. From water.

Family Tingidae Laport, 1877

Stephanitis pyri (Fabricius, 1775)

Material examined: Yekan dizaj: 1 specimen, May 2005. On garden apple.

Note: This species has been collected from different regions of Iran on apple, pear, cherry, peach, japanese quince, pyrus, white-thorn, plum, roses, malus, cerasus, alder, oak (Modarres Awal, 2002).

Family Miridae Hahn, 1831

Adelphocoris lineolatus Geoze, 1778

Material examined: Anamagh: 3 specimens, June 2005. On Lucerne.

Note: The species has generally distribution in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal, 2002).

Deraeocoris punctulatus (Fallen, 1801)

Material examined: Braham: 3 specimens, April 2005. On weeds.

Lygus rugulipennis Poppius, 1911

Material examined: Bangi: 2 specimens, June 2005, July 2006. On potato.

Family Anthocoridae Fieber, 1836

Anthocoris nemorum (Linnaeus, 1761)

Material examined: Marand: 2 specimens, July 2005. On garden apple.

Note: Predator of *Psylla pyricola, Anthonomus pomorum, Euzophera bigella, Hyponomeuta malinellus* and aphids (Modarres Awal, 2002).

Anthocoris nemoralis (Fabricius, 1794)

Material examined: Marand: 3 specimens, July 2006. On garden pear.

Note: Predator of aphids and *Psylla pyricola.*

Family Nabidae Costa, 1852

Nabis Pseudoferrus Remane, 1949

Material examined: Ordakloo :2 specimens, May 2005. On Lucerne.

Note: The species is predator and collected on sainfoin and Lucerne (Modarres Awal, 2002).

Coreidae Leach, 1815 Family

Coreus marginatus Linnaeus, 1758

Material examined: Bahram: 3 specimens, May 2005, 2 specimens, June 2006. On *Cirsium.*

Family Pyrrhocoridae Dohrn, 1859

Pyrrhocoris apterus Linnaeus, 1768

Material examined: Marand: 4 specimens, June 2005. On weeds.

Note: The species has been collected from East Azarbaijan, Khorasan, Tehran, Khozestan, Fars, Gilan and Gorgan provinces in Iran (Modarres Awal, 2002).

Family Alydidae Amyot and Servill, 1843

Camptopus lateralis (Germar, 1817)

Material examined: Marand: 6 specimens, April 2005. On lucene.

Family Rhopalidae Amyot and Servill, 1843

Corizus hyoscyami Linnaeus, 1758

Material examined: Ordakloo: 3 specimens, May 2005; **Marand:** 2 specimens, June 2006. On weeds.

Family Cydnidae Billberg, 1820

Cydnus aterrimus Foster, 1771

Material examined: Marand: 1 specimen, May 2005**.** On lucerne.

Family Scutelleridae Leach, 1815

Eurygaster integriceps Puton, 1886

Material examined:Marand: 8 specimens, June 2005. On wheat.

Note: This species has generally distribution in Iran (Modarrese Awal, 2002).

Eurygaster maura (Linnaeus, 1758)

Material examined: Marand: 5 specimens, May 2006. On wheat.

Odontotarsus robustus Jakovlev, 1883

Material examined: Bangi: 1 specimen, May 2006. On weeds.

Family Pentatomidae Leach, 1815

Aelia rostrata Bohemann, 1852

Material examined: Bahram: 1 specimen, June 2005. On wild graminae.

Note: Wheat, barley and wild graminae are the host of the species (Modarreas Awal, 2002).

Apodiphus amygdali Germar, 1817

Material examined: Marand: 5 specimens, July 2005. On apricot.

Note: This species has been collected from Tehran, Fars, Markazi. Kerman, Hormozgan, Semnan, Balouchestan, Esfahan provinces in Iran on poplar, almond, apricot, oriental plane, pistachio, tamarisk, oak, tung (Modarres Awal,2002).

Apodiphus integriceps Horvath, 1888

Material examined: Marand: 4 specimens, June 2006. On poplar.

Carpocoris fuscispinus (Bohemann, 1849)

Material examined: Marand: 2 specimens, July 2005. On lucern.

Note: The species has distribution in East Azarbaijan, Mazandaran, Zanjan, Tehran, Esfahan, Khorasan, Loretan in Iran on Lucerne, lupine, wheat, sugar-beet (Modarres Awal,2002).

Carpocoris lunata Fallen, 1852

Material examined: Bangi: 4 specimens, May 2006. On cereals.

Carpocoris purpureipennis (DeGeer, 1773)

Material examined: Marand: 5 specimens, August 2005. On weeds.

Dolycoris baccarum Linnaeus, 1758

Material examined: Anamagh: 3 specimens, June 2005. On lucerne.

Eurydema ornatum (Linnaeus, 1758)

Material examined: Marand: 2 specimens, April 2005. On cabbage.

Note: The species has been collected from different regions of Iran on turnip, cabbage, colza, mustard, wheat, radish and cultivated and wild crucifereae family plants (Modarres Awal, 2002).

Eurydema ventrale Kolenati, 1864

Material examined: Anamagh: 1 specimen, April 2006. On cabbage.

Graphosoma lineatum (Linnaeuse, 1758)

Material examined: Marand: 5 specimens, June 2005. On wild crucifereae.

Neottiglossa irana Wagner, 1963

Material examined: Bahram: 1 specimen, April 2005. On weeds

Palomena prasina (Linnaeus, 1761)

Material examined: Marand: 3 specimens, June 2006. On weeds.

Among the species found in this study, *Eurygaster integriceps* and *Camptopus lateralis* had the highest frequency and convertibly family of *Stephanitis pyri* had the minimum.

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A NOTE ON BAIT TRAP COLLECTED LONGHORN BEETLES (CERAMBYCIDAE) OF WESTERN TURKEY

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[Tezcan, S. & Can, P. 2009. A note on bait trap collected Longhorn Beetles (Cerambycidae) of western Turkey. Munis Entomology & Zoology, 4 (1): 25-28**]**

ABSTRACT: In this paper, information is given on 10 species of Cerambycidae collected by fermenting bait traps from western Turkey. Of these species, three (*Trichoferus preissi*, *T. spartii*, *Cerambyx welensii*) were recorded for the first time from İzmir, two (*T. kotschyi*, *C. cerdo*) from Manisa provinces and three (*Trichoferus kotschyi, T. preissi*, *Cerambyx welensii*) were recorded for the first time from Aegean Region of Turkey, respectively.

KEY WORDS: Cerambycidae, Fauna, Western Turkey, Bait trap.

Some data on the Longhorn beetle fauna of Western Turkey has been given by İyriboz (1938, 1940), Gül-Zümreoğlu (1972, 1975), Lodos (1998), Tezcan & Rejzek (2002) and Özdikmen (2008a, b) and recently detailed information on 134 species has been given by Özdikmen (2008b).

In this paper, the monitoring of Cerambycidae species occurring in the Turkish pine (*Pinus brutia* Ten.) (Pinales: Pinaceae) seed orchards by using a fermenting bait trap collection method is described.

MATERIAL AND METHODS

The beetles were collected in two pine seed orchards in western Turkey: Kınık (İzmir, 39° 04´N 27° 18´E), and Gelenbe (Manisa-Kırkağaç, 39° 11´N 27° 49´E). The specimens were collected during the months of June-September, 1999 by using fermenting bait traps. For this purpose, a total of 4 fermenting bait traps were hung in each orchard. The traps were charged with a mixture containing wine (100 ml), water (900 ml), sugar (25 g), and vinegar (25 ml) (Ulu et al. 1995). The traps were checked for the presence of beetles weekly intervals starting from beginning of June until the end of September.

All specimens were identified by M. Rejzek (Czech Republic) and were deposited in the collection of the Prof. Dr. Niyazi Lodos Museum (LEMT), Plant Protection Department, Faculty of Agriculture, Ege University, İzmir, Turkey.

Recent publication of Özdikmen (2008b) were used to give the distribution of each species in Turkey without given cited previous publications. If needed, Özdikmen (2008b) can be studied for detailed literature.

RESULTS

Cerambycinae

Hesperophanini

Hesperophanes sericeus (Fabricius, 1787)

Distribution in Turkey: Aydın, Denizli, Erzincan, Isparta, İzmir (Dikili) (Özdikmen, 2008b).

Material examined: İzmir (Kınık), 16.08.1999, 1 specimen.

Biology: Polyphagous on deciduous trees and shrubs *Juglans*, *Ficus*, *Vitis*, *Platanus*, *Quercus*, etc. (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Trichoferus fasciculatus (Faldermann, 1837)

Distribution in Turkey: Ankara, Antalya, Bartın, Bursa, İzmir (Kemalpaşa-Ören), Manisa (Muradiye), Muğla, Trabzon (Özdikmen, 2008b).

Material examined: Manisa (Kırkağaç-Gelenbe), 12.07.1999, 1 specimen.

Biology: Polyphagous in deciduous trees. It develops in *Ficus*, *Sorbus*, *Rhus*, *Nerium*, *Vitis*, *Paliurus*, *Spartium*, *Castanea*, *Ulmus*, *Morus*, *Punica*, *Rubus*, *Cytisus*, *Robinia*, *Ceratonia*, *Pistacia*, *Ziziphus*, *Coronilla*, etc. (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Trichoferus griseus (Fabricius, 1792)

Distribution in Turkey: Adana, Antalya, Aydın, Gaziantep, Hatay, İçel, İzmir (Bornova, Çeşme, Dikili, Güzelyalı, Kemalpaşa-Ören, Ödemiş, Tire), Konya, Manisa (Muradiye), Osmaniye (Özdikmen, 2008b).

Material examined: Manisa (Kırkağaç-Gelenbe), 19.08.1999, 1 specimen.

Biology: Polyphagous in deciduous trees (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Trichoferus kotschyi (Ganglbauer, 1883)

Distribution in Turkey: South Turkey (Sama & Makris, 2001); Mersin (Hoskovec & Rejzek, 2008).

Material examined: Manisa (Kırkağaç-Gelenbe), 19.08.1999, 1 specimen.

Biology: It develops in *Quercus* spp., *Ceratonia siliqua*, but also in dead herbaceous plants (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Remarks: First record for Manisa province and Aegean Region of Turkey. It is a rare species. Dauber (2004) gave this species as a new record for Europe (from Samos Island).

Trichoferus preissi Heyden, 1894

Distribution in Turkey: Southern Turkey (Sama & Makris, 2001); Western Turkey (Hoskovec & Rejzek, 2008).

Material examined: İzmir (Kınık), 23.08.1999, 5 specimens; 02.09.1999, 1 specimen; 22.09.1999, 1 specimen. Totally 7 specimens.

Biology: Polyphagous in deciduous trees (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Remarks: First record for İzmir province and Aegean Region of Turkey.

Trichoferus spartii (Müller, 1948)

Distribution in Turkey: İçel, Manisa (Muradiye) (Özdikmen, 2008b).

Material examined: İzmir (Kınık), 02.09.1999, 1 specimen. Manisa (Kırkağaç-Gelenbe), 12.07.1999, 1 specimen. Totally 2 specimens.

Biology: It develops in *Spartium*, *Rhus*, *Paliurus*, *Coronilla* spp. (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Remarks: First record for İzmir province.

Cerambycini

Cerambyx cerdo Linnaeus, 1758

Distribution in Turkey: Adana, Adıyaman, Ankara, Antalya, Artvin, Bartın, Bursa, Çanakkale, Denizli, Hatay, İçel, İstanbul, İzmir (Bergama, Bornova, Kemalpaşa-Armutlu), Kahramanmaraş, Kastamonu, Kayseri, Kırklareli, Kocaeli, Muğla, Niğde, Osmaniye, Sakarya, Samsun, Sinop, Şırnak, Tunceli (Özdikmen, 2008b).

Material examined: Manisa (Kırkağaç-Gelenbe), 12.08.1999, 1 specimen.

Biology: Polyphagous in deciduous trees including *Quercus* spp. (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

Remarks: First record for Manisa province. The examined specimen in this paper belongs to the subspecies *Cerambyx cerdo acuminatus* (Motschulsky, 1852).

Cerambyx welensii Küster, 1846

Distribution in Turkey: Adıyaman, Antalya, İçel, İstanbul, Kahramanmaraş, Karaman (Özdikmen, 2008b).

Material examined: İzmir (Kınık), 08.07.1999, 1 specimen.

Biology: It develops in *Quercus* spp. (Lieutier, 2004). No significance for pine seed orchards.

Remarks: First record for İzmir province and Aegean Region of Turkey.

Acanthocinini

Acanthocinus griseus (Fabricius, 1792)

Distribution in Turkey: Adana, Antalya, Bursa, Denizli, Edirne, Erzurum, Hatay, İçel, İzmir (Bornova), Konya, Manisa, Muğla, Trabzon (Özdikmen, 2008b).

Material examined: İzmir (Kınık), 23.08.1999, 3 specimens.

Biology: It develops mainly in coniferous trees (*Pinus*, *Picea*, *Abies*). It was also reported from oak (*Quercus*) (Hoskovec & Rejzek, 2008).

Clytini

Plagionotus detritus (Linnaeus, 1758)

Distribution in Turkey: Adana, Antalya, Erzurum, Hatay, İstanbul, Kahramanmaraş, Manisa (Muradiye), Sinop, Trabzon (Özdikmen, 2008b).

Material examined: Manisa (Kırkağaç-Gelenbe), 05.08.1999, 1 specimen.

Biology: Polyphagous in deciduous trees including *Quercus* spp. (Hoskovec & Rejzek, 2008). No significance for pine seed orchards.

DISCUSSION

In this study 10 species belonging to Cerambycidae were recorded for İzmir and Manisa provinces. Of these species, three (*Trichoferus preissi*, *T. spartii*, *Cerambyx welensii*) were recorded for the first time from İzmir, two (*T. kotschyi*, *C. cerdo*) from Manisa provinces and three (*Trichoferus kotschyi, T. preissi*, *Cerambyx welensii*) were recorded for the first time from the Aegean Region of Turkey, respectively.

Among those *A. griseus* may develop in coniferous trees. The rest of them have no significance for pine seed orchards. Probably they are travellers from areas adjacent to the orchards.

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A REVIEW ON THE GENERA *PSEUDOVADONIA* LOBANOV ET AL., 1981 AND *VADONIA* MULSANT, 1863 (COLEOPTERA: CERAMBYCIDAE: LEPTURINAE)

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[Özdikmen, H. & Turgut, S. 2009. A review on the genera *Pseudovadonia* Lobanov et al., 1981 and *Vadonia* Mulsant, 1863 (Coleoptera: Cerambycidae: Lepturinae). Munis Entomology & Zoology 4 (1): 29-52**]**

ABSTRACT: All taxa of the genera *Pseudovadonia* Lobanov et al., 1981 and *Vadonia* Mulsant, 1863 in the whole world are evaluated. These genera are also discussed in detail. The main aim of this catalogic work is to clarify current status of the genera in the world.

KEY WORDS: *Pseudovadonia, Vadonia,* Lepturinae, Lepturini, Cerambycidae.

Subfamily LEPTURINAE Latreille, 1802

Tribe LEPTURINI Kirby, 1837

= Lepturidae Kirby, 1837
= Lepturaires Mulsant, 1839
= Lepturitae Thomson, 1864

The tribe includes currently at least 109 genera as *Acanthoptura* Fairmaire, 1894; *Alosterna* Mulsant, 1863; *Analeptura* Linsley & Chemsak, 1976; *Anastrangalia* Casey, 1924; *Anoplodera* Mulsant, 1839; *Asilaris* Pascoe, 1866; *Batesiata* Miroshnikov, 1998; *Bellamira* LeConte, 1873; *Brachyleptura* Casey, 1913; *Carlandrea* Sama & Rapuzzi, 1999; *Cerrostrangalia* Hovore & Chemsak, 2005; *Charisalia* Casey, 1913; *Chloriolaus* Bates, 1885; *Chontalia* Bates, 1872; *Choriolaus* Bates, 1885; *Corennys* Bates, 1884; *Cornumutila* Letzner, 1843; *Cribroleptura* Vives, 2000; *Cyphonotida* Casey, 1913; *Dokhtouroffia* Ganglbauer, 1886; *Dorcasina* Casey, 1913; *Elacomia* Heller, 1916; *Ephies* Pascoe, 1866; *Etorofus* Matsushita, 1933; *Eurylemma* Chemsak & Linsley, 1974; *Euryptera* Lepeletier & Audinet-Serville in Latreille, 1828; *Eustrangalis* Bates, 1884; *Formosopyrrhona* Hayashi, 1957; *Fortuneleptura* Villiers, 1979; *Gnathostrangalia* Hayashi & Villiers, 1985; *Hayashiella* Vives & N.Ohbayashi, 2001; *Idiopidonia* Swaine & Hopping, 1928; *Idiostrangalia* Nakane & Ohbayashi, 1957; *Japanostrangalia* Nakane & Ohbayashi, 1957; *Judolia* Mulsant, 1863; *Judolidia* Plavilstshikov, 1936; *Kanekoa* Matsushita & Tamanuki, 1942; *Kanoa* Matsushita, 1933; *Katarinia* Holzschuh, 1991; *Kirgizobia* Danilevsky, 1992; *Leptalia* LeConte, 1873; *Leptochoriolaus* Chemsak & Linsley, 1976; *Leptostrangalia* Nakane & Ohbayashi, 1959; *Leptura* Linnaeus, 1758; *Lepturalia* Reitter, 1913; *Lepturobosca* Reitter, 1913; *Lepturopsis* Linsley & Chemsak, 1976; *Lycidocerus* Chemsak & Linsley, 1976; *Lycochoriolaus* Linsley & Chemsak, 1976; *Lycomorphoides* Linsley, 1970; *Lygistopteroides* Linsley & Chemsak, 1971; *Macrochoriolaus* Linsley, 1970; *Macroleptura* Nakane et Ohbayashi, 1957; *Megachoriolaus* Linsley, 1970; *Meloemorpha* Chemsak & Linsley, 1976; *Metalloleptura* Gressitt & Rondon, 1970; *Metastrangalis* Hayashi, 1960; *Mimiptera* Linsley, 1961; *Mimostrangalia* Nakane & Ohbayashi, 1957; *Mordellistenomimus* Chemsak & Linsley, 1976; *Munamizoa* Matsushita &

Tamanuki, 1940; *Nemognathomimus* Chemsak & Linsley, 1976; *Neobellamira* Swaine & Hopping, 1928; *Neoleptura* Thomson, 1860; *Neopiciella* Sama, 1988; *Nivellia* Mulsant, 1863; *Nustera* Villiers, 1974; *Ocalemia* Pascoe, 1858; *Oedecnema* Thomson, 1857; *Ohbayashia* Hayashi, 1958; *Orthochoriolaus* Linsley & Chemsak, 1976; *Ortholeptura* Casey, 1913; *Pachytodes* Pic, 1891; *Papuleptura* Gressitt, 1959; *Paracorymbia* Miroshnikov, 1998; *Paranaspia* Matsushita & Tamanuki, 1940; *Parastrangalis* Ganglbauer, 1889; *Pedostrangalia* Sokolov, 1897; *Platerosida* Linsley, 1970; *Pseudalosterna* Plavilstshikov, 1934; *Pseudoparanaspia* Hayashi, 1977; *Pseudophistomis* Linsley & Chemsak, 1971; *Pseudostrangalia* Swaine & Hopping, 1928; *Pseudotypocerus* Linsley & Chemsak, 1971; *Pseudovadonia* Lobanov , Danilevsky et Murzin, 1981; *Pygoleptura* Linsley & Chemsak, 1976; *Pygostrangalia* Hayashi, 1976; *Pyrocalymma* Thomson, 1864; *Pyrotrichus* LeConte, 1862; *Pyrrhona* Bates, 1884; *Rapuzziana* Danilevsky, 2006; *Robustoanoplodera*; *Rutpela* Nakane et Ohbayashi, 1957; *Stenelytrana* Gistel, 1848; *Stenoleptura* Gressitt, 1935; *Stenostrophia* Casey, 1913; *Stenurella* Villiers, 1974; *Stictoleptura* Casey, 1924; *Strangalepta* Casey, 1913; *Strangalia* Audinet-Serville, 1835; *Strangalidium* Giesbert, 1997; *Strangaliella* Bates, 1884; *Strangalomorpha* Solsky, 1873; *Strophiona* Casey, 1913; *Trachysida* Casey, 1913; *Trigonarthris* Haldeman, 1847; *Trypogeus* Lacordaire, 1869; *Typocerus* LeConte, 1850; *Vadonia* Mulsant, 1863 and *Xestoleptura* Casey, 1913. However, *Cortodera* Mulsant, 1863 and *Grammoptera* Audinet-Serville, 1835 was placed in the tribe Lepturini by Villiers (1978) and Vitali (2007).

Genus *PSEUDOVADONIA* Lobanov, Danilevsky & Murzin, 1981

= *Pseudalasterna* Auct.
= *Vadonia* Auct. partim
= *Leptura* Auct. partim
= *Anoplodera* Auct. partim

Type species: *Leptura livida* Fabricius, 1776

Body short and wide. Head broad at the level of eyes, temples reduced completely, mouth narrow and lengthened, cheeks so long as the half of eyes. Eyes large, hard but dilated. Antennae inserted at the level of the lower edge of the eye, very thickened towards the apex, exceed three fifth of elytra in males, more thick and exceeding only barely the middle of the elytron in the females; scape very arched and flattened underneath; second article equal to one third of the third, third article almost equal to the fourth, the fifth a little longer, following articles thickened and diminished size.

Pronotum a little longer than wide, very shrunk forward, rounded laterally, with the fine swelling collar and a transverse depression in front of the base. Pronotum strongly bisinuate, side rounded, nonprojecting angles. Scutellum subtriangular, bifid in the apex. Elytra relatively short, convex, separately round in the apex. Legs rather short, middle and hind tibiae rather strongly thickened in the apex. First article of hind tarsi longer than the two following joined articles together.

Larval development is in humus particles of soil and parts of the roots infested by fungus *Marasmius oreades* (Bolt.). Pupation is in late spring or early summer in the soil. Adults can be found on flowers.

The Palaearctic genus is monotypic.

livida Fabricius, 1776
ssp. ***livida*** Fabricius, 1776
ssp. ***pecta*** Daniel & Daniel, 1891
ssp. ***desbrochersi*** Pic, 1891

Original combination: *Leptura livida* Fabricius, 1776

Other names. *pastinacea* Panzer, 1795; *bicarinata* Arn., 1869; *caucasica* Daniel & Daniel, 1891 (nomen nudum); *corallipes* Reitter, 1894; *bicarinatoides* Plavilstshikov, 1936; *steigerwaldi* Heyrovský, 1955

The species is represented by three subspecies in Turkey. *P. livida desbrochersi* (Pic, 1891) occurs in East or North-East Turkey, *P. livida pecta* (Daniel & Daniel, 1891) occurs in South and West Turkey and the nominative *P. livida livida* occurs in other parts of Turkey. However, we think that the real status of distribution patterns of these subspecies needs to be clarified. According to Sama (2002), the taxonomy of this species needs revision. In Danilevsky (2008b) stated that "*according to J. Voříšek (personal communication,1992), Pseudovadonia livida livida does not occur eastwards France; in Italy - Pseudovadonia livida pecta; in Greece, Black sea coast of Bulgaria, Transcaucasie and Turkey - Pseudovadonia livida desbrochersi Pic; but near Sochi - Pseudovadonia livida pecta*". Also, "*Pseudovadonia livida caucasica Daniel was recorded for Mashuk and Zheleznovodsk. The taxon was never described, so Pseudovadonia livida caucasica Runich, Kasatkin, Lantzov, 2000 must be regarded as nomen nudum*". Danilevsky (2008b) stated that "*As it was reliably mentioned by G. Sama (2002), Pseudovadonia livida consists of many morphological determined populations, which need to be adequately reflected in nomenclature (different length, color and direction of elytral and pronotal pubescence, different color of legs and abdomen). For example it was mentioned (Sama, 2002), that populations from Middle East looks closer to European populations than to Anatolian. Leptura livida was described from Germany. Specimens (my materials and collection of Zoological Museum of Moscow University) from France, Germany, Austria, Czechia, Hungary and Greece seem to have relatively longer pronotal erect pubescence, than specimens from Italy (type locality of Vadonia livida pecta), Bulgaria, Ukraine, Russia and Kazakhstan. So, traditional separation of the east subspecies Pseudovadonia livida pecta seems to be adequate. Besides the black abdomen in females is rather typical for western populations Including Italy and Greece. All known to me females from Bulgaria, Moldavia, Ukraine, Russia, Kazakhstan, Caucasus and Turkey have red abdomen. Certain populations of P. livida from Transcaucasia and Turkey consist only of specimens with totally red legs (Armenia: Amberd-Biurakan, Goris, Khosrov; Georgia: Aspindza, Atskuri; Azerbajdzhan: Adzhikent; Turkey: Kagyzman, Sarykamysh), others are similar to East European populations with black legs (Armenia: Takerlu-Artavaz, Kirovakan-Vanadzor, Goris; Georgia: Mtzheta, Dviri, Borzhomi; Azerbajdzhan: Altyagach; Turkey: Kazikoporan). I regard them as two subspecies. P. livida with red legs was described several times: Vadonia livida var. desbrochersi from Bitlis (Turkey), Leptura l. var. corallipes from Armenia. I do not know specimens from Bitlis and provisionally regard both names as synonyms, so the name of the reg-legs subspecies is P. livida desbrochersi (= corallipes). Populations with partly red legs also exist (Artvin env., Turkey). Certain Transcaucasian populations are characterized by much shorter elytral and* *pronotal erect pubescence, than P. l. pecta (similar form seems to be known from Spain); Transcaucasian subspecies with black legs and short pubescence most probably needs a new name*".

RECORDS IN TURKEY: İstanbul prov.: Alem Mountain (Bodemeyer, 1906); Amasya prov., Gümüşhane prov.: Torul, Bayburt prov. and Erzurum prov.: Kop Mountain as *Leptura livida pecta* (Villiers, 1959); İstanbul prov.: Polonez village / Alem Mountain / Beykoz / Anadoluhisarı / Çengelköy, İzmir prov.: near Central / Kemalpaşa / Efes / Bergama, Antalya prov.: near Central / Belkıs (Aspendos, Cumali) / Antitoros Mountains (Bey Mountains / Korkuteli) / Alanya and near, Isparta prov.: Eğirdir and near as *Leptura livida* m. *pecta* (Demelt & Alkan, 1962); Ankara prov. (Villiers, 1967); Ankara prov. (Tuatay et al., 1972); Turkey (Demelt, 1963; Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985; Svacha & Danilevsky, 1988; Althoff & Danilevsky, 1997; Lodos, 1998; Sama & Rapuzzi, 2000; Sama, 2002); Turkey as *P. livida pecta* (Daniel, 1891) (Demelt, 1963; Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985); Giresun prov.: Kümbet (Sama, 1982); Ankara prov.: Kalecik (Öymen, 1987); Antalya prov.: Kemer / Kumluca (Yeniceköy) / Termessos / Manavgat-Sorgun, İçel prov.: Erdemli (Aslanlı), Osmaniye prov.: Nurdağı pass as *Pseudovadonia livida pecta* (Adlbauer, 1988); Antalya prov.: Arapsuyu, Artvin prov.: Ardanuç (Akarsu) / Şavşat (Çayağzı) / Çalmaşur (Karagöl) / Yusufeli (Sarıgöl), Bayburt prov.: Maden, Bilecik prov.: Central, Erzincan prov.: Ballıköy / Kemaliye, Erzurum prov.: Central (Palandöken) / Ilıca (Atlıkonak) / İspir / Oltu (Sütkans) / Pazarroad (Gölyurt pass) / Şenkaya (Turnalı) / Tortum (Aşağı Meydanlar), Kars prov.: Sarıkamış (Akkurt) / Karakurt (Şeytangeçmez) (Tozlu et al., 2002); Isparta prov.: Yalvaç (Bağkonak, Sultan mountains), Uşak prov.: Ulubey (Ovacık village, Gökgöz hill), Gümüşhane prov.: Kelkit (Günyurdu village) (Özdikmen & Çağlar, 2004); Ankara prov.: Central / Çubuk (Karagöl), Kars prov.: Sarıkamış, Isparta prov.: Gölcük (Çakıören) (Özdikmen et al., 2005); Manisa prov.: Turgutlu Çardağı (Aysekisi hill / Domunludeve valley), İzmir prov.: Menderes (Efem çukuru village), Kocaeli prov.: İzmit (Ballıkayalar Natural Park / Beşkayalar Natural Park,), Osmaniye prov.: Zorkun plateau road (Olukbaşı place) / Yarpuz road (Karataş place) / Bahçe (Yaylalar village), Gaziantep prov.: Nurdağı (plateau of Kazdere village) / Kuşçubeli pass, Hatay prov.: Hassa (Zeytinoba village, Aktepe) (Özdikmen & Demirel, 2005); Antalya prov.: Irmasan pass, Artvin prov.: from Şavşat to Çam pass, Bolu prov.: Abant, Bursa prov.: Uludağ / Central, Çankırı prov.: Çerkeş, Kırklareli prov.: Demirköy, Hatay prov.: Yayladağı, İçel prov.: Erdemli-Güzeloluk / Güzeloluk / Silifke (Ortagören to Mut), Rize prov.: İkizdere, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Adıyaman prov.: Nemrut Mountain, Artvin prov.: from Şavşat to Çam pass, Bitlis prov.: Güroymak, Erzurum prov.: İspir-Çamlıkaya / İspir, Kars prov.: Sarıkamış, Rize prov.: Artvin-Şavşat / Şavşat-Çam pass as *P. livida desbrochersi* (Pic, 1891) (Malmusi & Saltini, 2005); Ankara prov.: Beytepe (Özdikmen & Demir, 2006); Ankara prov.: Kızılcahamam (Güvem / Yenimahalle village / the peak of Bel), Niğde prov.: Altunhisar-Çiftlik road (entry of Çiftlik) (Özdikmen, 2006); Karabük prov.: Safranbolu (Bulak village, Mencilis Cave env., Gürleyik National Park), between Eflani–Pınarbaşı, Kastamonu prov.: Küre (Masruf pass env.), Ağılı–Azdavay road (Yumacık village), Azdavay, between Azdavay–Pınarbaşı, Pınarbaşı–Azdavay road (Karafasıl village), Küre–Seydiler road (Masruf pass), Pınarözü, Yaralıgöz pass, Dipsiz Göl National Park, Ilgaz–Kastamonu road (Kadın Çayırı village), Tosya (Ilgaz), Hanönü env., Şenpazar-Azdavay road (Yumacık village), Doğanyurt-Şenpazar road, between Daday-Araç, between Araç-Kurşunlu (Boyalı), Bolu prov.:

Mengen (Devrek–Mengen), Bartın prov.: Kalecik village, Artvin prov.: Karagöl (Özdikmen, 2007) (Map 1)

DISTRIBUTION: Europe (Portugal, Spain, France, Italy, Sicily, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, Great Britain, Ireland, Czechia, Slovakia, Poland, Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), Siberia, China, Caucasus, Transcaucasia, Armenia, Turkey, Lebanon, Syria, Israel, Iran

CHOROTYPE: Sibero-European + E-Mediterranean (Palaestino-Taurian)

Genus *VADONIA* Mulsant, 1863

= *Neovadonia* Kaszab, 1938
= *Leptura* Auct. partim
= *Anoplodera* Auct. partim

Type species: *Leptura unipunctata* Fabricius, 1787

As *Pseudovadonia* Lobanov et al., 1981 but scutellum triangular, not truncate, broader, temples longer, subangular behind, third article of antennae distinctly longer than the fourth, elytra more lengthened, subtruncate in the apex, metasternum without longitudinal carinae.

Larval development is unknown for most species of the genus. Probably, larvae are in underground parts of herbaceous living plants (e. g. according to Svacha & Danilevsky, 1988, *Knautia arvensis, Scabiosa ochroleuca, Euphorbia niciciana*). Bense (1995) stated that development for many species of the genus is in *Euphorbia* species probably. Pupations are unobserved in general. Adults can be found on the host plants probably and on flowers.

The main aim of this catalogic work is to clarify current status of the genus in the world. As commonly accepted that this chiefly Palaearctic genus *Vadonia* Mulsant, 1863 (except the orientalic species *V. eckweileri* Holzschuh, 1989 from Pakistan) is represented by 23 species (with 16 subspecies) in the whole world. Fourteen species are endemic to different countries. In Turkey, it is represented by 15 species as *Vadonia bicolor* (Redtenbacher, 1850), *Vadonia bipunctata* (Fabricius, 1781), *Vadonia bisignata* (Brullé, 1832), *Vadonia bitlisiensis* (Chevrolat, 1882), *Vadonia bolognai* Sama, 1982, *Vadonia ciliciensis* K. Daniel & J. Daniel, 1891, *Vadonia danielorum* Holzschuh, 1984, *Vadonia frater* Holzschuh, 1981, *Vadonia imitatrix* K. Daniel & J. Daniel, 1891, *Vadonia instigmata* (Pic, 1889), *Vadonia ispirensis* Holzschuh, 1993, *Vadonia moesiaca* K. Daniel & J. Daniel, 1891, *Vadonia monostigma* Ganglbauer, 1881, *Vadonia soror* Holzschuh, 1981 and *Vadonia unipunctata* (Fabricius, 1787). The seven species as *Vadonia bolognai* Sama, 1982, *Vadonia ciliciensis* K. Daniel & J. Daniel, 1891, *Vadonia danielorum* Holzschuh, 1984, *Vadonia frater* Holzschuh, 1981, *Vadonia instigmata* (Pic, 1889), *Vadonia ispirensis* Holzschuh, 1993 and *Vadonia soror* Holzschuh, 1981 are endemic to Turkey. The four species as *Vadonia aspoeckorum* Holzschuh, 1975, *Vadonia insidiosa* Holzschuh, 1984, *Vadonia mainoldii* Pesarini & Sabbadini, 2004 and *Vadonia parnassensis* (Pic, 1925) are endemic to Greece. On the other side, *Vadonia eckweileri* Holzschuh, 1989, *Vadonia hirsuta* K. Daniel & J. Daniel, 1891 and *Vadonia saucia* (Mulsant et Godart, 1855) are endemic to Pakistan, Romania and Crimea respectively. All taxa of this genus in the world are presented as follows:

aspoeckorum Holzschuh, 1975

Original combination: *Vadonia aspoeckorum* Holzschuh, 1975

This species was synonymized by Slama & Slamova (1996) with *Vadonia parnassensis* (Pic, 1925). However, it was restored by Pesarini & Sabbadini (2004).

DISTRIBUTION: Greece
CHOROTYPE: Greek endemic

bicolor Redtenbacher, 1850

Original combination: *Leptura bicolor* Redtenbacher, 1850

Other names. *tuerki* Heyden, 1879

RECORDS IN TURKEY: Turkey (Lobanov et al., 1981); Northern Turkey (Danilevsky & Miroshnikov, 1985) (Map 2)

DISTRIBUTION: Caucasus, NE Turkey, Iran
CHOROTYPE: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian)

bipunctata Fabricius, 1781

ssp. ***bipunctata*** Fabricius, 1781
ssp. ***steveni*** Sperk, 1835
ssp. ***adusta*** Kraatz, 1859
ssp. ***mulsantiana*** Plavilstshikov, 1936
ssp. ***puchneri*** Holzschuh, 2007

Original combination: *Leptura bipunctata* Fabricius, 1781

Other names. *fischeri* Zubkov, 1829; *litigiosa* Mulsant, 1863; *globicollis* Desbrochers, 1870; *laterimaculata* Motschulsky, 1875; *pfuhli* Reineck, 1920; *rufonotata* Pic, 1926; *sareptana* Pic, 1941; *beckeri* Pic, 1941; *bilitigiosa* Pic, 1941.

The systematics of this species was evaluated by Danilevsky (2008a,b) in detail. Now we share the approach of Danilevsky about this subject. According to this status, *Vadonia bipunctata* Fabricius, 1781 has five subspecies as *Vadonia bipunctata bipunctata* Fabricius, 1781 occurs in European Russia, Slovakia, European Kazakhstan, *Vadonia bipunctata steveni* Sperk, 1835 that was given by Sama (2002) as a separate species occurs in Europe (Moldova, West and Central Ukraine), *Vadonia bipunctata adusta* Kraatz, 1859 occurs in Europe (Slovenia, Macedonia, Hungary, Slovakia, Romania, ?Bulgaria), *Vadonia bipunctata mulsantiana* Plavilstshikov, 1936 occurs in South Ukraine, Moldova, European Russia and *Vadonia bipunctata puchneri* Holzschuh, 2007 occurs in Ukraine, Crimea, European Russia. Shortly, the nominate subspecies is eastern populations of this species. Other subspecies are more or less western populations of it. This species was recorded from Turkey as *Leptura bipunctata mulsantiana*.

Danilevsky (2008b) stated that "*Vadonia bipunctata from Crimea was described as a separate species V. puchneri Holzschuh, 2007 ("10km N Eupatoria, Suvorovo"[Suvorovskoe] and "40km 40 km NE Eupatoria, Krasnoyarske" [36km NNW Evpatoria, Kraskoyarskoe]) on the base of rough pronotal punctation (similar to V.unipunctata). The main character of V. bipunctata is the shape of parameres, which are long and narrow – finger-like, while in V. unipunctata (which is often sympatric with V.bipunctata) parameres are strongly dilated, flat. Vadonia bipunctata with rough pronotal punctation is widely distributed in Ukraine (from about Ochakov and Kherson to Donetzk and Lugansk) and in South Russia from about Rostov region to North Caucasus (Teberda, Piatigorsk). In Crimea such specimens are known everywhere with the exception of south coast (from Tarkhankut cape to Evpatoria and Simferopol environs, and then to Belogorsk, Kazantip and Kerch; specimens from Dzhankoj have a little less rough punctation. Inside this area certain populations of V. bipunctata have very fine pronotum as in typical populations from the East (Askania-Nova, Sochi, Eysk). Specimens from the north part of Odessa region, Dnepropetrovsk and from near Kiev, as well as certain specimens from near Kerson have moderately rough pronotum, which look as a transition from rough pronotum of V. b. puchneri (similar to V. unipunctata) and V. b. steveni to finer pronotum of V. b. mulsantiana and V. b. bipunctata. Specimens of V. b. bipunctata with rough pronotal punctation (as well as with a single spine of hind tibiae) were mentioned by A. I. Kostin (1973: 147) from Kazakhstan. That is why he wrongly supposed: bipunctata = unipunctata = steveni. Parameres in V. bipunctata puchneri (from Ochakov, Kerson, Evpatoria, Simferopol, Kerch, Dzhankoj, Donetzk, Lugansk, Rostov, Piatigorsk and Teberda) are usually wider than in V. b. bipunctata, V. b. mulsantiana or V. b. steveni (never close to V.unipunctata), but in general rather variable and often indistingushed from parameres of other subspecies. Apex of aedeagus in V. unipunctata has a distinct swelling, which is specially big and arrow-like in V. saucia. In V. bipunctata apex of aedeagus is never modified. The presence of long erect setae on hind femora of V. bipunctata is also a very important character. In V. b. puchneri erect setae of hind femora are usually not so long and dense as in other subspecies, but transitional situations are also known. The finest pronotal punctation (nearly indistinct) can be observed in certain specimens of V. bipunctata from NE Kazakhstan (Naurzum – ZMM). Generally very fine, small pronotal punctation is more usual for eastern populations (Kazakhstan: Kapchagaj, Aktjubinsk, Karachocat near north bank of Aral see, Janvartzevo and Uralsk environs, Urda in the north-west Kazakhstan; Russia: Orenburg and Volgograd regions, Dagestan, Sochi, north part of Rostov region. But in Emba-city environs (NW Kazakhstan) pronotal punctation of V.bipunctata is moderately big. Several Ukranean populations also consist of specimens with fine punctation (Cherkasy, Askania-Nova, Nikolaev, Odessa region), but other populations have moderately big pronotal punctation: Kharkov environs, north part of Odessa region, Kiev environs (that is close to Podolia – type area of V. steveni). Possibly the description of several other local subspecies of V. bipunctata is desirable, as near Askania-Nova in Ukraine specimens with very fine pronotal punctation are distributed, specimens from Piatigorsk have the roughest pronotum known in the species. The stable pale elytral color of certain easten populations (Urda environs) could be also the reason for a subspecies* *separation. V. b. bipunctata from Sarepta was described as Leptura (Vadonia) saucia var. beckeri Pic, 1941 (: 14) and Vadonia steveni var. sareptana Pic, 1941 (: 15). Vadonia bipunctata beckeri Pic, 1941 could be accepted as a valid name for those eastern V. bipunctata populations, which consist of specimens with partly black elytra. The name var. bilitigiosa Pic, 1941 (: 15) was proposed as a replacing name for Leptura steveni ab. litigiosa Muls. sensu Plav., 1936 (: 343, 556 – so, for V. bipunctata steveni) as Mulsant (1863) described ab. litigiosa from Austria - there it is Vadonia bipunctata adusta (Kraatz, 1859)*".

Danilevsky (2008a) also stated that "*Leptura (Vadonia) bipunctata mulsantina was described without published holotype and precisely mentioned type locality. Lectotype (my designation, in press) of Leptura bipunctata mulsantiana (designated as "Type" by Plavilstshikov in Moscow Zoological Museum) has the label: "Bessarabia, circ. Izmail, 2.6.1915 P.Elsky". Specimen is relatively light with black elytral apex and black suture. The series of paralectotypes (16ex. - each designated as "cotype") includes specimens from Crimea (and so V.b.puchneri Holz.), Ekaterinoslav (=Dnepropetrovsk), Chir river, Kustanaj, Uralsk, Kislovodsk. Lectotype is a member of a big series of specimens with same label ("Bessarabia, circ. Izmail, 2.6.1915 P.Elsky") identified by N.N. Plavilstshikov as Vadonia steveni (type locality – Podolia! – West Ukraine northwards upper half of Dnestr river). V. steveni is traditionally regarded as a species with males with a single spine on hind male tibia. Now I see, that this character is not of species level. Such specimens (with a single hind tibia spine) are known among different V. bipunctata (described from "Siberia") with different type of pronotal punctation from different parts of its area (Kazakhstan, south Russia, Ukraine), but dominated in the West. Inside a homogeneous series of V. bipunctata from Nikolaev (S Ukraine, ZIN) three males have one spine on hind tibiae and one male has two spines on hind tibiae. Among two males of V. bipunctata from Sochi (NW Caucasus, ZIN) one has two spines on hind tibia, another – one spine on hind tibia. A male with one spine on hind tibiae is also known from Eysk (N Krasnodar region, ZIN). A homogeneous series from near Izmail (type locality of V. b. mulsantiana) with 4 similar males has 1 male with a single hind tibia spine identified by Plavilstshikov as V.steveni, 1 male with different left and right hind tibiae (with a single spine and with a pair of spines) also identified by Plavilstshikov as V. steveni, and two males with paired hind tibiae spines: one of them was designated as a "type" of L. b. mulsantiana, but another was also identified as V. steveni, but its paired spines are conjugated! The presence of specimens with one tibiae spine in Central Kazakhstan (Aktiubinsk region) was mentioned by A. I. Kostin (1973). Generally two spines of hind tibiae in westertn populations often are situated much closer to each other, than in eastern populations. My series from Hungary totally consists of males with one hind tibiae spine – so called "Vadonia steveni", but pronotal and elytral punctation here differs from typical Ukranian specimens and from Russian specimens. This form can be named V. bipunctata adusta Kraatz, 1859. According to G. Sama (personal message of 2006 based on published data), the type series of V. steveni also includes males with one and two hind tibiae spines (G. Sama wrongly believes now that it represents two different species). I don't know specimens from Podolia (type locality of V. steveni), but specimens from the north part of Odessa region, from near Kiev and from near Dnepropetrovsk have considerably rougher pronotal punctation, than in specimens from near Izmail or from Askania-Nova. So, populations from West and Central Ukrane can be separated as V. bipunctata steveni (Podolia,* *north part of Odessa region, Kiev region, Dnepropetrovsk region). Populations from South Ukraine and Moldavia represent another subspecies with finer pronotum - V. b. mulsantiana (Izmail, Dolinkoe – northwards Odessa, Nikolaev, Askania-Nova). Both western subspecies often includes males with a single hind tibiae spine. to the west from about Podolia or from about Izmail. Yellow elytral color in both is much darker (orange-brown), than pale (yellow) elytral color of the nominative subspecies or in V. b. puchneri. The occurrence of very dark (nearly black) and pale specimens in Orenburg region can not be the reason to reject the separation of the species in two subspecies, as it was proposed by A. Shapovalov et al. (2006). In general the specimens V. b. bipunctata with wide black elytral areas (sometimes elytra are nearly totally black) are known from the east part of species area (Orenburg, north Kazakhstan, Volgograd environs, Tchir river valley), though populations with all specimens pale are also known in the east: north shore of Aral see, Mugodzhary Mts, Astrakhan region eastwards Volga river. All eastern populations (from Orenburg to Volgograd regions) are now preliminary regarded by me as V. b. bipunctata. The record of V. bipunctata for Iran (Daniel & Daniel, 1891; Plavilstshikov, 1936) looks strange, as it is not known to me (very rare?) from Transcaucasia, neither from Turkmenia*".

RECORDS IN TURKEY: İstanbul prov.: Polonez village (Demelt & Alkan, 1962); İstanbul prov.: Polonez village as *Leptura bipunctata* m. *mulsantiana* (Demelt, 1963); Turkey (Lodos, 1998) (Map 3)

DISTRIBUTION: European Russia, European Kazakhstan, Moldova, Ukraine, Slovenia, Macedonia, Hungary, Slovakia, Romania, ?Bulgaria, Crimea, NW Turkey, ?Turkmenia, ?Iran
CHOROTYPE: European or Turano-European

bisignata Brullé, 1832

= ssp. ***bisignata*** Brulléi 1832
= ssp. ***laurae*** Pesarini et Sabbadini, 2007

Original combination: *Leptura bisignata* Brullé, 1832

Other names. *grandicollis* Mulsant, 1863; *inapicalis* Pic, 1897

According to Pesarini & Sabbadini (2007), *Vadonia bisignata mahri* Holzschuh, 1986 that is described from eastern Greek Macedonia is a form of *Vadonia dojranensis* Holzschuh, 1984. However, they described a new subspecies, *Vadonia bisignata laurae,* from Greece in their paper. So this species has two subspecies again. The nominative subspecies, *Vadonia bisignata bisignata* (Brullé, 1832) occurs in Bulgaria, Greece, ?European Turkey and *Vadonia bisignata laurae* Pesarini & Sabbadini, 2007 occurs only in Greece (NW Greece and W Greek Macedonia).
RECORDS IN TURKEY: Turkey (Winkler, 1924-1932; Lodos, 1998); Antalya prov.: Antitoros Mountains (Bey Mountains) (Demelt & Alkan, 1962); Antalya prov.: Bey Mountain / Alanya, Isparta prov. (Demelt, 1963); European Turkey (Althoff & Danilevsky, 1997); Artvin prov.: Yusufeli (Tauzin, 2000) (Map 4)

DISTRIBUTION: Greece, Bulgaria, ?European Turkey, ?Ukraine
CHOROTYPE: Turano-Mediterranean (Balkano-Anatolian)

bitlisiensis Chevrolat, 1882

Original combination: *Leptura bitlisiensis* Chevrolat, 1882

Other names. *bistigmata* Pic, 1889; *cribricollis* Pic, 1889; *armeniaca* Pic, 1903

Vadonia bitlisiensis var. *instigmata* Pic, 1889 was accepted by some authors as a separate species. *Vadonia instigmata* (Pic, 1889) differs from this species mainly by completely red eltra and having any black point on elytra. So it is evaluated as a separate species in this work.

RECORDS IN TURKEY: Bitlis prov. (Pic, 1889); Van prov.: Çatak road (Görentaç village), North-East Turkey, East Anatolian Region (Villiers, 1959); Tunceli prov.: Selepür (Demelt, 1967); Turkey (Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985; Lodos, 1998; Erzurum prov.: Pasinler (Adlbauer, 1988); Gümüşhane prov.: Köse (Tauzin, 2000); Bilecik prov.: Central, Erzincan prov.: Kemaliye, Erzurum prov.: Dumlu (Köşk) / Güngörmez / Kargapazarı Mts. / Aşkale / Hacıhamza / Ilıca / Sorkunlu / İspir (Madenköprübaşı) / Oltu (Sütkans) / Pasinler (Çalıyazı) / Tortum / Aksu / Uzundere (Dikyar) (Tozlu et al., 2002) (Map 5)

DISTRIBUTION: Caucasus (Armenia), E Turkey
CHOROTYPE: SW-Asiatic (Anatolo-Caucasian)

bolognai Sama, 1982

Original combination: *Vadonia bolognai* Sama, 1982

This species is endemic to Turkey.

RECORDS IN TURKEY: Holotype: Samsun prov.: Kavak (Sama, 1982); Amasya prov.: Aydınca (İnegöl Mountain), Samsun prov.: Kavak (Hacılar pass), Kastamonu prov.: Yaraligöz (Malmusi & Saltini, 2005) (Map 6)

DISTRIBUTION: N Turkey
CHOROTYPE: N-Anatolian

ciliciensis K. Daniel & J. Daniel, 1891

Original combination: *Vadonia ciliciensis* K. Daniel & J. Daniel, 1891

This species is endemic to Turkey.

RECORDS IN TURKEY: Turkey (Winkler, 1924-1932; Acatay, 1963); Burdur prov.: Bucak (Kavacık forest), Antalya prov.: Elmalı (Çığlıkara, Suluçukur place and Bucak forest) (Tosun, 1975); Denizli prov.: Acıpayam and Tavas, Burdur prov.: Bucak, Antalya prov.: Elmalı (Çanakçıoğlu, 1983); Turkey (Lodos, 1998) (Map 7)

DISTRIBUTION: S and SW Turkey
CHOROTYPE: Anatolian

danielorum Holzschuh, 1984

Original combination: *Vadonia danielorum* Holzschuh, 1984

This species is endemic to Turkey.

RECORDS IN TURKEY: Antalya prov.: Taşağıl, Termessos (Adlbauer, 1992) (Map 8)

DISTRIBUTION: S Turkey
CHOROTYPE: Anatolian

dojranensis Holzschuh, 1984

= ssp. ***dojranensis*** Holzschuh, 1984
= ssp. ***mahri*** Holzschuh, 1986

Original combination: *Vadonia dojranensis* Holzschuh, 1984

According to Pesarini & Sabbadini (2007), *Vadonia bisignata mahri* Holzschuh, 1986 that described from eastern Greek Macedonia is a form of *Vadonia dojranensis* Holzschuh, 1984. This species has two subspecies. The nominative subspecies, *Vadonia dojranensis dojranensis* Holzschuh, 1984 occurs in Macedonia and *Vadonia dojranensis mahri* (Holzschuh, 1986) occurs in Greece and Bulgaria.

Danilevsky (2008a) stated that "*The area of Vadonia dojranensis was mistakenly mentioned as "BG" (Bulgaria) by Althoff and Danilevsky (1997: 12), as it was described from Rep. of Macedonia. I've got a pair from Bulgaria with label: "Bulgaria mer., Kresna, VI.1982 Strba leg." The species was also recorded for Bulgaria (Kalimansti env. in Pirin) by E. Migliaccio et al. (2007). V. dojranensis from Bulgaria is V. dojranensis mahri*".

DISTRIBUTION: Macedonia, Greece, Bulgaria
CHOROTYPE: East Mediterranean (NE Mediterranean) or ?Turano-Mediterranean (Balkano-Anatolian)

eckweileri Holzschuh, 1989

Original combination: *Vadonia eckweileri* Holzschuh, 1989

This species is endemic to Pakistan.

DISTRIBUTION: Pakistan
CHOROTYPE: Asiatic or Orientalic

frater Holzschuh, 1981

Original combination: *Vadonia frater* Holzschuh, 1981

This species is endemic to Turkey.

RECORDS IN TURKEY: Adana prov.: Nurdağı pass (Holzschuh, 1981) (Map 9)

DISTRIBUTION: Turkey
CHOROTYPE: Anatolian

hirsuta K. Daniel & J. Daniel, 1891

Original combination: *Vadonia hirsuta* K. Daniel & J. Daniel, 1891

This species is endemic to Romania. Danilevsky (2008a) stated that "Vadonia hirsuta was often considered as an individual variation of V. unipunctata. It was regarded as a species by Panin, Savulescu (1961), Althoff, Danilevsky (1997), Miroshnikov (1998: 407). The considerable defference in the shape of aedeagus apex between V. hirsuta and V. unipunctata was shown by R. Serafim (2006).

DISTRIBUTION: Romania
CHOROTYPE: Romanian endemic

imitatrix K. Daniel & J. Daniel, 1891

Original combination: *Vadonia imitatrix* K. Daniel & J. Daniel, 1891

Other names: *saucia* Ganglbauer, 1881; *externerufa* Pic, 1926; *koechlini* Pic, 1926

RECORDS IN TURKEY: European Turkey as *V. i.* a. *externerufa* Pic, 1926 and *V. i.* a. *koechlini* Pic, 1926 (Winkler, 1924-1932); Turkey (Lodos, 1998) (Map 10)
DISTRIBUTION: Europe (Italy, Croatia and Bosnia and Herzegovina, Serbia, ?Bulgaria), European Turkey
CHOROTYPE: E-Mediterranean (NE-Mediterranean)

insidiosa Holzschuh, 1984

Original combination: *Vadonia insidiosa* Holzschuh, 1984

This species is endemic to Greece.

DISTRIBUTION: Greece
CHOROTYPE: Greek endemic

instigmata Pic, 1889

Original combination: *Vadonia bitlisiensis* var. *instigmata* Pic, 1889

This species is endemic to Turkey. This species is accepted by some authors as a synonym of *Vadonia bitlisiensis* (Chevrolat, 1882). *Vadonia instigmata* (Pic, 1889) differs from it mainly by completely red eltra and having any black point on elytra. So it is evaluated as a separate species in this work.

RECORDS IN TURKEY: Bitlis prov. (Pic, 1889); Adıyaman prov.: Arsameia (Old Kahta) and peak region of Nemrut Mt. (Rejzek & Hoskovec, 1999); Adıyaman prov.: Nemrut Mt. (Malmusi & Saltini, 2005) (Map 11)

DISTRIBUTION: SE Turkey
CHOROTYPE: Anatolian

ispirensis Holzschuh, 1993

Original combination: *Vadonia ispirensis* Holzschuh, 1993

This species is endemic to Turkey.

RECORDS IN TURKEY: Erzurum prov.: Ispir (Holzschuh, 1993; Malmusi & Saltini, 2005) (Map 12)

DISTRIBUTION: NE Turkey
CHOROTYPE: Anatolian

mainoldii Pesarini & Sabbadini, 2004

Original combination: *Vadonia mainoldii* Pesarini & Sabbadini, 2004

This species is endemic to Greece.

DISTRIBUTION: Greece
CHOROTYPE: Greek endemic

moesiaca K. Daniel & J. Daniel, 1891

Original combination: *Vadonia moesiaca* K. Daniel & J. Daniel, 1891

RECORDS IN TURKEY: Turkey (Winkler, 1924-1932; Lodos, 1998); Antalya prov.: Taşağıl (Adlbauer, 1988); Çankırı prov.: Çerkeş, Kırklareli prov.: Demirköy (Malmusi & Saltini, 2005) (Map 13)

DISTRIBUTION: Serbia, Macedonia, Greece, Bulgaria, Turkey
CHOROTYPE: Turano-Mediterranean (Balkano-Anatolian)

monostigma Ganglbauer, 1881

Original combination: *Vadonia monostigma* Ganglbauer, 1881

RECORDS IN TURKEY: Turkey (Winkler, 1924-1932; Lodos, 1998); Antalya prov.: Bey Mountains (Antitoros) (Demelt & Alkan, 1962; Demelt, 1963); Amasya prov. (Gfeller, 1972); Amasya prov.: Central / Merzifon, Samsun prov.: Çakallı (Kavak), Kastamonu prov.: Yaralıgöz (Devrekani) / Akkaya (Adlbauer, 1992); Bolu prov.: Abant, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005) (Map 14)

DISTRIBUTION: Greece, Turkey
CHOROTYPE: Turano-Mediterranean (Balkano-Anatolian)

parnassensis Pic, 1925

Original combination: *Leptura bisignata* var. *parnassensis* Pic, 1925

This species is endemic to Greece.

DISTRIBUTION: Greece
CHOROTYPE: Greek endemic

saucia Mulsant et Godart, 1855

Original combination: *Leptura bipunctata* var. *saucia* Mulsant et Godart, 1855

This species is endemic to Crimea.

Danilevsky (2008a,b) stated that "*I know 7 totally black specimens (my collection and collection of Moscow Zoological Museum) from Crimea: Simferopol, Bajdary, Koreiz, Mukhalatka (between Faros and Alupka) described as Leptura saucia Mulsant et Godart, 1855. The identification is based on the original description (type locality – Crimea) of totally black specimen with small yellow spots near humeri. All series are characterized by very rough elytral and pronotal punctation, as well as by the absence of erect setae along hind femora and represent a local taxon close to V. unipunctata (not V. bipunctata! as it was considered by K. Daniel & J. Daniel, 1891; Plavilstshikov,1936 and Sama, 2002) with typically shaped (axe-like) parameres of V. unipunctata, but with very special big triangilar swelling of aedeagus apex. Populations of V. saucia distributed along south bank of Crimean peninsula from about Simferopol to Staryj Krym also include yellow specimens with black spots. Holzschuh (2007) supported traditional opinion and attributed V. saucia to V.bipunctata on the base of wrong interpretaion of the description by K. Daniel & J. Daniel (1891: 20), who in fact wrote nothing about genital structures of the type of V. saucia. It is evident that V. saucia is unknown for Holzschuh and his statement: "Die Zuordnung [of V. saucia] als Unterart zu V. unipunctata war wohl nur deshalb moglich, dass keine Untersuchung der Parameren vorgenommen wurde." was wrong*".

DISTRIBUTION: Crimea
CHOROTYPE: Crimean endemic

soror Holzschuh, 1981
= ssp. ***soror*** Holzschuh, 1981
= ssp. ***tauricola*** Holzschuh, 1993

Original combination: *Vadonia soror* Holzschuh, 1981

This species has two subspecies. The nominative subspecies, *Vadonia soror soror* Holzschuh, 1981 and *Vadonia soror tauricola* Holzschuh, 1993. Both are distributed in S Turkey. So it is endemic to Turkey. Içel record of Adlbauer (1988) should be *Vadonia soror taurica* Holzschuh, 1993.

RECORDS IN TURKEY: Denizli prov.: Pamukkale (Holzschuh, 1981); İçel prov.: Silifke (Gülnar) and Kuzucubelen (Adlbauer, 1988); Antalya prov. as ssp. *tauricola* (Hoskovec & Rejzek, 2008)(Map 15)

DISTRIBUTION: Turkey
CHOROTYPE: Anatolian

unipunctata Fabricius, 1787
= ssp. ***unipunctata*** Fabricius, 1787
= ssp. ***dalmatina*** Müller, 1906
= ssp. ***ohridensis*** Holzschuh, 1989
= ssp. ***makedonica*** Holzschuh, 1989
= ssp. ***syricola*** Holzscuh, 1993

Original combination: *Leptura unipunctata* Fabricius, 1787

Other names: *unistigmata* Pic, 1891; *occidentalis* Daniel & Daniel, 1891; *obscurepilosa* Pic, 1892; *jacqueti* Pic, 1900; *xambeui* Pic, 1900

This species is the type species of *Vadonia* Mulsant, 1863. As commonly accepted it has five subspecies in the world. The species is represented by the nominative subspecies in Turkey. The other known subspecies, *V. unipunctata dalmatina* Müller, 1906 occurs in Croatia, Bosnia and Herzegovina, ?Greece, *V. unipunctata ohridensis* Holzschuh, 1989 occurs in Macedonia, *V. unipunctata makedonica* Holzschuh, 1989 occurs in Greece and *V. unipunctata syricola* Holzschuh, 1993 occurs in Syria.

RECORDS IN TURKEY: Antalya prov.: Toros Mountains, Niğde prov.: Çamardı (Bodemeyer, 1900); Isparta prov.: Eğirdir, Ankara prov.: Gölbaşı, Afyon prov. (Demelt & Alkan, 1962; Demelt, 1963); Amasya prov. (Villiers, 1967); Bingöl prov., Elazığ prov.: Harput, Nevşehir [Kayseri] prov.: Ürgüp (Göreme), Malatya prov.: Darende (Fuchs & Breuning, 1971); Isparta prov. (Tuatay et al., 1972); İzmir prov.: Kemalpaşa (Gül-Zümreoğlu, 1975); Erzurum prov. and near (Özbek, 1978); Turkey (Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985; Svacha & Danilevsky, 1988; Althoff & Danilevsky, 1997; Lodos, 1998; Sama, 2002); Ankara prov.: Kavaklıdere, Amasya prov.: Ezinepazarı (Öymen, 1987); Uşak prov.: Banaz, Nevşehir prov.: Göreme, Aksaray prov.: Sultanhanı, Afyon prov.: Dinar, Burdur prov.: Bucak, Niğde prov.: Çiftehan (Adlbauer, 1988); Artvin prov.: Şavşat (Karagöl), Bilecik prov.: Central, Bayburt prov.: Aydıntepe, Erzurum prov.: 4. Kuyu / University Campus / Kargapazarı Mts. / Horasan (Okçular) / İspir (Madenköprübaşı) / Oltu (Başaklı) / Çamlıbel / Sarısaz / Sütkans / Olur (Coşkunlar) / Pazarroad (Kartal Plateau) / Tortum (Çiftlik) / Pehlivanlı / Uzundere (Dikyar) / Öşvank / Şelale, Kars prov.: Sarıkamış, Sivas prov.: Central, Tokat prov.: Central (Tozlu et al., 2002); Isparta prov.: Yalvaç (Eleği village) (Özdikmen & Çağlar, 2004); Isparta prov. (Özdikmen et al., 2005); Kocaeli prov.: İzmit (Ballıkayalar Natural Park), Osmaniye prov.: Yarpuz road (Karataş place) / Yeşil village (Hasanbeyli) (Özdikmen & Demirel, 2005); Artvin prov.: Şavşat / from Şavşat to Çam pass, Bitlis prov.: Güroymak, Çankırı prov.: Çerkeş, Erzurum prov.: İspir / İspir-Çamlıkaya / from Pazarroad to Gölyurt pass, Kayseri prov., Kars prov.: Sarıkamış / Karakurt, Kırşehir prov.: Mucur, Kastamonu prov.: Yaraligöz, Rize prov.: Şavşat-Çam pass (Malmusi & Saltini, 2005); Kahramanmaraş prov.: Afşin (Kabaağaç / Emirli (Gergel) / Göksun (Göksun-

Çardak road, Gücük plateau / Mehmetbey (Özdikmen & Okutaner, 2006); Osmaniye prov.: Central, Kastamonu prov.: Kastamonu–Tosya road (Tosya–Ilgaz pass), Ağılı–Azdavay road (Yumacık village), between Azdavay–Pınarbaşı, Pınarbaşı–Azdavay road (Karafasıl village), Azdavay (Ballıdağ Wild Life Protection District), Küre (Masruf pass env.), Devrekani–Çatalzeytin road, Yaralıgöz pass, Tosya–Ilgaz pass, Tosya–Kastamonu road, Bolu prov.: Devrek–Mengen road, Mengen (Devrek–Mengen), Yeniçağa, Karabük prov.: between Eflani–Pınarbaşı, Afyon prov.: Erkmen valley, Artvin prov.: Karagöl (Okurlar district) (Map 16)

DISTRIBUTION: Europe (Spain, France, Italy, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Czechia, Slovakia, Poland, ?Latvia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), ?North Africa (Algeria, Morocco), Caucasus, Transcaucasia, Near East, Turkey, Iran, Syria, Lebanon
CHOROTYPE: Turano-European or Turano-Europeo-Mediterranean. According to Sama (2002), the records from North Africa are erroneous.

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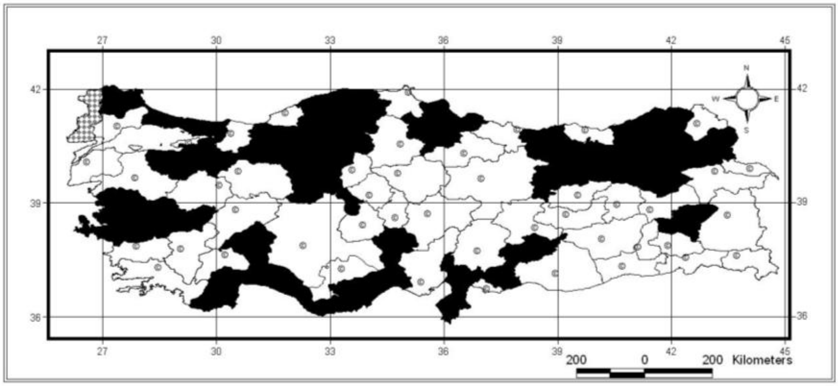
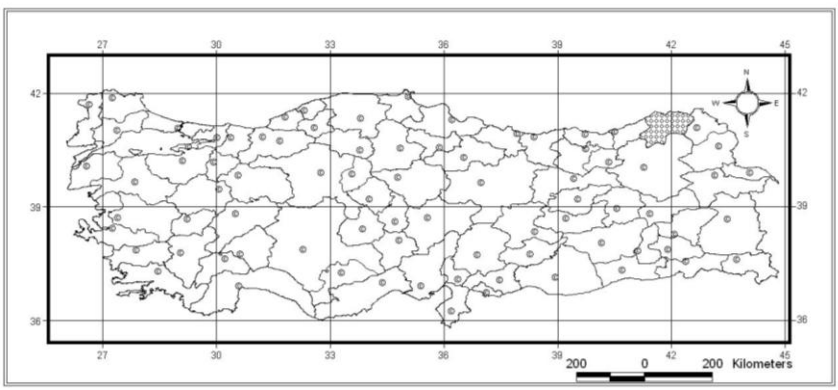
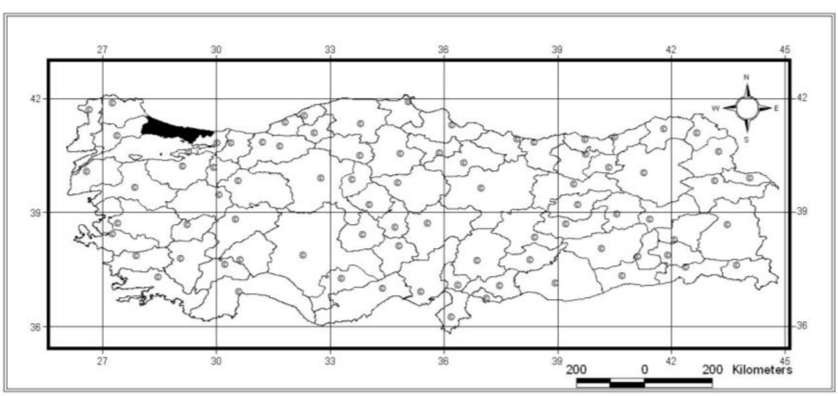


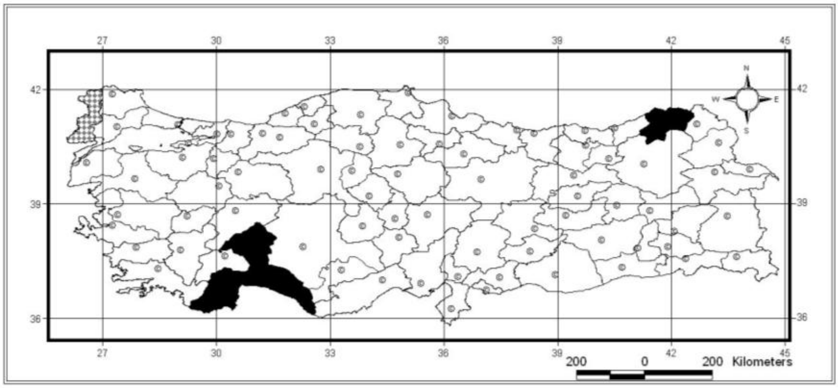
Map 1. *Pseudovadonia livida* (Fabricius, 1776): Distribution patterns in Turkey.



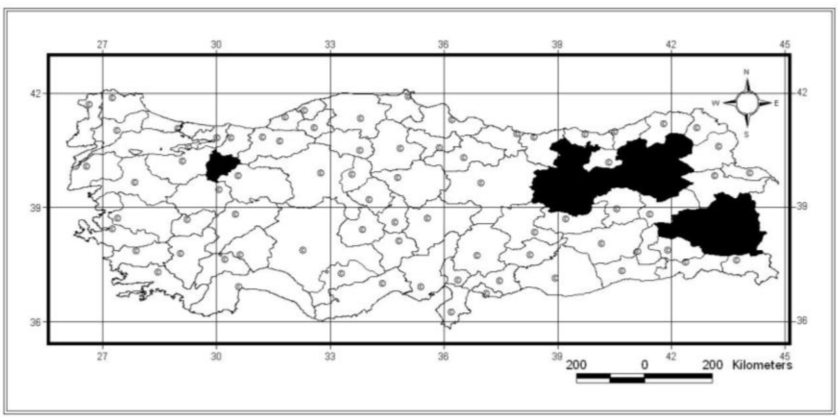
Map 2. *Vadonia bicolor* (Redtenbacher, 1850): Distribution patterns in Turkey.



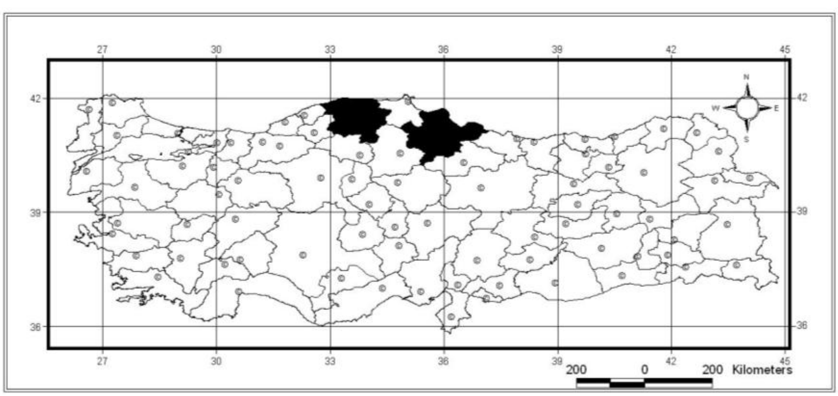
Map 3. *Vadonia bipunctata* (Fabricius, 1781): Distribution patterns in Turkey.



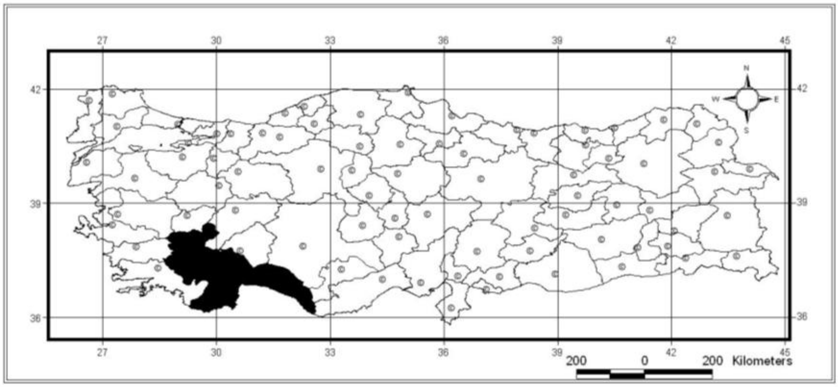
Map 4. *Vadonia bisignata* (Brullé, 1832): Distribution patterns in Turkey.



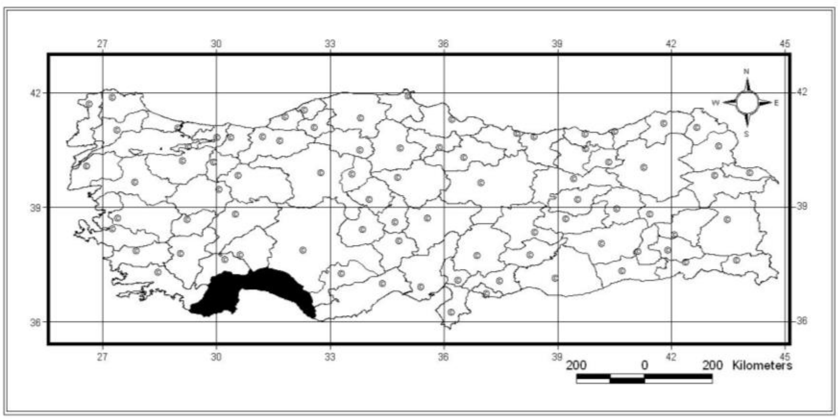
Map 5. *Vadonia bitlisiensis* (Chevrolat, 1882): Distribution patterns in Turkey.



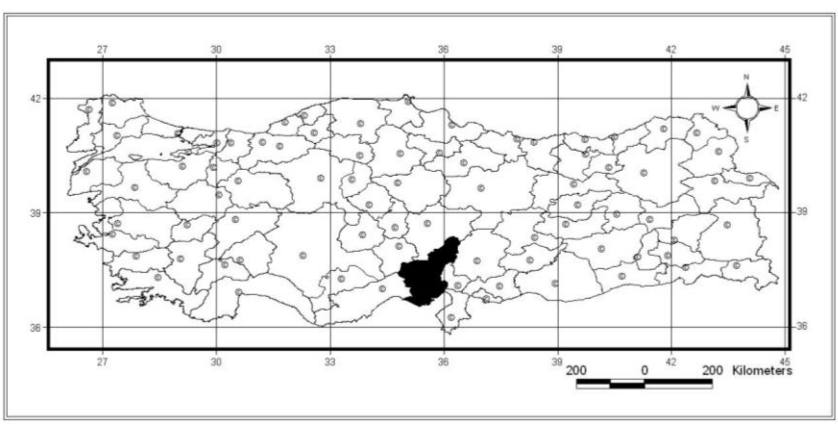
Map 6. *Vadonia bolognai* Sama, 1982: Distribution patterns in Turkey.



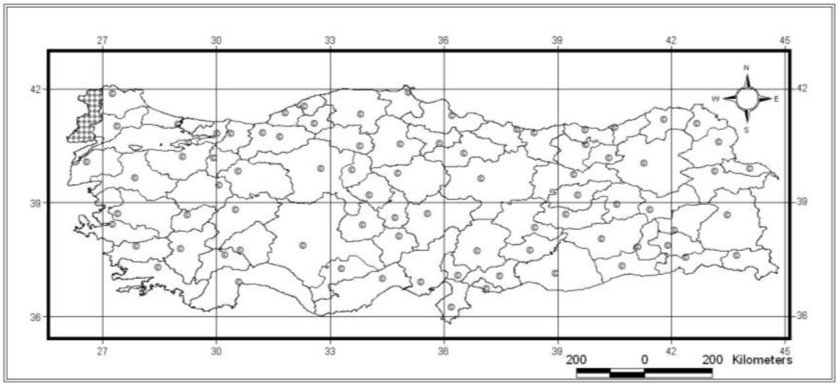
Map 7. *Vadonia ciliciensis* K. Daniel & J. Daniel, 1891: Distribution patterns in Turkey.



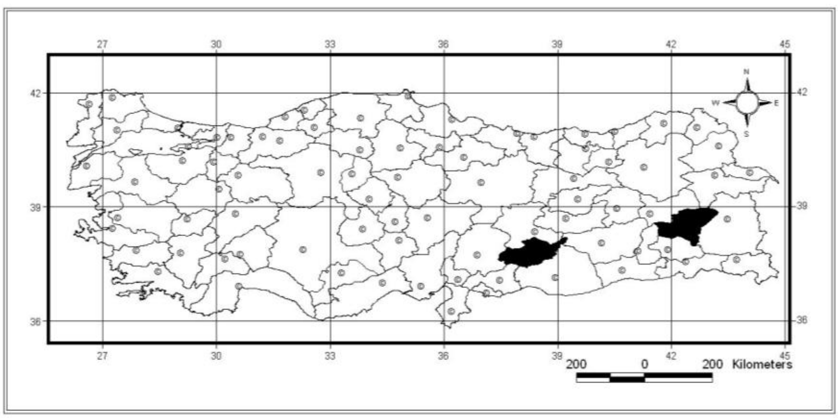
Map 8. *Vadonia danielorum* Holzschuh, 1984: Distribution patterns in Turkey.



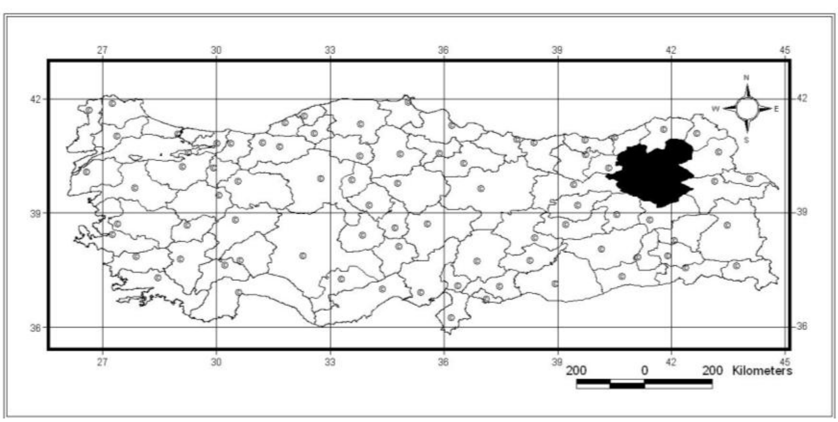
Map 9. *Vadonia frater* Holzschuh, 1981: Distribution patterns in Turkey.



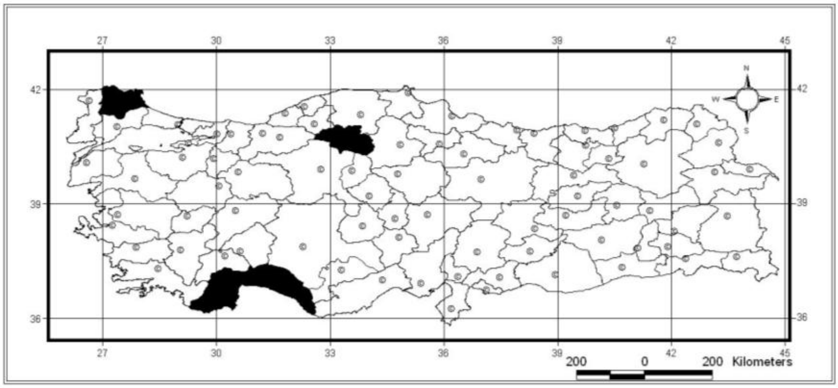
Map 10. *Vadonia imitatrix* K. Daniel & J. Daniel, 1891: Distribution patterns in Turkey.



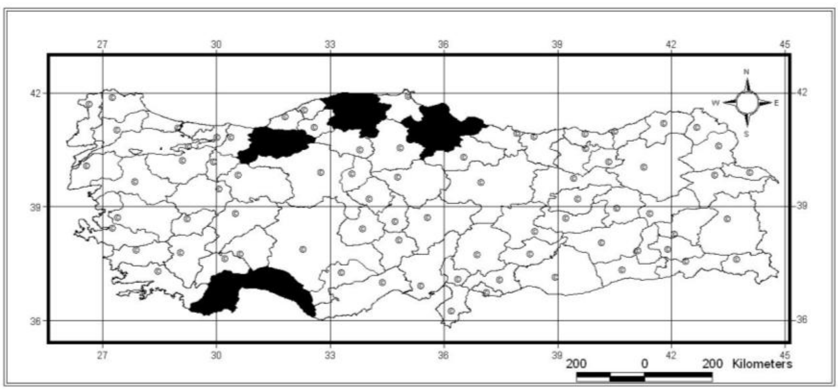
Map 11. *Vadonia instigmata* (Pic, 1889): Distribution patterns in Turkey.



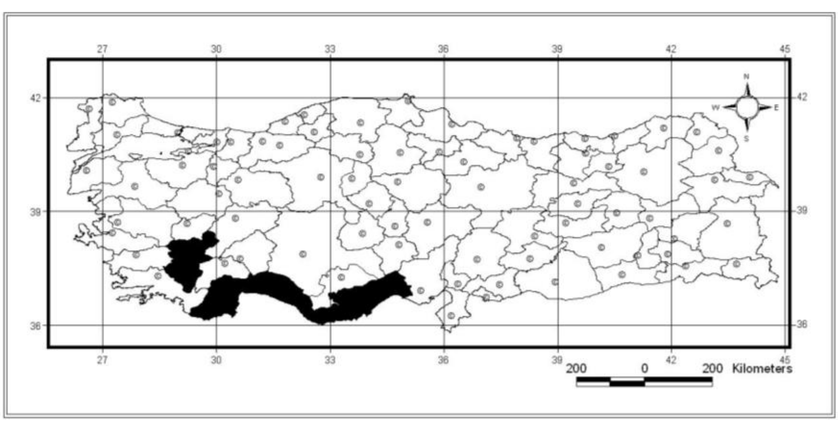
Map 12. *Vadonia ispirensis* Holzschuh, 1993: Distribution patterns in Turkey.



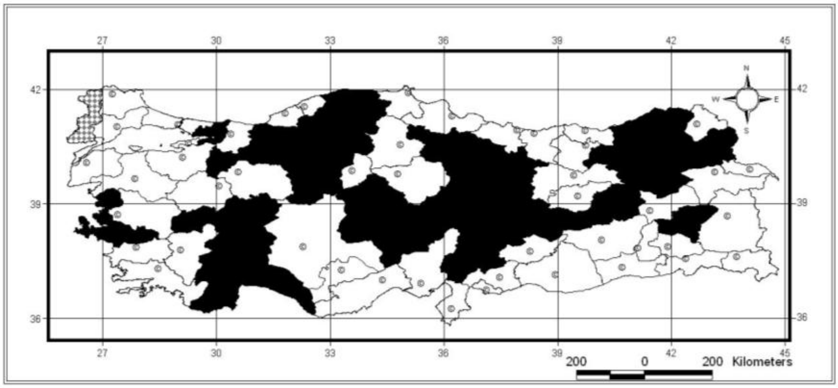
Map 13. *Vadonia moesiaca* K. Daniel & J. Daniel, 1891: Distribution patterns in Turkey.



Map 14. *Vadonia monostigma* Ganglbauer, 1881: Distribution patterns in Turkey.



Map 15. *Vadonia soror* Holzschuh, 1981: Distribution patterns in Turkey.



Map 16. *Vadonia unipunctata* (Fabricius, 1787): Distribution patterns in Turkey.

PREVALENCE OF *EIMERIA* SPECIES AMONG BROILER CHICKS IN TABRIZ (NORTHWEST OF IRAN)

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[**Nematollahi, A., Moghaddam, Gh. & Pourabad, R. F.** 2009. Prevalence of *Eimeria* species among broiler chicks in Tabriz (Northwestern of Iran). Munis Entomology & Zoology, 4 (1): 53-58]

ABSTRACT: Five chicks (2–6 weeks of age) were taken randomly from each of 218 broiler farms in Tabriz northwest of Iran. These chicks were submitted for post-mortem and parasitological examinations. Five *Eimeria* spp. were identified: *E. acervulina*, *E. tenella*, *E. necatrix*, *E. maxima* and *E. mitis*. The overall prevalence of *Eimeria* spp. among examined farms was 55.96 % (122 of 218 farms). *E. acervulina* was the most prevalent species (23.58%). Prevalences did not vary by flock size. Also, neither the use of coccidiostat nor previous coccidiosis clinical outbreaks were associated with the prevalence of infestation. The prevalence of infestation increased with the age of the chickens. Chickens with 5 weeks of age showed the highest prevalence of infestation.

Coccidiosis is one of the most important and common diseases that affect poultry, it results in a great economic loss all over the world (Braunius, 1980). It is caused by the genus *Eimeria* of an Apicomplexa protozoan parasite (Shirley, 1995). This parasitic infection occurs in the epithelial cells of the intestine, despite the advances in nutrition, chemotherapy, management and genetics (Magner, 1991). Most *Eimeria* species affect birds between 3 and 18 weeks of age and can cause high mortality in young chicks (McDougald, & Mattiello, 1997).

About 1800 *Eimeria* species affect the intestinal mucosa of different animals and birds (Shirley, 1995). In the domestic fowl *Gallus gallus*, nine *Eimeria* species are recognized: *E. brunetti, E. maxima, E. necatrix* and *E. tenella* are highly pathogenic, *E. acervulina, E. mitis* and *E. mivati* are rather less pathogenic, and *E. praecox* and *E. hagani* are regarded as the least pathogenic(Thebo, et al., 1988). Bad management (such as wet litter that encourages oocyst sporulation, contaminated drinkers and feeders, bad ventilation, and high stocking density) can exacerbate the clinical signs (Ruff, 1993).

Coccidiosis can be controlled by good management including good ventilation, dry and clean litter (Jordan, 1995), cleaning and decontamination of drinkers and feeders (Gross, 1985), and proper stocking density in the farm (Jordan, 1995).

We studied the prevalence of *Eimeria* spp. among broiler farms in northwest Iran. Also, we tested the risk factors of flock size, use of coccidiostats, and prior clinical coccidiosis.

MATERIALS AND METHODS

Study site

The survey was undertaking from September 2005 to December 2006 in 218 chicken farms. An average population of 5 000 000 broiler-chicks distributed over 500 chicken farms exists in this area. The houses of farms were built of brick and cement and are of different sizes. The method of housing the broilers is an intensive deep-litter system. Before birds were placed, the houses were cleaned, washed, disinfected and provided with new wood shavings. During the rearing period, the birds received mash feed. The broiler-chickens were slaughtered at an average of 48 days of age with an average live weight of 1.8 kg. The broiler-chickens are produced in different broiler parent stocks and hatcheries in Iran. The most-common breed broiler was the Ross308.

Sample size determination

A sample of five birds per 10 000 is sufficient to diagnose coccidiosis (Mattiellio, 1990). Because the prevalence of coccidiosis in chicken farms in Iran has not been reported, the prevalence of infection in each farm was assumed to be 50%. The desired sample size was 218 houses (houses typically have <10 000 chickens each), using a 95% level of confidence and 5% desired absolute precision (Thrusfield, 1995). 218 chicken farms were randomly selected by using a random-numbers table; we also used such a table to select one house per farm. Randomly selected farms were initially contacted by veterinary services.

Sampling

Five chicks from each house were selected. The chicks were brought to the laboratory of parasitology in faculty of veterinary medicine in university of Tabriz for necropsy. All viscera were examined for gross pathological changes and the mucos of duodenum, jejunum, ileum and the caeci were examined for the presence of *Eimeria* spp. Stage according to the method described by Mattiellio (Mattiellio, 1990).

Parasitological technique

Wet smears of mucosa were prepared from intestinal and caecal scraping for microscopic examination of *Eimeria* spp. and *Eimeria* spp. identified according on the site of infection and oocysts morphology including size, color presence or absence of micropyle, cap and time of sporulation (Soulsby, 1982). Sporulation was performed in wet chamber at 24-26^{oC} in a 2.5% aqueous solution of potassium dichromate ($K_2Cr_2O_7$).

At the same time that chicks were sampled, litter samples were collected for counting of oocysts in litter. A modification of the McMaster's oocyst-counting technique was used (Soulsby, 1982). Litter samples were thoroughly homogenized by manual mixing. Then, a 9 g sample was weighed and soaked in 126 ml of water and allowed to stand overnight. Next morning, the samples were vigorously shaken to break up the feces. Then, each sample was sieved through a tea strainer. The strained samples were poured into a 15 ml centrifuge tube. The tubes were centrifuged at 2000 rpm for 5 min. The supernatant fluid was decanted and sediment was mixed with a saturated solution of sugar in the centrifuge tube. The suspension was thoroughly mixed and a sample was taken and placed in a McMaster's chamber. The number of oocysts within each ruled area, multiplied by 100 represents the number per gram of the original sample collected around the drinker and feeders of the same house from which chickens were collected on each farm.

Data collection

Information collected at the time of sampling included farmer's name, address, farm location, flock age, flock size and use of coccidiostats in the feed for that flock and previous coccidiosis infection within the last year in the farm.

Statistical analyses

Data comparing prevalence by risk factors were analyzed using chi-square with a significance level of $p<0.05$. 95% confidence intervals were calculated for the prevalence.

RESULTS

Five *Eimeria* spp. was identified in naturally infected birds in northwest Iran.The overall prevalence of *Eimeria* spp.infection among examined farms was 55.96 % (122 of 218 farms). *E. acervulina* was the most prevalence species (Table 1). All farms had multiple infections.

Table 1. Prevalence of five *Eimeria* spp. among 218 broiler farms in west north Iran.

Eimeria spp.	Broiler farms	
	No. of positive	% of positive
E. acervulina	52	23.58
E. tenella	31	14.22
E. necatrix	22	10.09
E. maxima	12	5.5
E. mitis	5	2.29

No significant difference was observed between the prevalence of infection among farms of different flock size. Also, neither the use of coccidiostat nor previous coccidiosis clinical outbreaks were associated with the prevalence of coccidiosis (Table 2).

Table 2. Prevalence of coccidiosis among 218 broiler-chicks farm.

Risk factor	Level of risk factor	No. of farm	No. of positive farm	% of positive farm
Flock size	2000-4000	14	8	57.14
	4000-8000	81	53	65.43
	8000-10000	123	72	58.53
Use of coccidiostat	Yes	180	83	46.1
	No	38	23	60.52
Previous coccidiosis infection	Yes	203	117	57.63
	No	15	9	60

The prevalence of infection increased with the age of the chickens. Chickens with 5 weeks of age showed the highest prevalence of infection. The median number of oocyst/gr of litter in the 5 weeks old chickens was higher than for other age of chickens (Table 3).

Table 3. Prevalence of coccidiosis and median of oocysts of litter in chicken farms by age.

Age(Week)	No. of farm	No. of positive farm	% of positive farm	Oocyst/gr median
2	31	16	51.61	120
3	42	28	66.66	300
4	63	41	65.07	420
5	52	40	76.92	600
6	30	16	53.33	140

DISCUSSION

In this study, the prevalence of *Eimeria* spp. in broiler farms in Tabriz was 55.96%.This rate is high compared to results of other survey in iran where Razmi and Kalideri (2000) reported 38% (Razmi, & Kalideri, 2000).The Poor management practices in Tabriz area broiler farmers might be a direct cause. Also one cause of this difference might be due to the different season in which survey was undertaken.

The biologic characteristics of coccidian of chickens are well known and variable,and can be identified on the basis of oocyst size (McDougald, & Mattiello, 1997). This study showed that five *Eimeria* spp. was identified in naturally infected birds (*E. acervulina, E. tenella, E. necatrix, E. maxima* and *E. mitis*). These results are in agreement with reports from Sweden, France, and Argentina and Jordan (Except *E. brunetti*) suggesting that those species of *Eimeria* are widespread in most countries where poultry are produced on a commercial basis (Al-Natour

& Suleiman, 2002; McDougald, & Mattiello, 1997; Thebo, et al., 1988; Williams, et al., 1996).

This survey showed that the size of flock is not effective in the rate of infestation to *Eimeria*.This result is not in agreement with other surveys in Iran and Netherlands that express the prevalence of coccidiosis increased with flock size (Braunius, 1980; Razmi, & Kalideri, 2000).

There was no significant different in the prevalence of *Eimeria* and previous coccidiosis This result is in agreement with the experience of Razmi and Kalidari (2000) and Al natour and et al (2002) and expressed the role of good results of disinfectant material in prevention of disease after an outbreak of it in the other period of breeding (Al-Natour & Suleiman, 2002; Razmi, & Kalideri, 2000). Also there was no significant difference in prevalence of *Eimeria* and and use of coccidiostats. This might be due to misuse of coccidiostats (dose or improper mixing in feed)or the development of local strain of *Eimeria* to variable compounds.

The results of this study showed that the prevalence of *Eimeria* and the median of oocyst/gr of litter increased with age and is picked in 5 weeks. This result is in agreement to the experiences of Long and Rowell (1975), McDougald and Reid (1991) and is not in agreement with Chapman and Johnson (1992), Stayer et al (1995) experiences (Chapman, & Johnson, 1992; Long, & Rowell, 1975; McDougald, & Mattiello, 1997; Stayer et al., 1995). In many studies the occurance period of coccidiosis is related to species of *Eimeria* and the type of anticoccidial drugs. Therefore, differences in management of the anticoccidial programs may have contributed to this difference.

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LONGHORNED BEETLES OF ANKARA REGION IN TURKEY (COLEOPTERA: CERAMBYCIDAE)

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[**Özdikmen, H., Turgut, S. & Güzel, S.** 2009. Longhorned beetles of Ankara region in Turkey (Coleoptera: Cerambycidae). Munis Entomology & Zoology, 4 (1): 59-102]

ABSTRACT: This work is the first attempt for entire longhorned beetles fauna of Ankara. All known taxa from Ankara province are given with some new faunistical data in the present text. *Aegosoma scabricorne* (Scopoli, 1763) for subfamily Prioninae, *Chlorophorus cursor* Rapuzzi & Sama, 1999 and *Chlorophorus trifasciatus* (Fabricius, 1781) for subfamily Cerambycinae and *Oberea oculata* (Linnaeus, 1758) for subfamily Lamiinae are recorded for the first time for Ankara's fauna. Longhorned beetles fauna of this region is about one fifth (20 %) of the fauna of Turkey, while the territorial area of Ankara is 3.19 % of whole Turkey. This work is introduced that Ankara's fauna is important for Turkey and is one of the richest faunas among the other Turkish provinces. A simple faunistical list for Ankara is also presented at the end of this work.

KEY WORDS: Cerambycidae, Coleoptera, fauna, new records, Ankara, Turkey

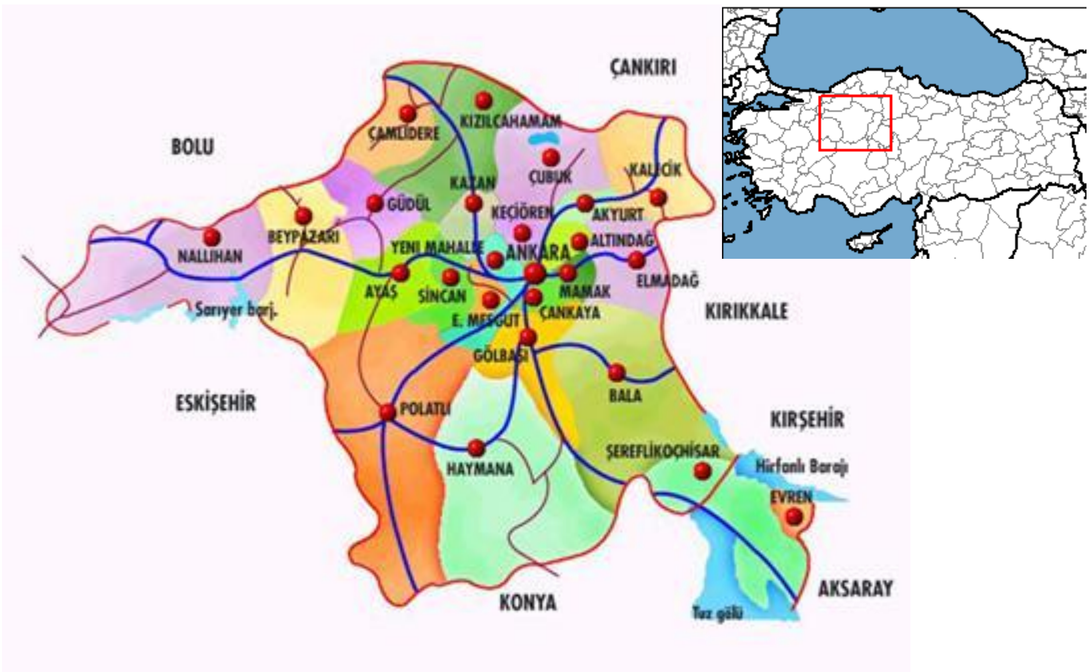
Ankara is an ancient city and it is the capital city of Turkey and the country's second largest city after İstanbul. As with many ancient cities, Ankara has gone by several names over the ages: The Hittites gave it the name "Ankuwash" before 1200 BC. The Galatians and Romans called it "Ancyra". In the classical, Hellenistic, and Byzantine periods it was known as "Ánkyra". It was also known as "Angora" after it fell to the Seljuks in 1073, and was so known up until 1930.

Ankara is located at 39°57' North, 32°53' East coordinates. It is placed in NW of Central Anatolian Region of Turkey (in Upper Sakarya Part). It is bounded by Kırşehir and Kırıkkale provinces in the East, Bilecik and Eskişehir provinces in the West, Çankırı province in the North, Bolu province in the Northwest and Konya and Aksaray provinces in the South (Map 1).

Except the lakes (6.194 km^2), the area of Ankara is 24.521 km^2 that is 3.19 % of the area of whole Turkey. It has a mean elevation between 830 and 890 m as average altitude.

Ankara is situated on the large plains of central Anatolia, with mountain forests to the north and the dry plain of Konya to the south. The mountains in N and NW of Ankara are covered with forest areas partly. The plain is irrigated by the Kızılırmak and Sakarya River systems, the Sarıyar reservoir and many natural lakes and pools. 50% of the land is used for agriculture, 28% is forest and another 10% is meadow and grazing land. The large salt lake (Tuz Gölü) partly lies in the province. The highest point is the Işık Dağı (2,015 m). The widest valley is the Polatlı valley (3.789 km^2).

Ankara is one of the driest places in Turkey and is surrounded by a barren steppe vegetation. The climate is hot and dry in summer, cold and snowing in winter, wetter in the north of the province than the dry plains to the south. Rainfall occurs mostly during the spring and autumn.



Map 1. Ankara region.

Ankara has two different types of vegetation, namely "Step vegetation" and "Forest vegetation". Step vegetation is more widespread than forest vegetation. It is common in deep-set areas and on the plateaus. The forest vegetation occurs in isolated mountains on platoes (e.g. Beynam forest) and in mountainous areas of the North. The forest vegetation beginning from near Kızılcahamam in N Ankara becomes frequent in the mountainous areas of the North. Coniferous plants are common in these areas. Soğuksu National Park in Kızılcahamam has been selected as a single nature protection zone in Ankara.

Ankara has a rich fauna. Longhorned beetles fauna of this region is about one fifth (20 %) of the fauna of the whole territory of Turkey, while the territorial area of Ankara is 3.19 % of the area of Turkey. It is a transition gate for Euxine, Mediterranean and Irano-Turan elements phytogeographycally. On the other side, it is related with Paphlagonia (the mountainous area between Bithynia and Pontus on the Black Sea coast, bordered by the ancient Halys river to the east) in the North, Bithynia (the mountainous area between Thrace and Paphlagonia, the territory of Bithynia was restricted to an area west of the Sangarius River (now Sakarya River) in the North and North-west, Phrygia (this ancient district is located between Galatia and Lydia on the east and west and Bithynia on north) in the West, Lycaonia (this ancient district is located between Galatia and Cilicia on the north and south and Phrygia and Cappadocia on the west and east) in the South and Cappadocia (this ancient district is located in north of Taurus Mts. and Galatia on the northwest and Pontus on the northeast) in the far South-east in ancient geography. The modern capital of Turkey, Ankara (ancient Ancyra), was also the capital of ancient Galatia (the region lies in the basins of the present-day Kızılırmak and Delice rivers, on the great central plateau of Turkey) (Map 2).

Map 2. Ancient Ankara (Ancyra) region.

The data on this fauna has accumulated in a piecemeal fashion over the twentieth century and this century especially. Various authors have reported some partial data on the fauna in their different works. However, most of works were completed in a short time and their works did not focus on fauna of Ankara generally. So the longhorned beetles fauna of Ankara has not been studied completely until now. Especially the recent works of Özdikmen et al. (2005), Özdikmen & Demir (2006), Özdikmen (2006 and 2007) are important on this subject. More detailed information of most evaluated species in the text can obtain in the works of Özdikmen (2007 and 2008a,b).

In this work, some new faunistical data are presented. Besides, according to cited literatures, all known taxa from Ankara province are also given in the text. *Aegosoma scabricorne* (Scopoli, 1763) for subfamily Prioninae, *Chlorophorus cursor* Rapuzzi & Sama, 1999 and *Chlorophorus trifasciatus* (Fabricius, 1781) for subfamily Cerambycinae and *Oberea oculata* (Linnaeus, 1758) for subfamily Lamiinae are recorded for the first time for Ankara's fauna. So we determined that the longhorned beetles fauna of Ankara province consists of 119 species (belong to 6 subfamily, 27 tribe, 56 genera). However, it must be suppose that the fauna is richer from determining fauna now. Since some known taxa in Turkish fauna should be presented in this region. But the taxa which can be supposed in this area are not mentioned in the present text. Consequently it would be expected that a number of additional species and new records are to be expected to occur in Ankara region.

Finally, this work indicates that Ankara's fauna is important for Turkey and is one of the richest faunas among the Turkish provinces. We propose that at least a protection area for step vegetation must be designated to protect this rich fauna for the future.

ARRANGEMENT OF INFORMATION

Information in the present text is given in the following order:

The subfamily and the tribe names are given simply.

For the genus and subgenus names, the type species are provided under the taxon names.

For each species, the whole subspecies are provided under the taxon names.

The data, **Material examined, Records in Ankara, Records in Turkey, Remarks** and **Chorotype** under the title for each taxon is given.

Material examined. Material examined that is provided for only some taxons covers the original records for Ankara province in Turkey. The most materials were collected by authors from various localities in Ankara. They are deposited in Gazi University (Ankara).

The data under the title of Material examined are given according to the following outline as possible as:

Ankara(1): Kızılcahamam(2), Güvem(3), 14.05.1997(4), 1200 m(5), 2 specimens(6), leg. H. Özdikmen(7) ((1) Administrative district (Province); (2) Town; (3) Village; (4) Collecting date (day/month/year); (5) Altitude; (6) Number of specimens; (7) The name of collector).

Records in Ankara. These parts include previous records that have been given by various authors in different literatures from Ankara. The whole records are evaluated with localities in related references. Each record is accompanied by the author's name and publication date of the related reference.

Records in Turkey. The abbreviations of the provinces and lands in Turkey are given in paranthesis. These parts include previous records that have been given by various authors in different literatures.

Remarks. In these parts, taxonomical and nomenclatural problems are discussed for some taxons and are given regional and general distribution range in Turkey chiefly.

Chorotype. The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al. (1999). In the text, a possible chorotype description can be identified for each taxon. But this kind of description can not be possible for some taxons, so two or more chorotypes are used for them.

CLASSIFICATION

In this paper, classification and nomenclature of the longhorn beetles suggested by Sama (2002) and Danilevsky (2008a,b) are followed chiefly. Within the subfamilies all genera are listed in the same order in Danilevsky (2008b). Within the genera the species are listed alphabetically. Each name of a species or subspecies is accompanied by the author's name and description date.

ABREVIATIONS OF THE PROVINCES AND LANDS IN TURKEY

ADANA (AD)	ELAZIĞ (EL)	MANİSA (MN)
ADIYAMAN (ADY)	ERZİNCAN (ER)	MARDİN (MR)
AFYON (AF)	ERZURUM (EZ)	MUĞLA (MG)
AĞRI (AG)	ESKİŞEHİR (ES)	MUŞ (MU)
AKSARAY (AK)	GAZİANTEP (GA)	NEVŞEHİR (NE)
AMASYA (AM)	GİRESUN (GI)	NİĞDE (NI)
ANKARA (AN)	GÜMÜŞHANE (GU)	ORDU (OR)
ANTALYA (ANT)	HAKKARİ (HA)	OSMANİYE (OS)
ARDAHAN (AR)	HATAY (HT)	RİZE (RI)
ARTVİN (ART)	IĞDIR (IG)	SAKARYA (SA)
AYDIN (AY)	ISPARTA (IP)	SAMSUN (SM)
BALIKESİR (BL)	İÇEL (IC)	SİİRT (SI)
BARTIN (BR)	İSTANBUL (IS)	SİNOP (SN)
BATMAN (BA)	İZMİR (IZ)	SİVAS (SV)
BAYBURT (BY)	KAHRAMANMARAŞ (KA)	ŞANLIURFA (SU)
BİLECİK (BI)	KARABÜK (KR)	ŞIRNAK (SK)
BİNGÖL (BN)	KARAMAN (KM)	TEKİRDAĞ (TE)
BİTLİS (BT)	KARS (KAR)	TOKAT (TO)
BOLU (BO)	KASTAMONU (KS)	TRABZON (TB)
BURDUR (BU)	KAYSERİ (KY)	TUNCELİ (TU)
BURSA (BS)	KIRIKKALE (KI)	UŞAK (US)
ÇANAKKALE (CA)	KIRKLARELİ (KK)	VAN (VA)
ÇANKIRI (CN)	KIRŞEHİR (KIR)	YALOVA (YA)
ÇORUM (CO)	KİLİS (KL)	YOZGAT (YO)
DENİZLİ (DE)	KOCAELİ (KO)	ZONGULDAK (ZO)
DİYARBAKIR (DI)	KONYA (KN)	THRACIA (=EUROPEAN TUR.) (TRA)
DÜZCE (DU)	KÜTAHYA (KU)	TURKEY (TUR)
EDİRNE (ED)	MALATYA (MA)	

Family CERAMBYCIDAE

Subfamily PRIONINAE

Tribe ERGATINI

***Ergates* Serville, 1832**
[Type sp.: *Prionus serrarius* Panzer, 1793 = Cerambyx faber Linnaeus, 1767]

***Ergates faber* (Linnaeus, 1761)**
= ssp. *faber* Linnaeus, 1767
= ssp. *opifex* Mulsant, 1851

Records in Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006).
Records in Turkey: (AN-ANT-ART-BO-BS-DU-KA-KS-KO-SN-TB-TRA-TUR)
Remarks: The species distributes mostly in N Turkey. It is represented by the nominative subspecies in Turkey. The other known subspecies, *E. faber opifex* Mulsant, 1851 occurring in North Africa (Morocco and Algeria), Italy and Sicily.
Chorotype: Turano-Europeo-Mediterranean.

Tribe AEGOSOMATINI

***Aegosoma* Serville, 1832**
[Type sp.: *Cerambyx scabricornis* Scopoli, 1763]

***Aegosoma scabricorne* (Scopoli, 1763)**

Material examined: Ankara prov.: Kayaş, Bayındır dam env., 03.07.2003, 895 m., 1 specimen and 20.07.2004, 895 m., 1 specimen, leg. S. Güzel.
Records in Turkey: (AN-ANT-BL-BR-GU-IP-IS-KA-KN-KR-SM-VA-TRA-TUR)
Remarks: New to Ankara province. According to distribution in Turkey of host plants, probably the species distributes widely in Turkey.
Chorotype: Turano-European.

Tribe PRIONINI

***Prionus* Geoffroy, 1762**
[Type sp.: *Cerambyx coriarius* Linnaeus, 1758]

***Prionus coriarius* (Linnaeus, 1758)**

Records in Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006).
Records in Turkey: (AN-ANT-ART-AY-BL-BO-BU-HT-KA-KK-KO-KS-RI-SN-TB-TRA-TUR)
Remarks: According to distribution in Turkey of host plants, probably the species distributes rather widely in Turkey.
Chorotype: Sibero-European + Turano-Europeo-Mediterranean.

***Mesoprionus* Jakovlev, 1887**
[Type sp.: *Mesoprionus angustatus* Jakovlev, 1887]

***Mesoprionus besicanus* (Fairmaire, 1855)**

Records in Ankara prov.: Kalecik (Yeşildere) (Özdikmen & Demir, 2006).
Records in Turkey: (AD-AN-ANT-BI-BS-BU-CA-DE-ER-EZ-IC-IS-IZ-KI-KL-KN-KU-KY-MG-NE-TRA-TUR-US)
Remarks: The species distributes mostly in west half of Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Subfamily LEPTURINAE

Tribe RHAMNUSIINI

***Rhamnusium* Latreille, 1829**
[Type sp.: *Callidium salicis* Fabricius, 1787 = *Cerambyx bicolor* Schrank, 1781]

***Rhamnusium graecum* Schaufuss, 1862**
= ssp. *graecum* Schaufuss, 1862
= ssp. *italicum* Müller, 1966

Records in Ankara prov.: Kızılcahamam (Svacha & Danilevsky, 1988).
Records in Turkey: (AN-IS-TRA-TUR)
Remarks: The species distributes in N and NW Turkey. It is represented by the nominotypical subspecies in Turkey. Known other subspecies *R. graecum italicum* Müller, 1966 occurs only in Italy.
Chorotype: Turano-Mediterranean (Turano-Apenninian).

***Rhamnusium testaceipenne* Pic, 1897**

Records in Ankara prov.: Çubuk (Demelt, 1963).
Records in Turkey: (AN-TUR)
Remarks: The species distributes only in N Turkey.
Chorotype: Turanian (Ponto-Caspian).

Tribe RHAGIINI

***Rhagium* Fabricius, 1775**
[Type sp.: *Cerambyx inquisitor* Linnaeus, 1758]

Subgenus *Rhagium* Fabricius, 1775
[Type sp.: *Cerambyx inquisitor* Linnaeus, 1758]

***Rhagium inquisitor* (Linnaeus, 1758)**
= ssp. *inquisitor* Linnaeus, 1758
= ssp. *stshukini* Semenov, 1897
= ssp. *rugipenne* Reitter, 1898
= ssp. *fortipes* Reitter, 1898
= ssp. *cedri* Reymond, 1953

Records in Ankara prov.: Kızılcahamam (Alkan, 1946; Demelt, 1967).
Records in Turkey: (AM-AN-ANT-ART-BO-BS-BU-DU-EZ-GI-GU-IS-KR-KAR-KS-OR-RI-SA-SN-TB-TRA-TUR)
Remarks: The species has five distinct subspecies in the World. In Turkey, it is represented by three subspecies. *R. inquisitor stshukini* Semenov, 1897 occurs only in NE Turkey, *R. inquisitor fortipes* Reitter, 1898 occurs only in SE Turkey and the nominative *R. inquisitor inquisitor* (Linnaeus, 1758) occurs in other parts of Turkey. Known other subspecies, *R. inquisitor cedri* Raymond & Reid, 1953 occurs in North Africa (Morocco and Algeria), *R. inquisitor rugipenne* Reitter, 1898 occurs in European Russia, Siberia, China and Mongolia. According to Sama (2002), *R. japonicum* Bates, 1884 occurs in Kunashir Island to Japan is a subspecies of *R. inquisitor*.
Chorotype: Holarctic.

***Stenocorus* Geoffroy, 1762**
[Type sp.: *Leptura meridiana* Linnaeus, 1758]

Subgenus *Anisorus* Mulsant, 1862
[Type sp.: *Cerambyx quercus* Götz, 1783]

Remarks: Danilevsky (2008a,b) regarded as a subgenus of *Stenocorus* Geoffroy, 1762. According to Sama (2002), *Anisorus* Mulsant, 1862 is a separate genus.

***Stenocorus quercus* (Götz, 1783)**
= ssp. *quercus* Götz, 1783
= ?ssp. *aureopubens* Pic, 1908
= ?ssp. *punctipennis* Reitter, 1914

Records in Ankara prov.: Kızılcahamam as *Stenocorus quercus* m. *magdalenae* Pic u. *discoideus* Reitter (Demelt, 1967).
Records in Turkey: (AN-BN-EZ-RI-TRA-TUR)
Remarks: The species distributes in N Turkey. It is represented by the nominative subspecies in Turkey. Known other subspecies, *A. quercus aureopubens* Pic, 1908 that was proposed by Danilevsky (2008b) for Transcaucasian populations occurs only in Caucasia and NE Turkey. According to Sama (2002), specimens from the Pelopennese (Greece) do not differ significantly from Central European populations. So he gave *Stenocorus quercus* ssp. *punctipennis* Reitter, 1914 as a synonym.
Chorotype: Sibero-European.

***Acmaeops* LeConte, 1850**
[Type sp.: *Leptura proteus* Kirby, 1837]

***Acmaeops marginatus* (Fabricius, 1781)**

Records in Ankara prov.: Kızılcahamam as *A. marginata* m. *spadicea* (Demelt, 1967); Kızılcahamam (Sama, 2002).
Records in Turkey: (AM-AN)
Remarks: The species distributes in N Turkey.
Chorotype: Sibero-European.

***Dinoptera* Mulsant, 1863**
[Original designation as subgenus of *Acmeops* LeConte, 1850. Type sp.: *Leptura collaris* Linnaeus, 1758]

***Dinoptera collaris* (Linnaeus, 1758)**

Records in Ankara prov.: Işık Mountain (Demelt, 1963); Kızılcahamam (Soğuksu National Park and Aköz village) (Özdikmen, 2006).
Records in Turkey: (AM-AN-ART-BO-BS-CN-EZ-IC-IP-IS-KS-KO-KR-RI-SM-TRA-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Sibero-European.

***Cortodera* Mulsant, 1863**
[Type sp.: *Grammoptera spinosula* Mulsant, 1839 = *Leptura humeralis* Schaller, 1783]

***Cortodera alpina* Hampe, 1870**
= ssp. *alpina* Hampe, 1870
= ssp. *starcki* Reitter, 1888
= ssp. *umbripennis* Reitter, 1890
= ssp. *rosti* Pic, 1892
= ssp. *fischtensis* Starck, 1894
= ssp. *xanthoptera* Pic, 1898

Records in Ankara prov.: Çubuk dam as *Cortodera umbripennis* (Demelt, 1963).
Records in Turkey: (AN-ANT-AR-ART-EZ-IC-KAR-KN-MU-NI-VA-TUR)
Remarks: The species distributes rather widely in Turkey. It is represented by two subspecies in Turkey. These are *C. alpina xanthoptera* Pic, 1898 occurs in S Turkey and *C. alpina umbripennis* Reitter, 1890 occurs in other parts of Turkey. The nominotypical

subspecies (*C. alpina alpina* Hampe, 1870) and known other subspecies (*C. alpina starcki* Reitter, 1888; *C. alpina rosti* Pic, 1892 and *C. alpina fischtensis* Starck, 1894) occur only in Caucasus.
Chorotype: SW-Asiatic (Anatolo-Caucasian + ? Irano-Caucasian + ? Irano-Anatolian) + Turano-Mediterranean (Balkano-Anatolian).

***Cortodera colchica* Reitter, 1890**
= ssp. *colchica* Reitter, 1890
= ssp. *rutilipes* Reitter, 1890
= ssp. *danczenkoi* Danilevsky, 1985
= ssp. *kalashiani* Danilevsky, 2000

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) as *C. holosericea* (Özdikmen, 2003a); Kızılcahamam (Yukarı Çanlı) (Özdikmen, 2003a,b and 2006).
Records in Turkey: (AD-ADY-AK-AN-ANT-ART-BN-BU-BY-EZ-HA-IC-KAR-KY-KN-SV-TUR)
Remarks: The species distributes rather widely in Turkey. It is represented by two subspecies in Turkey. These are *C. colchica rutilipes* Reitter, 1890 occurs in NE Turkey (Erzurum prov. env.) and the nominotypical subspecies *C. colchica colchica* Reitter, 1890 occurs in other parts of Turkey. Known other subspecies *C. colchica danczenkoi* Danilevsky, 1985 and *C. colchica kalashiani* Danilevsky, 2000 occur only in Caucasus.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

***Cortodera differens* (Pic, 1898)**

Records in Ankara prov.: Angora (=Ankara prov.) as *C. discolor* v. *variipes* Ganglbauer, 1897 (Winkler, 1924-1932); Kızılcahamam as *C. discolor differens* Pic, 1898 (Demelt, 1967); Kızılcahamam (Adlbauer, 1992); Kızılcahamam (Güvem village) (Özdikmen, 2008).
Records in Turkey: (AN-ANT)
Remarks: The species distributes only in western half of Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Cortodera femorata* (Fabricius, 1787)**

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park, Güvem village) (Özdikmen, 2006).
Records in Turkey: (AN-AK)
Remarks: The species distributes probably in NW and C Turkey (western half of Turkey).
Chorotype: European.

***Cortodera flavimana* (Waltl, 1838)**
= ssp. *flavimana* Waltl, 1838
= ssp. *brachialis* Ganglbauer, 1897

Material examined: Ankara prov.: Kızılcahamam, Salin village, 20.05.2005, 2100 m., 115 specimens, leg. S. Güzel; Kızılcahamam, Işık Mountain, 21.05.2005, 2230 m., 14 specimens, leg. S. Güzel; Şereflikoçhisar, Kale district, 22.03.2006, 980 m., 1 specimen, leg. S. Güzel; Bağlum, 13.07.2005, 1170 m., 1 specimen, leg. S. Güzel; Kızılcahamam, Soğuksu National Park, 21.05.2006, 18 specimens, leg. S. Turgut.
Records in Ankara prov.: Kızılcahamam (Gfeller, 1972); Kızılcahamam (Central, Güvem, Yukarı Çanlı, Soğuksu National Park) (Özdikmen, 2003a and 2006); Çubuk (Karagöl) (Özdikmen et al., 2005); Kızılcahamam (Işık Mountain) (Özdikmen & Demir, 2006).
Records in Turkey: (AD-AF-AK-AN-ANT-ART-BO-BS-BY-CN-EZ-GU-IC-IP-IS-IZ- NI-KA-KAR—KN-KO-KR-KS-KY-RI-SM-SN-SV-TO-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey due to the host plant, *Ranunculus*, is a cosmopolite genus of plants. It has variability in elytral coloration. So, it is possible represented by several subspecies (presumably some of them in local areas) in Turkey. But distribution patterns of the potential subspecies need to be clarified. For example, there are two distinct subspecies of *C. flavimana* (*C. flavimana flavimana* (Waltl, 1838) and *C.*

flavimana brachialis Ganglbauer, 1897 (Greece and West Turkey) in Europe. Up to now, both two subspecies (*C. flavimana flavimana* and *C. flavimana brachialis* Ganglbauer, 1897) of the species has been known in Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Cortodera humeralis* (Schaller, 1783)**

Records in Ankara prov.: Kızılcahamam (Köroğlu Mountains) (Adlbauer, 1992); Kızılcahamam (Soğuksu National Park, Güvem) (Özdikmen, 2003a and 206).
Records in Turkey: (AN-ART-BO-TRA)
Remarks: The species distributes in N Turkey. According to Sama (2002), *C. humeralis orientalis* Adlbauer, 1988 that described as a subspecies of *C. humeralis*, is a distinct species that occurs only in S Turkey.
Chorotype: S-European.

***Cortodera syriaca* Pic, 1901**
= ssp. *syriaca* Pic, 1901
= ssp. *nigroapicalis* Holzschuh, 1981

Records in Ankara prov.: Şereflikoçhisar (Malmusi & Saltini, 2005).
Records in Turkey: (ADY-AK-AN-IC-KA-MU-TUR)
Remarks: The species distributes mostly in Eastern half of Turkey. It is represented by both subspecies in Turkey. *Cortodera syriaca nigroapicalis* Holzschuh, 1981 occurs only in SE Turkey and the nominative subspecies occurs in other parts of Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

***Cortodera villosa* Heyden, 1876**
= ssp. *villosa* Heyden, 1876
= ssp. *circassica* Reitter, 1890
= ssp. *major* Miroshnikov, 2007
= ssp. *nakhichevanica* Miroshnikov, 2007

Records in Ankara prov.: Ankara prov. (Özdikmen, 2003b).
Records in Turkey: (AN)
Remarks: Probably the species distributes only in N Turkey. It is represented by the nominative subspecies in Turkey. The other subspecies, *Cortodera villosa villosa* Heyden, 1876 occurs E Europe, *Cortodera villosa circassica* Reitter, 1890 and *Cortodera villosa nakhichevanica* Miroshnikov, 2007 occur only in Caucasus and *Cortodera villosa major* Miroshnikov, 2007 occurs only in European Russia.
Chorotype: E-European.

***Grammoptera* Serville, 1835**
[Type sp.: *Leptura praeusta* Fabricius, 1787 = *Leptura ustulata* Schaller, 1783]

***Grammoptera abdominalis* (Stephens, 1831)**

Records in Ankara prov.: Kızılcahamam as *G. variegata* (Germ.) (Demelt, 1967).
Records in Turkey: (AN-BO-GU-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: European.

***Grammoptera ustulata* (Schaller, 1783)**

Records in Ankara prov.: Kızılcahamam (Demelt, 1967); Kızılcahamam (Soğuksu National Park) (Özdikmen, 2006).
Records in Turkey: (AN-BO-GU-TO-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: European.

Tribe LEPTURINI

***Vadonia* Mulsant, 1863**
[Type sp.: *Leptura unipunctata* Fabricius, 1787]

***Vadonia unipunctata* (Fabricius, 1787)**
= ssp. *unipunctata* Fabricius, 1787
= ssp. *dalmatina* Müller, 1906
= ssp. *ohridensis* Holzschuh, 1989
= ssp. *makedonica* Holzschuh, 1989
= ssp. *syricola* Holzscuh, 1993

Material examined: Ankara prov.: Beytepe, 16.06.2005, 985 m., 19 specimens, leg. S. Güzel; İncek, 28.06.2006, 1070 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Gölbaşı (Demelt & Alkan, 1962; Demelt, 1963); Central (Kavaklıdere) (Öymen, 1987); Kızılcahamam (Işık Mountain, Aköz village, Güvem, Yukarı Çanlı) (Özdikmen, 2006).
Records in Turkey: (AF-AK-AM-AN-ANT-ART-BI-BN-BO-BT-BU-BY-CN-EL-EZ-IP-IZ-KA-KAR-KIR-KO-KR-KS-KY-MA-NE-NI-OS-RI-SV-TO-US-TRA-TUR)
Remarks: The species distributes widely in Turkey. It is represented by the nominative subspecies in Turkey. The other known subspecies, *V. unipunctata dalmatina* Müller, 1906 occurs in Croatia, Bosnia and Herzegovina, ? Greece, *V. unipunctata ohridensis* Holzschuh, 1989 occurs in Macedonia, *V. unipunctata makedonica* Holzschuh, 1989 occurs in Greece and *V. unipunctata syricola* Holzschuh, 1993 occurs in Syria.
Chorotype: Turano-European or Turano-Europeo-Mediterranean. According to Sama (2002), the records from North Africa are erroneous.

***Pseudovadonia* Lobanov, Danilevsky et Murzin, 1981**
[Type sp.: *Leptura livida* Fabricius, 1776]

***Pseudovadonia livida* (Fabricius, 1776)**
= ssp. *livida* Fabricius, 1776
= ssp. *pecta* Daniel & Daniel, 1891
= ssp. *desbrochersi* Pic, 1891

Material examined: Ankara: E Beytepe, 12.07.2004, 980 m., 1 specimen, leg. S. Güzel; Bağlum, 06.07.2005, 1170 m., 1 specimen, 11.07.2005, 1 specimen, 13.07.2005, 4 specimens, leg. S. Güzel; Şereflikoçhisar, Gülhöyük, 22.05.2006, 980 m., 1 specimen, leg. S. Güzel; İncek, 28.06.2006, 1075 m., 5 specimens, leg. S. Güzel.
Records in Ankara prov.: Ankara prov. (Villiers, 1967; Tuatay et al., 1972); Kalecik (Öymen, 1987); Central and Çubuk (Karagöl) (Özdikmen et al., 2005); Kızılcahamam (Güvem, Yenimahalle village, the peak of Bel) (Özdikmen, 2006).
Records in Turkey: (ADY-AM-AN-ANT-ART-BI-BO-BR-BS-BT-BY-CN-ER-EZ-GA-GI-GU-HT-IC-IP-IS-IZ-KAR-KK-KO-KR-KS-MN-NI-OS-RI-SM-US-TRA-TUR)
Remarks: The species distributes widely in Turkey. It is represented by three subspecies in Turkey. *P. livida desbrochersi* (Pic, 1891) occurs in E or NE Turkey, *P. livida pecta* (Adlbauer, 1988) occurs in S and W Turkey and the nominative *P. livida livida* occurs in other parts of Turkey. I think that the real status of distribution patterns of these subspecies needs to be clarified.
Chorotype: Sibero-European + E-Mediterranean (Palaestino-Taurian).

***Anoplodera* Mulsant, 1839**
[Type sp.: *Leptura sexguttata* Fabricius, 1775]

***Anoplodera rufipes* (Schaller, 1783)**
= ssp. *rufipes* Schaller, 1783
= ssp. *lucidipes* Sama, 1999
= ssp. *izzilloi* Sama, 1999

Records in Ankara prov.: Kızılcahamam (Demelt, 1963, 1967).
Records in Turkey: (AN-BN-BO-BU-EZ-GU-IC-KS-OR-RI-TB-TUR)
Remarks: The species distributes rather widely in Turkey. The species is represented by two subspecies in Turkey. *A. rufipes lucidipes* Sama, 1999 occurs only in S Turkey and the nominative *A. rufipes rufipes* occurs mostly in N Turkey. *A. rufipes izzilloi* Sama, 1999 occurs only in Italy.
Chorotype: Sibero-European.

***Stictoleptura* Casey, 1924**
[Type sp.: *Leptura cribripennis* LeConte, 1859]

***Stictoleptura cordigera* (Füsslins, 1775)**
= ssp. *cordigera* Füsslins, 1775
= ssp. *illyrica* Müller, 1948
= ssp. *romanica* Podany, 1964
= ssp. *anojaensis* Slama, 1982

Material examined: Ankara prov.: Beytepe, 850 m, 07.07.2004 and 12.07.2004, 2 specimens, leg. S. Güzel; N Bağlum, 13.07.2005, 1170 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (ADY-AK-AN-ANT-ART-BL-BN-BO-BT-BU-CA-DE-ED-EZ-GA-GU-HT-IC-IS-IZ-KA-KK-KN-KO-MG-MN-MU-NE-NI-OS-TE-TU-YA-TRA-TUR)
Remarks: The species distributes widely in Turkey. According to Sama (2002), the species really is represented by two subspecies in Turkey. *S. cordigera anojaensis* Slama, 1982 that was described from Crete occurs also in SW Turkey (Sama, 2002) and the nominative *S. cordigera cordigera* occurs in other parts of Turkey. The other known subspecies, *S. cordigera illyrica* (Müller, 1948) occurs in Western Balkans (Croatia, Bosnia and Herzegovina, Serbia, Albania and Greece) and *S. cordigera romanica* Podany, 1964 occurs in Eastern Balkans (Romania and Bulgaria) and ? European Turkey.
Chorotype: Turano-European.

***Stictoleptura tesserula* (Charpentier, 1825)**

Records in Ankara prov.: Kızılcahamam (Central, Soğuksu National Park) (Özdikmen, 2006).
Records in Turkey: (EZ-KN-KR-KS-RI-TUR)
Remarks: The species distributes mostly in N Turkey.
Chorotype: Turano-European (Turano-Sarmato-Pannonian + Ponto-Pannonian).

***Anastrangalia* Casey, 1924**
[Type sp.: *Leptura sanguinea* LeConte, 1859]

***Anastrangalia sanguinolenta* (Linnaeus, 1761)**

Records in Ankara prov.: Beynam Forest (Özdikmen et al., 2005); Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006); Kızılcahamam (Central, Soğuksu National Park, Işık Mountain, Güvem) (Özdikmen, 2006).
Records in Turkey: (AM-AN-ART-BO-BS-EZ-GI-GU-KAR-KR-KS-KY-SM-SN-TB-TO-YO-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: Sibero-European or European. According to Sama (2002) records from Siberia not confirmed by Cherepanov (1990).

***Pachytodes* Pic, 1891**
[Type sp.: *Leptura cerambyciformes* Schrank, 1781]

***Pachytodes erraticus* (Dalman, 1817)**
= ssp. *erraticus* Dalman, 1817
= ssp. *erythrura* Küster, 1848

= ssp. *bottcheri* Pic, 1911

Material examined: Ankara prov.: N Bağlum, 06.07.2005, 1190 m., 19 specimens, leg. S. Güzel; Bağlum, 11.07.2005, 1170 m., 3 specimens, 13.07.2005, 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen et al., 2005); Kızılcahamam (Işık Mountain, Yukarı Çanlı village) (Özdikmen & Demir, 2006); Kızılcahamam (Soğuksu National Park, Işık Mountain, Güvem, Yenimahalle village, Yasin village, Yukarı Çanlı), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (AF-AM-AN-ANT-ART-BI-BO-BR-BS-BT-CN-CO-EL-ER-EZ-GA-GU-HAT-IP-IS-IZ-KAR-KK-KO-KN-KR-KS-MN-MU-RI-SM-SN-SV-TB-TO-TU-YO-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey. It has been widely accepted that the species has three subspecies. The Eastern Palaearctic subspecies, *P. erraticus bottcheri* Pic, 1911 occurs in Siberia, Kazakhstan and China, *P. erraticus erythrura* Küster, 1848 occurs in S parts of the distribution area of the nominative subspecies and the nominative *P. erraticus erraticus* Dalman, 1817 occurs in other parts of Palaearctic Region including Turkey. Namely, the species is represented by two subspecies in Turkey: *P. erraticus erythrura* Küster, 1848 in S Turkey and *P. erraticus erraticus* Dalman, 1817 in other parts of Turkey.
Chorotype: Sibero-European.

***Leptura* Linnaeus, 1758**
[Type sp.: *Leptura quadrifasciata* Linnaeus, 1758]

***Leptura quadrifasciata* Linnaeus, 1758**
= ssp. *quadrifasciata* Linnaeus, 1758
= ssp. *caucasica* Plavilstshikov, 1924

Records in Ankara prov.: Beytepe (Özdikmen, 2007).
Records in Turkey: (AN-ART-BO-GI-IS-KAR-KR-KS-RI-SV-TB-TRA-TUR)
Remarks: The species is represented by two subspecies in Turkey. These are *L. quadrifasciata caucasica* Plavilstshikov, 1924 (Caucasus, Iran, Turkey) and the nominative *L. quadrifasciata quadrifasciata*. Both subspecies distribute in North Turkey.
Chorotype: Sibero-European.

***Stenurella* Villiers, 1974**
[Type sp.: *Leptura melanura* Linnaeus, 1758]

***Stenurella bifasciata* (Müller, 1776)**
= ssp. *bifasciata* Müller, 1776
= ssp. *nigrosuturalis* Reitter, 1895
= ssp. *limbiventris* Reitter, 1898

Material examined: Ankara prov.: Bağlum, 06.07.2005, 1170 m., 1 specimen, 11.07.2005, 2 specimens, 13.07.2005, 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen et al., 2005); Ankara prov. (Malmusi & Saltini, 2005); Kızılcahamam (Central, Soğuksu National Park, Işık Mountain, S of New dam, Güvem, Yasin village, the peak of Bel, Yukarı Çanlı), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (AD-AF-AK-AM-AN-ANT-ART-BI-BN-BO-BR-BS-BT-BU-CA-CN-CO-ER-EZ-GA-GU-HT-IC-IZ-KA-KK-KN-KO-KR-KS-KY-MG-MN-NE-OS-RI-SM-TB-US-YA-YO-ZO-TUR)
Remarks: The species distributes widely in Turkey. It is represented by three subspecies in Turkey. *S. bifasciata nigrosuturalis* (Reitter, 1895) occurs in SE Turkey and Lebanon and Syria, *S. bifasciata limbiventris* (Reitter, 1898) occurs only in N Turkey and the nominative *S. bifasciata bifasciata* (Müller, 1776) occurs in other parts of Turkey.
Chorotype: Sibero-European + SW-Asiatic.

***Stenurella septempunctata* (Fabricius, 1792)**
= ssp. *septempunctata* Fabricius, 1792
= ssp. *anatolica* Heyrovský, 1961

Records in Ankara prov.: Azapderesi (Özdikmen & Demir, 2006); Kızılcahamam (Central, Soğuksu National Park, Işık Mountain, Güvem), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (AF-AM-AN-ART-BI-BO-BS-CA-EZ-GU-IS-IZ-KK-KO-KR-KS-RI-SM-TO-TB-YA-YO-ZO-TUR)
Remarks: The species distributes mostly in N Turkey and Northern Central Turkey. There are two distinct subspecies in the World. These are; the nominative *S. septempunctata septempunctata* (Fabricius, 1792) and *S. septempunctata anatolica* Heyrovský, 1961 occurs in Balkans (from Bulgaria), Transcaucasia and Turkey.
Chorotype: Turano-European (Ponto-Pannonian + Turano-Sarmato-Pannonian) + Turano-Mediterranean (Turano-Apenninian).

Subfamily <u>ASEMINAE</u>

Tribe <u>ASEMINI</u>

***Asemum* Eschscholtz, 1830**
[Type sp.: *Cerambyx striatus* Linnaeus, 1758]

***Asemum tenuicorne* Kraatz, 1879**

Records in Ankara prov.: Kızılcahamam (Demelt, 1967; Özdikmen & Turgut, 2006).
Records in Turkey: (AN-TUR)
Remarks: The species probably distributes rather widely in Turkey (especially N, C and SE Turkey).
Chorotype: S-European.

***Arhopalus* Serville, 1834**
[Type sp.: *Cerambyx rusticus* Linnaeus, 1758]

***Arhopalus rusticus* (Linnaeus, 1758)**
= ssp. *rusticus* Linnaeus, 1758
= ssp. *nubilus* LeConte, 1850
= ssp. *montanus* LeConte, 1873
= ssp. *obsoletus* Randall, 1838
= ssp. *hesperus* Chemsak & Linsley, 1965

Records in Ankara prov.: Ankara prov. (Öymen, 1987; Tozlu et al., 2002; Özdikmen & Turgut, 2006); Kızılcahamam (Soğuksu National Park) (Özdikmen, 2006 and 2007).
Records in Turkey: (AN-ANT-ART-BL-BO-BU-BY-DE-GU-IS-KAR-KR-KS-KU-MG-OR-RI-SM-SN-TB-TO-TUR)
Remarks: The species distributes rather widely in Turkey. It is represented by the nominotypical subspecies in Palaearctic Region (incl. Turkey). Known other subspecies are distributed in Nearctic Region. These are; *A. rusticus montanus* (LeConte, 1873) occurs in United States, Mexico, *A. rusticus nubilus* (LeConte, 1850) occurs in United States, Mexico, Jamaica, Bahamas, *A. rusticus obsoletus* (Randall, 1838) occurs in United States, Guatemala, Honduras, Canada, Mexico and *A. rusticus hesperus* Chemsak & Linsley, 1965 occurs in United States.
Chorotype: Holarctic.

***Arhopalus tristis* (Fabricius, 1787)**

Records in Ankara prov.: Botanic Garden (Öymen, 1987; Özdikmen & Turgut, 2006).
Records in Turkey: (AD-AM-AN-ANT-AY-BI-BO-CA-ES-HT-IZ-KK-KU-MG-TO-TUR)
Remarks: The species probably distributes rather widely in Turkey.

Chorotype: Palearctic.

Subfamily SPONDYLIDINAE

Tribe SPONDYLIDINI

***Spondylis* Fabricius, 1775**
[Type sp.: *Attelabus buprestoides* Linnaeus, 1758]

***Spondylis buprestoides* (Linnaeus, 1758)**

Records in Ankara prov.: Kızılcahamam (Demelt, 1967; Özdikmen & Turgut, 2006); Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006); Kızılcahamam (Soğuksu National Park) (Özdikmen, 2006).
Records in Turkey: (AN-ART-BS-IS-KAR-KR-SN-TB-TUR)
Remarks: The species distributes mostly in N Turkey.
Chorotype: Sibero-European or Sibero-European + N-Africa. Because, according to Sama (2002), records from North Africa (Morocco) need confirmation.

Subfamily CERAMBYCINAE

Tribe HESPEROPHANINI

***Trichoferus* Wollaston, 1854**
[Type sp.: *Trichoferus senex* Wollaston, 1854 = *Trichoferus fasciculatus senex* Wollaston, 1854]

***Trichoferus fasciculatus* (Faldermann, 1837)**
= ssp. *fasciculatus* Faldermann, 1837
= ssp. *senex* Wollaston, 1854

Material examined: Ankara prov.: Etlik, 31.07.2008, 850 m., 1 specimen, leg. K. Arslan.
Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen, 2006).
Records in Turkey: (AN-ANT-BR-BS-IZ-MG-MN-TB-TUR)
Remarks: The species probably distributes rather widely in Turkey. The species is represented by the nominative subspecies *T. fasciculatus fasciculatus* in Turkey. Other subspecies *T. fasciculatus senex* Wollaston, 1854 was described from local populations in Canary Islands and Madeira.
Chorotype: Turano-Mediterranean.

***Stromatium* Serville, 1834**
[Type sp.: *Callidium barbatum* Fabricius, 1775]

***Stromatium unicolor* (Olivier, 1795)**

Records in Ankara prov.: Ankara prov. (Özdikmen & Şahin, 2006).
Records in Turkey: (AD-AF-AM-AN-ANT-BL-BS-CA-DE-EL-ER-EZ-GA-GI-GU-HT-IC-IS-IZ-KA-KK-MA-MG-MN-OR-OS-SM-TB-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Subcosmopolitan (Nearctic + Neotropic + Mediterranean + Centralasiatic).

Tribe CERAMBYCINI

***Cerambyx* Linnaeus, 1758**
[Type sp.: *Cerambyx cerdo* Linnaeus, 1758]

Subgenus *Cerambyx* Linnaeus, 1758
[Type sp.: *Cerambyx cerdo* Linnaeus, 1758]

***Cerambyx carinatus* (Küster, 1846)**

Records in Ankara prov.: Güdül, Beytepe (Özdikmen, 2007).
Records in Turkey: (AN-AY-DE-IZ-MN-TUR)
Remarks: Probably the species distributes mostly in Southwestern Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Cerambyx cerdo* Linnaeus, 1758**
= ssp. *cerdo* Linnaeus, 1758
= ssp. *mirbecki* Lucas, 1842
= ssp. *acuminatus* Motschulsky, 1852
= ssp. *pfisteri* Stierlin, 1864

Material examined: Ankara prov.: Kayaş, 20.07.2003, 870 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Hacıkadın (Özdikmen et al., 2005); Kayaş (Bayındır dam env.) (Özdikmen & Demir, 2006).
Records in Turkey: (AD-ADY-AN-ANT-ART-BR-BS-CA-DE-HT-IC-IS-IZ-KA-KK-KO-KS-KY-MG-NI-OS-SA-SK-SM-SN-TU-TRA-TUR)
Remarks: The species distributes widely in Turkey. There are four subspecies in the World. These are; *C. cerdo acuminatus* (Motschulsky, 1852) (in Crimea, Turkey, Lebanon, Syria), *C. cerdo pfisteri* Stierlin, 1864 (in Sicily, ?Italy, ?Malta, ?Greece), *C. cerdo mirbecki* Lucas, 1842 (Portugal, Spain, Algeria, Morocco) and the nominative *C. cerdo cerdo*. But, the species is represented by two subspecies, *C. cerdo cerdo* and *C. cerdo acuminatus* (Motschulsky, 1852), in Turkey. In Sama (2002), he did not accept as distinct subspecies *C. cerdo acuminatus* (Motschulsky, 1852) and *C. cerdo pfisteri* Stierlin, 1864 due to large variability of *C. cerdo* in the size and body shape. We share the same idea, as seen above because of the known data of *C. cerdo acuminatus* (Motschulsky, 1852) in Turkey is unavailable to the allopatric distribution rule of subspecies theorically.
Chorotype: Turano-Europeo-Mediterranean.

***Cerambyx dux* (Faldermann, 1837)**

Records in Ankara prov.: Ankara prov. (Özdikmen et al., 2005).
Records in Turkey: (AD-ADY-AN-ANT-BI-BN-BS-BU-DE-EL-ER-EZ-GA-HT-IC-IP-IS-IZ-KA-KAR-KK-KN-KS-KY-MA-MG-NI-OS-TO-TU-VA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Turano-Mediterranean (Turano-Balkan).

Subgenus *Microcerambyx* Miksic et Georgijevic, 1973
[Type sp.: *Cerambyx scopolii* Füsslins, 1775]

***Cerambyx scopolii* Fusslins, 1775**
= ssp. *scopolii* Fusslins, 1775
= ssp. *nitidus* Pic, 1892

Records in Ankara prov.: Keçiören (Özdikmen, 2006).
Records in Turkey: (AN-ANT-ART-BN-BO-ED-IC-IS-KAR-KK-NI-OS-RI-SA-SM-SN-TB-TO-TRA-TUR)
Remarks: The species distributes widely in Turkey (Especially in N Turkey). The species is represented by two subspecies in Turkey. *C. scopolii nitidus* (Pic, 1892) occurs only in S Turkey and the nominative *C. scopolii scopolii* occurs in other parts of Turkey. According to Sama (2002), *C. paludivagus* Lucas, 1846 is a distinct species in North Africa and not a form of *C. scopolii*.
Chorotype: European. According to Sama (2002), records from North Africa are belonging to *C. paludivagus* Lucas, 1846.

Tribe PURPURICENINI

***Purpuricenus* Dejean, 1821**
[Type sp.: *Cerambyx kaehleri* Linnaeus, 1758]

***Purpuricenus budensis* (Götz, 1783)**
= ssp. *budensis* Götz, 1783
= ? ssp. *bitlisiensis* Pic, 1902
= ? ssp. *caucasicus* Pic, 1902
= ssp. *interscapillatus* Plavilstshikov, 1937
= ssp. *productus* Plavistshikov, 1940

Records in Ankara prov.: Ankara prov. (Lodos, 1998); Kazan (Orhaniye village) (Özdikmen & Çağlar, 2004); Ankara prov. (Özdikmen, et al., 2005).
Records in Turkey: (AD-ADY-AF-AM-AN-ANT-ART-AY-BL-BN-BO-BS-BU-CA-CO-DE-ED-EZ-GA-GU-HT-IC-IP-IS-IZ-KA-KI-KN-KO-MG-MN-MU-NI-OS-RI-SI-SM-SN-TO-TU-YO-TUR)
Distribution: Europe (Spain, France, Italy, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, Romania, Hungary, Slovakia, Ukraine, Crimea, Moldavia, European Russia), Caucasus, Transcaucasia, Turkey, Iran, Middle East.
Remarks: The species distributes widely in Turkey. The species is represented by three (or four) subspecies in Turkey. *P. budensis productus* Plavistshikov, 1940 occurs in S Turkey, *P. budensis interscapillatus* Plavilstshikov, 1937 occurs in SW and S Turkey and the nominative *P. budensis budensis* (Götz, 1783) occurs in other parts of Turkey (? *P. budensis bitlisiensis* Pic, 1902 occurs in SE Turkey). According to Danilevsky & Miroshnikov (1985), *Purpuricenus caucasicus* Pic, 1902 that is distributed in Crimea, Caucasus and possibly in Europe is a distinct species. Later, Sabbadini & Pesarini (1992) stated that *P. caucasicus* Pic, 1902 is a subspecies of *Purpuricenus budensis* from Armenia and Turkey. However, Sama (2002) mentioned that many taxa described by Pic as varieties from Eastern Mediterranean were distinct species (*P. bitlisiensis* Pic, 1902; *P. caucasicus* Pic, 1902; *P. nigronotatus* Pic, 1907; *P. longevittatus* Pic, 1950). We share the same idea for *Purpuricenus caucasicus* Pic, 1902, as seen above because of the known data of this taxon in Turkey is unavailable to the allopatric distribution rule of subspecies theorically. The real status of these taxa needs to be revised.
Chorotype: Turano-Europeo-Mediterranean.

Tribe CALLICHROMATINI

***Aromia* Serville, 1833**
[Type sp.: *Cerambyx moschatus* Linnaeus, 1758]

***Aromia moschata* (Linnaeus, 1758)**
= ssp. *moschata* Linnaeus, 1758
= ssp. *ambrosiaca* Stevens, 1809
= ssp. *vetusta* Jankowsky, 1934
= ssp. *cruenta* Bogatschev, 1962
= ssp. *sumbarensis* Danilevsky, 2007
= ssp. *jankovskyi* Danilevsky, 2007

Records in Ankara prov.: Ankara prov. (Özdikmen, et al., 2005).
Records in Turkey: (AD-ADY-AN-ANT-ART-AY-BI-BL-BN-BS-BU-CA-EZ-IC-IP-IS-IZ-KA-KO-MN-SM-TO-TU-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey. According to Sama (2002), three subspecies are recognized. The nominative *Aromia moschata moschata* occurs from the great part of Europe to Baikal Lake, *Aromia moschata ambrosiaca* (Stevens, 1809) occurs from Mediterranean Region and North Africa to Central Asia including Turkey, Middle East and Caucasus and *Aromia moschata orientalis* Plavilstshikov, 1932 occurs from Baikal Lake to Japan. However, according to Danilevsky (2008b), the species has four subspecies as the nominative *A. moschata moschata* (Linnaeus, 1758) occurring from Central and Northern

Europe including Balkans to East Siberia and Central Asia, *A. moschata ambrosiaca* (Steven, 1809) occurs in North Africa, Southern Europe, Near East and Iran, *A. moschata vetusta* Jankowsky, 1934 occurs in Kazakhstan and *A. moschata cruenta* Bogatschev, 1962 occurs in Central Asia. Besides, he regarded *Aromia orientalis* Plavilstshikov, 1932 as a distinct species. We agree with the approach of Danilevsky (2008b). However, Ohbayashi & Niisato (2007) mentioned that *A. orientalis* is a subspecies of *A. moschata*. Finally, according to Danilevsky (2008c), *A. moschata* has six subspecies with *A. moschata sumbarensis* Danilevsky, 2007 from Turkmenia and *A. moschata jankovskyi* Danilevsky, 2007 from Kirgizia. Apparently, *Aromia moschata* is represented by two subspecies in Turkey. The nominative *Aromia moschata moschata* (Linnaeus, 1758) and *Aromia moschata ambrosiaca* (Steven, 1809) (= *thoracica* Fischer, 1824).
Chorotype: Palearctic.

Tribe GRACILIINI

***Penichroa* Stephens, 1839**
[Type sp.: *Callidium fasciatum* Stephens, 1831]

***Penichroa fasciata* (Stephens, 1831)**

Material examined: Ankara prov.: Keçiören, Pınarbaşı, 02.07.2005, 890 m., 1 specimen, 08.08.2005, 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Ayaş (Başbereket village), Mamak (Misket district), Etimesgut (Park of Alparslan Türkeş) (Özdikmen, 2006).
Records in Turkey: (AM-AN-ANT-IC-SM-TO-YO-TRA-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Turano-Europeo-Mediterranean + Nearctic.

Tribe MOLORCHINI

***Molorchus* Fabricius, 1792**
[Type sp.: *Necydalis minor* Linnaeus, 1767]

Subgenus *Glaphyra* Newman, 1840
[Type sp.: *Glaphyra semiusta* Newman, 1840]

Remarks: Sama (2002) gave *Glaphyra* Newman, 1840 as a distinct genus.

***Molorchus kiesenwetteri* Mulsant et Rey, 1861**
= ssp.*kiesenwetteri* Mulsant et Rey, 1861
= ssp. *hircus* Abeille de Perrin, 1881

Records in Ankara prov.: Asia Minor as *M. kiesenwetteri angorensis* Pic, 1912 (Winkler, 1924-1932); Kızılcahamam (Köroğlu Mountains) (Adlbauer, 1992).
Records in Turkey: (AM-AN-ANT-BI-IC-IZ-KN-KS-TRA-TUR)
Remarks: The species distributes rather widely in Turkey. It is represented by two subspecies in Turkey. *G. kiesenwetteri hircus* (Abeille de Perrin, 1881) occurs mostly in S and SW Turkey and the nominative *G. kiesenwetteri kiesenwetteri* (Mulsant et Rey, 1861) occurs in other parts of Turkey.
Chorotype: Turano-Mediterranean (Turano-E-Mediterranean + Turano-Apenninian) + Turano-European (Turano-Sarmato-Pannonian + Ponto-Pannonian).

***Molorchus umbellatarum* (Schreber, 1759)**
= ssp. *umbellatarum* Schreber, 1759
= ssp. *diversipes* Pic, 1897
= ?ssp. *obscuripes* Müller, 1948

Records in Ankara prov.: Kızılcahamam (Demelt, 1967).
Records in Turkey: (AN-BO-IZ-TB-TRA-TUR)

Remarks: The species distributes mostly in N Turkey. It is represented by two subspecies in Turkey. *G. umbellatarum diversipes* (Pic, 1897) occurs in North-Eastern Turkey and the nominative *G. umbellatarum umbellatarum* (Schreber, 1759) occurs in other parts of Turkey. Known other subspecies, *G. umbellatarum obscuripes* Müller, 1948 occurs only in Italy. According to Sama (2002), *G. umbellatarum obscrupes* Müller, 1948 is not a subspecies.
Chorotype: European.

Tribe STENOPTERINI

***Stenopterus* Illiger, 1804**
[Type sp.: *Necydalis rufa* Linnaeus, 1767]

***Stenopterus rufus* (Linnaeus, 1767)**
= ssp. *rufus* Linnaeus, 1767
= ssp. *geniculatus* Kraatz, 1863
= ssp. *syriacus* Pic, 1892
= ?ssp. *transcaspicus* Plavilstshikov, 1940

Records in Ankara prov.: Kızılcahamam (Yukarı Çanlı) (Özdikmen, 2006).
Records in Turkey: (ADY-AM-AN-ANT-ART-BI-BO-BR-BS-CA-CN-CO-EZ-GA-GU-HT-IC-IS-IZ-KA-KK-KN-KO-KR-KS-KY-MN-NI-OS-RI-SM-SN-TB-TO-TU-YA-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by three subspecies in Turkey. *S. rufus geniculatus* Kraatz, 1863 occurs mostly in N Turkey, *S. rufus syriacus* Pic, 1892 occurs in S Turkey (Southern costal region and Amanos Mts.) (Sama, 1995) and the nominative *S. rufus rufus* (Linnaeus, 1767) occurs in other parts of Turkey. The other known subspecies *S. rufus transcaspicus* Plavilstshikov, 1940 distributes in Turkmenia, Sakhalin Island and Iran. Danilevsky (2008b) stated that "*According to J. Voricek (personal communication, 1992), Stenopterus rufus in Turkmenia is represented by S. r. transcaspicus Plav., 1940 (in fact the name was introduced as "morpha" and so infrasubspecific). The publication by Tozlu et al. (2005) of "Stenopterus rufus transcaspicus Plav., 1940" did not made the name valid. According to I. M. Kerzhner (personal message, 2006), following ICZN, after 1999 the validation of such name must be accompanied with special remark "ssp. n." or "stat. n.*"
Chorotype: Turano-European. According to Sama (2002), this species is not in North Africa.

***Callimus* Mulsant, 1846**
[Type sp.: *Callimus bourdini* Mulsant, 1846 = *Saperda angulata* Schrank, 1789]

Subgenus *Lampropterus* Mulsant, 1863
[Type sp.: *Necydalis femoratus* Germar, 1824]

***Callimus femoratus* (Germar, 1824)**

Records in Ankara prov.: Kızılcahamam (Güvem) (Özdikmen et al., 2005)
Records in Turkey: (AD-ADY-AM-AN-ANT-ART-BL-BN-BS-BU-CA-DI-ED-EZ-GA-HA-HT-IC-IS-IZ-KA-KI-KK-KN-MA-MG-MN-MU-NI-OS-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Turano-Mediterranean (Turano-E-Mediterranean).

Tribe CERTALLINI

***Certallum* Dejean, 1821**
[Type sp.: *Saperda ruficollis* Fabricius, 1787 = *Cerambyx ebulinus* Linnaeus, 1767]

***Certallum ebulinum* (Linnaeus, 1767)**
= ssp. *ebulinum* Linnaeus, 1767
= ?ssp. *ruficollis* Fabricius, 1787

Material examined: Ankara prov.: Kayaş, 10.05.2004, 874 m., 4 specimens, leg. S. Güzel; Kızılcahamam, Işık Mt., 20.05.2005, 2100 m., 1 specimen, leg. S. Güzel; Şereflikoçhisar, 17.04.2006, 980 m., 14 specimens, 29.05.2006, 3 specimens, leg. S. Güzel; Şereflikoçhisar, Hacı enbiya district, 08.05.2006, 990 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Ankara prov. (Tuatay et al., 1972); Beynam (Ex. - Gül-Zümreoğlu, 1975); Ankara prov. (Lodos, 1998); Şereflikoçhisar, Şereflikoçhisar-Ankara road, Central, Polatlı road 25. km, Entry of Temelli, Yenikent (Bucak village) (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AK-AM-AN-ANT-AY-BI-BL-BS-CA-CN-DE-DI-ER-GA-HT-IC-IP-IS-IZ-KA-KN-KY-MG-MN-MR-NE-NI-OS-SN-SU-TB-?YO-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. ebulinum ruficolle* (Fabricius, 1787) that distributed in Mediterranean Region (from Iberian peninsula to Iran including North Africa) occurs mostly in S Turkey and the nominative *C. ebulinum ebulinum* (Linnaeus, 1767) occurs in other parts of Turkey. According to Sama (1988), *C. ruficolle* is a subspecies of *C. ebulinum*. But according to Danilevsky, *C. ruficolle* is a synonym of *C. ebulinum*.
Chorotype: Turano-Europeo-Mediterranean.

Tribe HYLOTRUPINI

***Hylotrupes* Serville, 1834**
[Type sp.: *Cerambyx bajulus* Linnaeus, 1758]

***Hylotrupes bajulus* (Linnaeus, 1758)**

Records in Ankara prov.: Elmadağ (Villiers, 1967; Öymen, 1987); Elmadağ, Çamlıdere (Tozlu et al., 2002); Ankara prov. (Özdikmen, et al., 2005); Kızılcahamam (Çileklitepe) (Özdikmen, 2006).
Records in Turkey: (AD-AM-AN-ANT-ART-AY-BI-BO-BR-BS-CA-DE-DU-ER-EZ-GI-GU-HT-IC-IP-IS-IZ-KA-KAR-KN-KR-KS-KU-KY-RI-SN-SV-TB-US-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Subcosmopolitan.

Tribe CALLIDIINI

***Ropalopus* Mulsant, 1839**
[Type sp.: *Callidium insubricum* Germar, 1824]

***Ropalopus clavipes* (Fabricius, 1775)**

Records in Ankara prov.: Ankara prov. (Özdikmen, et al., 2005).
Records in Turkey: (AD-ADY-AN-BL-BO-CN-CO-DE-ED-ER-HT-IC-IS-IZ-KO-KU-MN-MU-NI-OS-US-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: European or Sibero-European. Sama (2002) reported that this species distributed in Siberia too.

***Phymatodes* Mulsant, 1839**
[Type sp.: *Cerambyx variabilis* Linnaeus, 1761 = *Cerambyx testaceus* Linnaeus, 1758]

***Phymatodes testaceus* (Linnaeus, 1758)**

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (ADY-AN-ANT-ART-BO-CA-GU-HT-IC-IS-NI-OS-TRA-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Holarctic.

Tribe CLYTINI

***Echinocerus* Mulsant, 1863**
Type sp.: *Cerambyx floralis* Palas, 1773]

***Echinocerus floralis* (Pallas, 1773)**

Material examined: Ankara prov.: Beytepe, 17.07.2004, 985 m., 1 specimen, 16.06.2005, 1 specimen, leg. S. Güzel; İncek, 09.06.2005, 1070 m., 2 specimens, 28.07.2006, 36 specimens, leg. S. Güzel; Bağlum, 11.07.2005, 1170 m., 1 specimen, 13.07.2005, 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Kavaklıdere (Villiers, 1967); Ankara prov. (Özer & Duran, 1968); Ayaş, Beynam Forest (Öymen, 1987); Çal Mountain, Azap Deresi, Kızılcahamam (Güvem, Bel Pınarı, Işık Mountain, Yukarı Çanlı) (Özdikmen & Demir, 2006); Kızılcahamam (Işık Mountain, Yenimahalle village, Yukarı Çanlı, Güvem, Yasin village, the peak of Bel) (Özdikmen, 2006) ; Beytepe (Maslak valley) (Özdikmen, 2007).
Records in Turkey: (AD-ADY-AF-AG-AM-AN-ANT-AR-ART-BI-BO-BS-BU-BY-CA-CN-CO-DE-EL-ER-ES-EZ-GI-GU-IC-IG-IP-IZ-KA-KAR-KIR-KK-KM-KN-KO-KR-KS-KY-MA-MN-MU-NI-OS-SM-SN-SV-TB-TO-TU-US-YO-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Sibero-European.

***Chlorophorus* Chevrolat, 1863**
[Type sp.: *Callidium annularis* Fabricius, 1787]

***Chlorophorus aegyptiacus* (Fabricius, 1775)**

Records in Ankara prov.: Central (Bodenheimer, 1958).
Records in Turkey: (AM-AN-BL-BO-BS-CA-DE-HT-IS-IZ-MG-MN-TUR)
Remarks: The species distributes rather widely in western half of Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Chlorophorus cursor* Rapuzzi & Sama, 1999**

Material examined: Ankara prov.: İncek, 28.06.2006, 1075 m., 1 specimen, leg. S. Güzel.
Records in Turkey: (AN-BO)
Remarks: The species is endemic to Turkey and new to Ankara province. It distributes only in N Turkey.
Chorotype: N-Anatolian.

***Chlorophorus hungaricus* (Seidlitz, 1891)**

Material examined: Ankara prov.: İncek, 09.06.2005, 1070 m., 1 specimen, 28.06.2005, 1080 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Işık Mountain) (Özdikmen, 2006).
Records in Turkey: (AD-AN-BO-BR-GA-IC-KA-KO-KR-KS-NI-OS-SV-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Turano-European (Ponto-Pannonian).

***Chlorophorus sartor* (Müller, 1766)**

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen et al., 2005); Kızılcahamam, Beypazarı (Dereli) (Özdikmen, 2006).
Records in Turkey: (AD-AM-AN-ANT-ART-AY-BI-BL-BR-BS-BU-CA-CN-DE-EL-ES-EZ-GA-GU-HT-IC-IP-IS-IZ-KA-KK-KN-KR-KS-KY-MG-MN-OS-RI-SM-SN-TE-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Turano-European. According to Sama (2002), the records from Siberia not confirmed.

***Chlorophorus trifasciatus* (Fabricius, 1781)**

Material examined: Ankara prov.: Bağlum, 13.07.2005, 1170 m., 1 specimen, leg. S. Güzel.
Records in Turkey: (AN-ANT-BI-IC-IS-KN-KO-KR-KS-KU-TUR)
Remarks: New to Ankara province. The species distributes rather widely in western half of Turkey.
Chorotype: Mediterranean.

***Chlorophorus varius* (Müller, 1766)**
= ssp. *varius* Müller, 1766
= ssp. *damascenus* Chevrolat, 1854
= ssp. *pieli* Pic, 1924

Material examined: Ankara prov.: Beytepe, 17.07.2004, 985 m., 5 specimens, leg. S. Güzel; N Bağlum, 11.07.2005, 1170 m., 2 specimens, leg. S. Güzel; Campus of ODTÜ, 12.08.2005, 960 m., 5 specimens, leg. S. Güzel; Polatlı, 07.06.2006, 850 m., 2 specimens, leg. S. Güzel; Şereflikoçhisar, 18.07.2006, 985 m., 3 specimens, leg. S. Güzel.
Records in Ankara prov.: Ankara prov. (İren & Ahmed, 1973); Central (Tozlu et al., 2002); Gölbaşı, Şereflikoçhisar, Çubuk (Özdikmen et al., 2005); Çubuk dam (Özdikmen, 2007).
Records in Turkey: (AD-ADY-AK-AM-AN-ANT-ART-AY-BI-BL-BO-BR-BU-CA-CN-DE-ER-ES-EZ-GU-HA-HT-IC-IG-IP-IS-IZ-KA-KI-KIR-KK-KM-KN-KO-KR-KS-KY-MA-MG-MN-MR-MU-NE-NI-OS-SU-TB-TO-US-ZO-VA-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. varius damascenus* Chevrolat, 1854 occurs in S Turkey and the nominative *C. varius varius* (Müller, 1766) occurs in other parts of Turkey. Known other subspecies *C. varius pieli* (Pic, 1924) occurs in Vietnam and China.
Chorotype: Palearctic.

***Xylotrechus* Chevrolat, 1860**
[Type sp.: *Clytus sartorii* Chevrolat, 1860]

Subgenus *Xylotrechus* Chevrolat, 1860
[Type sp.: *Clytus sartorii* Chevrolat, 1860]

***Xylotrechus rusticus* (Linnaeus, 1758)**

Records in Ankara prov.: Ankara prov.: Bağlum (Özdikmen, 2006).
Records in Turkey: (AN-BO-BU-CN-DU-ES-IS-IZ-KAR-KK-KN-KO-KS-KY-MU-SA-SM-TO-TU-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Palearctic.

***Clytus* Laicharting, 1784**
[Type sp.: *Cerambyx arietis* Linnaeus, 1758]

***Clytus arietis* (Linnaeus, 1758)**
= ssp. *arietis* Linnaeus, 1758
= ssp. *lederi* Ganglbauer, 1881
= ssp. *oblitus* Roubal, 1932

Records in Ankara prov.: Kızılcahamam (Yenimahalle village) (Özdikmen, 2006).
Records in Turkey: (AM-AN-ART-BO-CA-CN-DU-EZ-GU-IS-KO-KS-SM-TB-ZO-TRA-TUR)
Remarks: The species distributes in N and E Turkey. The species has three subspecies in the World. It is represented by two subspecies in Turkey. *C. arietis lederi* Ganglbauer, 1881 occurs in Caucasus (Talysh, Kopet-Dag and North Iran), E Turkey and the nominative *C.*

arietis arietis (Linnaeus, 1758) occurs in other parts of N Turkey. Another subspecies is *C. arietis oblitus* Roubal, 1932 occurs only in Caucasus.
Chorotype: European.

***Clytus rhamni* Germar, 1817**
= ssp. *rhamni* Germar, 1817
= ssp. *temesiensis* Germar, 1824
= ssp. *bellieri* Gautier, 1862

Records in Ankara prov.: Kızılcahamam (Işık Mountain, Yukarı Çanlı) (Özdikmen & Demir, 2006); Kızılcahamam (S of Dam, Güvem, Yasin village, Yukarı Çanlı), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AM-AN-ANT-ART-BI-BS-BY-CA-CN-GA-GU-HT-IC-IP-IS-IZ-KA-KK-KN-KO-KR-KS-KY-MA-OS-RI-SM-SN-SV-TO-YA-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. rhamni temesiensis* Germar, 1824 occurs in S Turkey and the nominative *C. rhamni rhamni* Germar, 1817 occurs in other parts of Turkey. The other known subspecies, *C. rhamni bellieri* Gautier, 1862, occurs in Western Mediterranean, Central Europe, Sicily and Italy.
Chorotype: European.

***Clytus schurmanni* Sama, 1996**

Material examined: Ankara prov.: Bağlum, 06.07.2005, 1175 m., 4 specimens, 11.07.2005, 1 specimen, 13.07.2005, 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Işık Mountain) as *C. schneideri* Kiesenwetter, 1879 (Demelt, 1967); Çubuk dam as *C. schneideri* Kiesenwetter, 1879 (Gül-Zümreoğlu, 1975); Kızılcahamam as *C. schneideri* Kiesenwetter, 1879 (Adlbauer, 1992); Kızılcahamam (Central, Işık Mountain) (Sama, 1996); Ankara prov. as *C. schneideri* Kiesenwetter, 1879 (Lodos, 1998); Kızılcahamam (Soğuksu National Park), Sincan (Mülk, Ayaş Mountain) (Özdikmen & Demir, 2006); Kızılcahamam (Soğuksu National Park), Beypazarı (Dereli village) (Özdikmen, 2006).
Records in Turkey: (AM-AN-BO-CN-CO-IZ-KIR-KR-KS-TO-YO-TUR)
Remarks: The species distributes mostly in central parts of N Turkey. It is endemic to Turkey.
Chorotype: Anatolian.

Subfamily LAMIINAE

Tribe LAMIINI

***Morimus* Brullé, 1832**
[Type sp.: *Lamia lugubris* Fabricius, 1832 = *Cerambyx asper* Sulzer, 1776]

***Morimus asper* (Sulzer, 1776)**

Records in Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006); Nallıhan (Özdikmen, 2007).
Records in Turkey: (AN-ART-GI-GU-IS-RI-SN-TB-TRA-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: S-European.

***Morimus funereus* (Mulsant, 1863)**

Material examined: Ankara prov.: Beypazarı, Akçalı village, 15.05.2004, 730 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Central, Hacıkadın (Özdikmen et al., 2005); Kızılcahamam (Soğuksu National Park), Beypazarı (Akçalı village, İnözüderesi) (Özdikmen & Demir, 2006); Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006); Güdül (Özdikmen, 2007).

Records in Turkey: (AM-AN-ANT-BI-BO-BR-BS-BU-CA-DU-KK-KO-TO-TUR)
Remarks: The species distributes only in Northern West half of Turkey.
Chorotype: Turano-European (Ponto-Pannonian).

***Morimus orientalis* (Reitter, 1894)**

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen & Demir, 2006).
Records in Turkey: (EZ-IS-SA-TRA-TUR)
Remarks: Probably it distributes rather widely in Turkey.
Chorotype: SW-Asiatic (Irano-Anatolian).

Tribe DORCADIINI

***Dorcadion* Dalman, 1817**
[Type sp.: *Cerambyx glycyrrhizae* Pallas, 1771]

Subgenus *Carinatodorcadion* Breuning, 1943
[Type sp.: *Cerambyx carinatus* Pallas, 1771 (nomen protectum)]

***Dorcadion carinatum* (Pallas, 1771)**
= ssp. *carinatum* Pallas, 1771
= ssp. *cylindraceum* Reitter, 1886
= ssp. *igrenum* Danilevsky, 1998
= ssp. *sunzhenum* Danilevsky, 1998
= ssp. *uralense* Danilevsky, 1998

Records in Ankara prov.: Beynam (Özdikmen & Hasbenli, 2004).
Records in Turkey: (AM-AN-AR-KAR-RI)
Remarks: The species distributes in N Turkey. The subspecies structure of *D. carinatum* was revised by Danilevsky (1998). However, Danilevsky (1998) has never mentioned the occurrence of *D. carinatum* in Turkey. Probably it represented by the nominative subspecies in Turkey. The other known subspecies *D. carinatum cylindraceum* Reitter, 1886 occurs in E Caucasus (Dagestan: Derbent, Azerbaijan), *D. carinatum uralense* Danilevsky, 1998 occurs in Kazakhstan, *D. carinatum sunzhenum* Danilevsky, 1998 occurs in N Caucasus and *D. carinatum igrenum* Danilevsky, 1998 occurs in Ukraine, Southern half of European part of Russia. On the other hand, according to Danilevsky (1998) distribution patterns of the nominative subspecies *D. carinatum carinatum* never reach to Turkey in the South. As seen above, *D. carinatum* is represented by three subspecies in Caucasus (two of them in N Caucasus and the other one in E Caucasus). For this reason, the Turkish populations of *D. carinatum* may be belong to a different subspecies.
Chorotype: Turanian (Ponto-Caspian).

Subgenus *Cribridorcadion* Pic, 1901
[Type sp.: *Dorcadion mniszechi* Kraatz, 1873]

***Dorcadion arenarium* (Scopoli, 1763)**
= ssp. *arenarium* Scopoli, 1763
= ssp. *abruptum* Germar, 1839
= ssp. *lemniscatum* Küster, 1847
= ssp. *subcarinatum* Müller, 1905
= ssp. *dalmatium* Müller, 1905
= ssp. *velebiticum* Müller, 1905
= ssp. *brattiense* Müller, 1905
= ssp. *hypsophilum* Müller, 1905
= ssp. *muelleri* Depoli, 1912
= ssp. *rubrimembre* Pic, 1917
= ssp. *shkypetarum* Heyrovsky, 1937

Records in Ankara prov.: Çubuk dam (Önalp, 1990).
Records in Turkey: (AM-AN-KS-TUR)
Remarks: The species distributes mostly in N of Central Turkey. It is represented by the nominative subspecies in Turkey. The other known subspecies, *D. arenarium abruptum* Germar, 1839 occurs in Arbe Island, Hvar Island (Bosnia and Herzegovina, Croatia), *D. arenarium lemniscatum* Küster, 1847 occurs in Bosnia and Herzegovina, Croatia, *D. arenarium subcarinatum* Müller, 1905 occurs in Northern Italy: Elba Island (Italy, France), *D. arenarium dalmatinum* Müller, 1905 occurs in Pago and Eso Islands (Bosnia and Herzegovina, Croatia), *D. arenarium velebiticum* Müller, 1905 occurs in Velebit and Mossor Mts. (Bosnia and Herzegovina, Croatia), *D. arenarium brattiense* Müller, 1905 occurs in Brazza and Solta Islands (Bosnia and Herzegovina, Croatia), *D. arenarium hypsophylum* Müller, 1905 occurs in Dalmatia and Montenegro (Bosnia and Herzegovina, Yugoslavia, Croatia), *D. arenarium muelleri* Depoli, 1912 occurs in Quernero, Cherso Island, Ossero (Bosnia and Herzegovina, Croatia), *D. arenarium rubrimembre* Pic, 1917 occurs in Southern Dalmatia, Montenegro, Northern Albania (Bosnia and Herzegovina, Albania, Yugoslavia, Croatia), *D. arenarium shkypetarum* Heyrovsky, 1937 occurs in Albania.
Chorotype: Turano-European (Ponto-Pannonian).

***Dorcadion bangi* Heyden, 1894**
= ssp. *bangi* Heyden, 1894
= ssp. *heinzorum* Braun, 1975
= ssp. *roridum* Pesarini & Sabbadini, 1999

Records in Ankara prov.: Elmadağ (Özdikmen et al., 2005).
Records in Turkey: (AN-BO-CO-KR-KS)
Remarks: The species is endemic to Turkey. It is represented by three subspecies. The nominative *D. bangi bangi* Heyden, 1894 occurs only in West parts of Western Black Sea Region (Kastamonu and Bolu provinces) and *D. bangi roridum* Pesarini & Sabbadini, 1999 and *D. bangi heinzorum* Braun, 1975 occurs probably eastward from the distribution patterns of nominative subspecies.
Chorotype: N-Anatolian.

***Dorcadion bodemeyeri* Daniel, 1900**

Records in Ankara prov.: Gölbaşı (Demelt, 1963); Central and Gölbaşı (Önalp, 1990).
Records in Turkey: (AF-AM-AN-ES-IZ-KN-TUR)
Remarks: The species is endemic to Turkey and it distributes mostly in the western half of Anatolia.
Chorotype: Anatolian.

***Dorcadion boluense* Breuning, 1962**
= ssp. *boluense* Breuning, 1962
= ssp. *imitator* Pesarini & Sabbdini, 1999
= ssp. *corallinum* Pesarini & Sabbdini, 1999

Material examined: Ankara prov.: Ankara –Ayaş road, 17.04.2005, 1480 m., 33 specimens, leg. S. Güzel; Kızılcahamam, Salin Köyü, 20.05.2005, 2100 m., 7 specimens, leg. S. Güzel; Şereflikoçhisar, Kale district, 22.03.2006, 985 m., 3 specimens, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Işık Mountain, Güvem, Çamlıdere) (Braun, 1978); Kızılcahamam (Sama, 1982); Çal Mountain (Özdikmen & Demir, 2006); Kızılcahamam (Yukarı Çanlı) (Özdikmen, 2006).
Records in Turkey: (AN-BO-TUR)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and it distributes in N and NW Turkey. It is represented by three subspecies in Turkey. These are the nominotypical subspecies *D. boluense boluense* Breuning, 1962, *D. boluense imitator* Pesarini & Sabbadini, 1999 and *D. boluense corallinum* Pesarini & Sabbadini, 1999.
Chorotype: NW-Anatolian.

***Dorcadion cinerarium* (Fabricius, 1787)**
= ssp. *cinerarium* Fabricius, 1787
= ssp. *caucasicum* Küster, 1847
= ? ssp. *susheriense* Breuning, 1970
= ssp. *gorodinskii* Danilevsky, 1996

Records in Ankara prov.: Ankara prov. as *D. c.* m. *corallicorne* / Ankara prov. as *D. c.* m. *sericatulum* (Breuning, 1962); Elmadağ as *D. c. micans* (Demelt, 1963); Gölbaşı as *D. cinerarium* m. *cinerarium* (Perissinotto & Luchini, 1966); Gölbaşı as *D. c. micans* (Perissinotto & Luchini, 1966); Gölbaşı as *D. cinerarium* m. *caucasicum* (Perissinotto & Luchini, 1966); Gölbaşı, Central, Elmadağ (Braun, 1978); Ankara prov. (from map in Braun, 1979); Keçiören (Bağlum), Çal Mt. (Çaytepe) (Özdikmen & Demir, 2006); Kepekli, Yenikent (İlyakut village), Eğmir lake (Özdikmen, 2006). Also, old records that were given as *D. sericatum* Krynicki, 1832 should be *D. cinerarium*. These are: Beynam, Elmadağ, Hüseyin Gazi Mountain, Dam I (Önalp, 1990); Beynam (Özdikmen & Hasbenli, 2004); Hüseyin Gazi Mountain (Özdikmen et al., 2005).
Records in Turkey: (AM-AN-ANT-BS-CA-CN-CO-ER-ES-EZ-GA-GU-IC-IS-IZ-KA-KI-KM-KS-KY-NI-OR-SM-SU-SV-TO-US-VA-YO-TUR)
Remarks: The species distributes rather widely in Turkey. It has many different populations that are placed mostly in local areas in Turkey. The real status of taxonomies and distribution patterns of the populations needs to be revised. For example, Braun (1979) stated *D. cinerarium susheriense* Breuning, 1970 that described from N Turkey as based on only two specimens could be just a variation of *D. cinerarium*. Also according to Braun (1979), *D. paracinerarium* Breuning, 1974 is a synonym of *D. cinerarium* (Fabricius, 1787) as morpha and *D. heinzi* Breuning, 1964 that described from Eğribel pass in Giresun province (N Turkey) as a subspecies of *D. cinerarium* is a separate species. Also *D. caucasicum* Küster, 1847 has been widely accepted as a subspecies of *D. cinerarium*. According to Danilevsky (2008b), *D. cinerarium danczenkoi* Danilevsky, 1996 is a separate species. Danilevsky et al. (2005) proposed *D. caucasicum* as a subspecies of *D. cinerarium*. Known other subspecies, *D. cinerarium gorodinskii* Danilevsky, 1996 occurs in Ukraine.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian) + Turanian (Ponto-Caspian).

***Dorcadion divisum* Germar, 1839**
ssp. *divisum* Germar, 1839
ssp. *mytilinense* Kraatz, 1873
ssp. *bleusei* Pic, 1899
ssp. *rhodicum* Della Bufa, 1924
ssp. *chioticum* Breuning, 1946
ssp. *subdivisum* Breuning, 1955
ssp. *parteinterruptum* Breuning, 1962

Records in Ankara prov.: Gölbaşı as *D. divisum ssp. subdivisum* Breuning, 1955 (Fuchs et Breuning, 1971); Ankara prov. (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AN-BL-BS-BU-CA-DI-ES-IP-IZ-KN-MN-MR-NI-SV-TRA-TUR)
Remarks: Probably the species distributes rather widely in Turlkey. It is represented by two subspecies in Turkey as the nominotypical subspecies and *D. divisum subdivisum* Breuning, 1955. However, the taxonomic status in Turkey of this species is unclear.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Dorcadion escherichi* Ganglbauer, 1897**

Records in Ankara prov.: Turkey as *D. angorense* (Winkler, 1924-1932; Lodos, 1998); Ankara prov. as the type loc. of *Dorcadion escherichi* Ganglbauer, 1897 (Bodemeyer, 1900); Ankara prov. (Breuning, 1962); Gölbaşı (Braun, 1978); Central, Hüseyin Gazi Mountain (Önalp, 1990).
Records in Turkey: (AM-AN-BI-KN-TO-TUR)
Distribution: Turkey.

Remarks: The species is endemic to Turkey and it distributes in C and C parts of N Turkey. According to some authors, *D. angorense* Ganglbaueri 1897 is a separate species.
Chorotype: Anatolian.

***Dorcadion haemorrhoidale* Hampe, 1852**

Records in Ankara prov.: Ankara prov. (Önalp, 1990).
Records in Turkey: (AG-AN-EZ-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

***Dorcadion infernale* Mulsant et Rey, 1863**
= ssp. *infernale* Mulsant et Rey, 1863
= ssp. *asperatum* Breuning, 1947

Material examined: Ankara prov.: Ayaş-Polatlı road, 17.04.2005, 1380 m., 3 specimens, leg. S. Güzel.
Records in Ankara prov.: Ankara prov. (Önalp, 1990) Beynam (Özdikmen & Hasbenli, 2004); Bayındır Dam and Ayaş-Polatlı road (Sarıoba env.) (Özdikmen, 2006).
Records in Turkey: (AM-AN-ANT-BI-BU-CO-DI-ES-IC-IZ-KA-KN-NI-SV-US-TUR)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and it distributes rather widely in Turkey. It represented by two subspecies in Turkey. *Dorcadion infernale asperatum* Breuning, 1947 occurs in SE Turkey (Diyarbakır province) and the nominative *D. infernale infernale* Mulsant et Rey, 1863 occurs in other parts of Turkey.
Chorotype: Anatolian.

***Dorcadion kindermanni* Waltl, 1838**

Records in Ankara prov.: Beynam Forest, Hüseyin Gazi Mountain (Önalp, 1990).
Records in Turkey: (AN-IZ-TRA-TUR-US)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and it distributes mostly in west half of Turkey.
Chorotype: W-Anatolian.

***Dorcadion olympicum* Kraatz, 1873**
ssp. *olympicum* Kraatz, 1873
ssp. *flavosuturale* Kratschmer, 1987

Records in Ankara prov.: Ankara prov. (Önalp, 1990).
Records in Turkey: (AN-BI-BS-IS-KU-TRA-TUR)
Remarks: The species distributes mostly in NW Turkey. It is represented by both subspecies in Turkey. – *convexum* Breuning, 1943 which the type locality is Anatolia: ?Kütahya prov.: Akdağ was given by Bruning (1962) as a subspecies of *D. olympicum*.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Dorcadion parallelum* Küster, 1847**

Records in Ankara prov.: Central, Hüseyin Gazi Mountain, Lalabel (Önalp, 1990).
Records in Turkey: (AM-AN-CO-TO-YO-TUR)
Remarks: The species distributes mostly in N of C parts of Turkey.
Chorotype: SW-Asiatic (Syro-Anatolian).

***Dorcadion pararufipenne* Braun, 1976**
= ssp. *pararufipenne* Braun, 1976
= ssp. *rassei* Braun, 1976

Records in Ankara prov.: Bayındır Dam, Ayaş road (Başayaş village env.), Çubuk (Özdikmen, 2006).
Records in Turkey: (AN-BO)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and it distributes in a local area of N Turkey. The species is represented by two subspecies in Turkey. Both subspecies distribute in Bolu and Ankara provinces of N Turkey. The nominative *D. pararufipenne pararufipenne* Braun, 1976 and *D. pararufipenne rassei* Braun, 1976 occurs probably eastward from the distribution patterns of nominative subspecies.
Chorotype: NW-Anatolian.

***Dorcadion rufipenne* Breuning, 1946**
= ssp. *rufipenne* Breuning, 1946
= ssp. *major* Breuning, 1962

Records in Ankara prov.: Kızılcahamam (Akdoğan) (Braun, 1978).
Records in Turkey: (AN-KS-SN)
Remarks: The species is endemic to Turkey and it distributes in C parts of N Turkey. The species is represented by two subspecies in Turkey. The nominative *D. rufipenne rufipenne* Breuning, 1946 occurs in Kastamonu prov. and *D. rufipenne major* Breuning, 1962 occurs in S Sinop prov. (Eastern subspecies). According to Braun (1978), *D. boluense* is a subspecies of *D. rufipenne* Breuning, 1946. According to Pesarini & Sabbadini (1999), *D. boluense* is a distinct species. On the other hand, some authors regard – *rufipenne* Breuning, 1962 as a subspecies of *D. subsericatum* Pic, 1901.
Chorotype: N-Anatolian.

***Dorcadion scabricolle* Dalman, 1817**
= ssp. *scabricolle* Dalman, 1817
= ? ssp. *sevangense* Reitter, 1889
= ssp. *caramanicum* Daniel, 1903
= ssp. *paphlagonicum* Breuning, 1962
= ssp. *balikesirense* Breuning, 1962
= ssp. *nakhiczevanum* Danilevsky, 1999
= ssp. *paiz* Danilevsky, 1999

Material examined: Ankara prov.: Ayaş, 17.04.2005, 1490 m., 1 specimen, leg. S. Güzel; Kızılcahamam, Işık Dağı, 20.05.2005, 2230 m., 13 specimens, leg. S. Güzel.
Records in Ankara prov.: Central, Kızılcahamam (Central, Güvem) (Braun, 1978); Ankara prov. (from map in Braun, 1978); Güvem (Adlbauer, 1988); Central, Gölbaşı, Çal Mt., Hüseyin Gazi Mt. (Önalp, 1990); Çal Mountain (Özdikmen & Demir, 2006); Kızılcahamam (Yukarı Çanlı, Salin village, Yenimahalle village), Ayaş road (Başayaş village env.) (Özdikmen, 2006).
Records in Turkey: (AD-AF-AG-AN-ANT-AR-BI-BL-BS-CO-ER-EZ-GU-IC-IP-KA-KAR-KN-KS-KY-MA-NI-SV-US-VA-YO-TUR)
Remarks: The species distributes widely in Turkey. It is represented by four subspecies in Turkey. *D. scabricolle caramanicum* Daniel, 1903 (Southern subspecies) occurs in Cilician Taurus (SE Turkey), *D. scabricolle paphlagonicum* Breuning, 1962 (Northern subspecies) occurs in Kastamonu province of N Turkey, *D. scabricolle balikesirense* Breuning, 1962 (Western subspecies) occurs in Balıkesir province of NW Turkey and the nominative *D. scabricolle scabricolle* Dalman, 1817 that described from Georgia occurs in Transcaucasia and Armenia to Anatolia. The other known subspecies of this species are *D. scabricolle nakhiczevanum* Danilevsky, 1999 and *D. scabricolle paiz* Danilevsky, 1999 occur in Caucasus. According to Braun (1978), *D. sevangense* Reitter, 1889 that described from Transcaucasia as *D. scabricolle* v. *sevangensis* is a distinct species. He mentioned that it separated clearly from *D. scabricolle*. According to Danilevsky (2008b), - *sevangense* Reitter, 1889 is a subspecies of *D. scabricolle*.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

***Dorcadion septemlineatum* Waltl, 1838**
= ssp. *septemlineatum* Waltl, 1838
= ssp. *novemlineatum* Kraatz, 1873
= ssp. *octolineatum* Kraatz, 1873
= ssp. *abanti* Braun, 1976

Records in Ankara prov.: Central, Soğuksu National Park, Karagöl (Önalp, 1990).
Records in Turkey: (AF-AN-BI-BL-BO-BS-BU-CA-ES-GA-IP-IS-KN-KO-KR-KU-SA-TRA-TUR)
Remarks: The species distributes rather widely in Turkey (especially west half of Turkey). The species is represented by four subspecies in Turkey. *D. septemlineatum octolineatum* Kraatz, 1873 occurs in NW Anatolia: Bursa prov. and Karaköy, *D. septemlineatum novemlineatum* Kraatz, 1873 occurs in Bilecik and Eskişehir provinces (NW Anatolia), *D. septemlineatum abanti* Braun, 1976 occurs in Bolu province (NW Anatolia) and the nominative *D. septemlineatum septemlineatum* Waltl, 1838 occurs mainly in European Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Dorcadion subsericatum* Pic, 1901**
= ssp. *subsericatum* Pic, 1901
= ssp. *vulneratum* Pesarini & Sabbadini, 1999

Records in Ankara prov.: Ankara prov. (Adlbauer, 1992); Bayındır Dam, Ayaş road (Başayaş village env.), Çubuk (Özdikmen, 2006).
Records in Turkey: (AN-CN-KN-KS)
Remarks: The species is endemic to Turkey and it distributes rather widely in Turkey. It is represented by two subspecies in Turkey.
Chorotype: Anatolian.

***Dorcadion subvestitum* Daniel, 1900**

Records in Ankara prov.: Ankara prov. (Önalp, 1990).
Records in Turkey: (AM-AN-ES-IZ-KN-MA-NI-TUR)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and probably it distributes rather widely in Turkey.
Chorotype: Anatolian.

Tribe POGONOCHERINI

***Pogonocherus* Dejean, 1821**
[Type sp.: *Cerambyx hispidulus* Piller et Mitterpacher, 1783]

Subgenus *Pityphilus* Mulsant, 1862
[Type sp.: *Cerambyx ovatus* Goeze, 1777]

***Pogonocherus decoratus* Fairmaire, 1855**

Records in Ankara prov.: Kızılcahamam (Demelt, 1967).
Records in Turkey: (AN-BO-KS-TUR)
Remarks: The species distributes in N Turkey.
Chorotype: European or Sibero-European.

Tribe ACANTHOCININI

***Acanthocinus* Dejean, 1821**
[Type sp.: *Cerambyx aedilis* Linnaeus, 1758]

***Acanthocinus aedilis* (Linnaeus, 1758)**

Records in Ankara prov.: Kızılcahamam (Alkan, 1946); Demetevler (Özdikmen & Demir, 2006); Beytepe (Özdikmen, 2007).
Records in Turkey: (AM-AN-ANT-ART-BI-BL-BO-BS-CA-DE-ES-EZ-GI-GU-IP-IZ-KAR-KR-KS-KU-MG-SN-TO-TRA-TUR)
Remarks: The species distributes widely in Turkey.
Chorotype: Sibero-European.

***Leiopus* Serville, 1835**
[Type sp.: *Cerambyx nebulosus* Linnaeus, 1758]

***Leiopus femoratus* Fairmaire, 1859**

Records in Ankara prov.: Soğuksu National Park (Özdikmen, 2007).
Records in Turkey: (AM-AN-ART-BL-CA-IS-KS-TO-TRA-TUR)
Remarks: The species distributes mostly in N Turkey.
Chorotype: Turano-European.

Tribe TETRAOPINI

***Tetrops* Stephens, 1829**
[Type sp.: *Leptura praeusta* Linnaeus, 1758]

***Tetrops praeusta* (Linnaeus, 1758)**
= ssp. *praeusta* Linnaeus, 1758
= ssp. *algirica* Chobaut, 1893
= ssp. *anatolica* Özdikmen & Turgut, 2008

Records in Ankara prov.: Kızılcahamam (Gfeller, 1972); between Sereflikoçhisar-Evren (Özdikmen, 2006).
Records in Turkey: (AN-ANT-BI-CO-IS-NI-SA-SM-SN-TRA-TUR)
Remarks: The species distributes rather widely in Turkey (especially west half of Turkey). It is represented by two subspecies in Turkey. The nominative and *T. praeusta anatolica* that was recenly described by Özdikmen & Turgut (2008a) occurs only in S Turkey. The other known subspecies, *T. praeusta algirica* (Chobaut, 1893) occurs only in N Africa (Algeria).
Chorotype: Palearctic.

Tribe SAPERDINI

***Saperda* Fabricius, 1775**
[Type sp.: *Cerambyx scalaris* Linnaeus, 1758]

Subgenus *Anaerea* Mulsant, 1839
[Type sp.: *Cerambyx carcharias* Linnaeus, 1758]

***Saperda carcharias* (Linnaeus, 1758)**

Records in Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006).
Records in Turkey: (AN-BS-DE-EZ-IS-IZ-KAR-MN-TB-TRA-TUR)
Remarks: The species distributes in N and W Turkey.
Chorotype: Sibero-European.

Tribe PHYTOECIINI

***Oberea* Dejean, 1835**
[Type sp.: *Cerambyx oculatus* Linnaeus, 1758]

Subgenus *Oberea* Dejean, 1835
[Type sp.: *Cerambyx oculatus* Linnaeus, 1758]

***Oberea oculata* (Linnaeus, 1758)**

Material examined: Ankara prov.: Kayaş, Bayındır dam env., 02.07.2003, 890 m., 1 specimen, leg. S. Güzel.
Records in Turkey: (AD-ADY-AN-ANT-DE-EZ-HT-IC-IP-IZ-KA-KN-KO-MG-NI-TU-TRA-TUR)
Remarks: The species is new to Ankara province and it distributes widely distributed in Turkey.
Chorotype: Palaearctic.

Subgenus *Amaurostoma* Müller, 1906
[Type sp.: *Cerambyx erythrocephalus* Schrank, 1776]

***Oberea erythrocephala* (Schrank, 1776)**
= ssp. *erythrocephala* Schrank, 1776
= ssp. *taygetana* Pic, 1901
= ssp. *calvescens* Müller, 1948
= ssp. *schurmanni* Heyrovsky, 1962
= ssp. *amanica* Holzschuh, 1993

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) as *O. erythrocephala schurmanni* (Özdikmen, 2006).
Records in Turkey: (AF-AM-AN-ANT-ART-BY-CO-ER-EZ-GU-IS-KA-KAR-KO-KS-NI-OS-SV-VA-TRA-TUR)
Remarks: The species distributes widely in Turkey. It is represented by four subspecies in Turkey. *O. erythrocephala taygetana* Pic, 1901 occurs only in a local area of C parts of S Turkey, *O. erythrocephala amanica* Holzschuh, 1993 occurs in NE Turkey, *O. erythrocephala schurmanni* Heyrovsky, 1962 occurs mainly in C, S and E Turkey and *O. erythrocephala erythrocephala* (Schrank, 1776) occurs in the other parts of Turkey (especially European Turkey, NW and W Anatolia). The other known subspecies, *O. erythrocephala canescens* Müller, 1948 occurs only in Italy. According to Adlbauer (1988), *O. taygetana* Pic, 1901 is a subspecies of *O. erythrocephala* (Schrank, 1776) based on the specimens from Nurdağı pass. Clearly, *Oberea taygetana* was described as a species. It was treated later, however, as a variation by *Oberea erythrocephala*. Recently, it has been mentioned again as a species. For example, *O. taygetana* Pic, 1901 in Althoff & Danilevsky (1997) and Danilevsky (2005b) gave as a separate species. Now I accept the approach in Adlbauer (1988). Because, Adlbauer (1988) stated that the specimens of Osmaniye province (Nurdağı pass) differed from typical specimens with very shining surface and a little smaller body. In any case, the specimens from Nurdağı pass are still different from those.
Chorotype: Palearctic.

***Oberea ressli* Demelt, 1963**
= ssp. *ressli* Demelt, 1963
= ssp. *taygetana* Demelt, 1963

Records in Ankara prov.: Kızılcahamam as the type loc. of *O. ressli* (Demelt, 1963); Kızılcahamam (Adlbauer, 1988; Rejzek et al., 2001); Kızılcahamam (Central, Güvem, Işık Mts.) (Özdikmen et al., 2005).
Records in Turkey: (AN-CN-MN-TUR)
Distribution: Turkey.
Remarks: The species is endemic to Turkey and it distributes in N parts of C Anatolian Region and W parts of Turkey. It is represented by two subspecies in Turkey. These are the nominotypical subspecies *O. ressli ressli* Demelt, 1963 and *O. ressli taygetana* Demelt, 1963 (western subspecies).
Chorotype: Anatolian.

***Oxylia* Mulsant, 1863**
[Type sp.: *Oxylia duponcheli* Brullé, 1832]

***Oxylia argentata* (Ménetries, 1832)**

Records in Ankara prov.: Elmadağ (Breuning et Villiers, 1967); Kızılcahamam (Aköz village) (Özdikmen, 2006).
Records in Turkey: (ADY-AG-AN-ANT-ART-BT-BY-CO-DI-EL-ER-EZ-GU-HT-IC-IP-KAR-KI-KN-KS-NI-YO-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian) + Turanian (Ponto-Caspian).

***Oxylia duponcheli* (Brullé, 1832)**

Records in Ankara prov.: Bağlum, Kızılcahamam (Güvem) (Özdikmen et al., 2005); Çal Mountain (Özdikmen & Demir, 2006).
Records in Turkey: (AK-AN-ART-ES-IC-KA-KM-MA-MN-OS-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Coptosia* Fairmaire, 1864**
[Type sp.: *Phytoecia compacta* Menetries, 1832]
(See the remarks under the genus name *Phytoecia* Dejean, 1821)

***Coptosia albovittigera* (Heyden, 1863)**

Records in Ankara prov.: Kazan (Orhaniye village) (Özdikmen & Hasbenli, 2004).
Records in Turkey: (ADY-AN-BI-MA-TUR)
Remarks: Probably the species distributes rather widely in Turkey (especially west half of Turkey).
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Helladia* Fairmaire, 1864**
[Type sp.: *Saperda millefolii* Adams, 1817]
(See the remarks under the genus name *Phytoecia* Dejean, 1821)

***Helladia humeralis* (Waltl, 1838)**

Material examined: Ankara prov.: Kayaş, 10.05.2004, 874 m., 5 specimens, leg. S. Güzel; Şereflikoçhisar, Hacı enbiya district, 08.05.2006, 990 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: near Eymir lake (Gül-Zümreoğlu, 1975); Şereflikoçhisar (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AK-AM-AN-ANT-AY-BU-DE-DI-ED-ES-HA-HT-IC-IP-IZ-KA-KN-MN-NI-OS-US-TUR)
Remarks: The species distributes widely in Turkey. Probably it may be represented by two subspecies in Turkey. One of them occurs mostly in N Turkey and the other ones occurs in S Turkey. Besides, according to Danilevsky (2008b), this species is represented by the nominotypical subspecies in Balkans, Caucasus, Near East and Iran.
Chorotype: E-Mediterranean (Palaestino-Cyprioto-Taurian + NE-Mediterranean).

***Helladia praetextata* (Steven, 1817)**
= ssp. *praetextata* Steven, 1817
= ssp. *nigricollis* Pic, 1891

Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen & Demir, 2006; Özdikmen,2006).
Records in Turkey: (AN-BY-DU-EZ-GU-HT-IC-KS-SV-ZO-TUR)

Remarks: The species distributes rather widely in Turkey. It is represented by two subspecies in Turkey. *H. praetextata nigricollis* Pic, 1891 occurs in S Turkey and the nominative *H. praetextata praetextata* (Steven, 1817) occurs mostly in N Turkey.
Chorotype: E-Mediterranean (NE-Mediterranean + Palaestino-Taurian).

***Neomusaria* Plavilstshikov, 1928**
[Type sp.: *Saperda balcanica* Frivaldsky, 1835]
(See the remarks under the genus name *Phytoecia* Dejean, 1821)

***Neomusaria balcanica* (Frivaldsky, 1835)**

Records in Ankara prov.: Kızılcahamam, Işık Mt. (Demelt, 1967); Kızılcahamam (Yenimahalle village) (Özdikmen, 2006).
Records in Turkey: (AM-AN-HA-MR-KR-KS-TU-TRA-TUR)
Remarks: The species distributes rather widely in Turkey (from European Turkey to Hakkari province). Probably *N. balcanica subvitticollis* occurs probably only in C part of N Turkey. The real taxonomic status of - *subvitticollis* needs to be clarified.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Neomusaria pauliraputii* Sama, 1993**

Material examined: Ankara prov.: A.O.Ç., 13.06.2004, 870 m., 7 specimens, 15.06.2004, 877 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Çal Mountain, Kızılcahamam (Soğuksu National Park) as *N. merkli* (Özdikmen & Demir, 2006).
Records in Turkey: (AN-BI-CN-ES-IZ-MN-TRA-TUR)
Remarks: The species is endemic to Turkey. Probably it distributes rather widely in W and C Turkey.

***Phytoecia* Dejean, 1835**
[Type sp.: *Saperda cylindrica* Fabricius, 1775 = *Cerambyx cylindricus* Linnaeus, 1758]

Remarks: *Coptosia* Fairmaire, 1864, *Helladia* Fairmaire, 1864, *Neomusaria* Plavilstshikov, 1928, *Opsilia* Mulsant, 1863 and *Blepisanis* Pascoe, 1866 which are given as separate genera in the text has been regarded by some authors as subgenera of *Phytoecia* Dejean, 1835.

***Phytoecia caerulea* (Scopoli, 1772)**
= ssp. *caerulea* Scopoli, 1772
= ssp. *baccueti* Brullé, 1832
= ssp. *gilvimana* Ménetries, 1832
= ssp. *bethseba* Reiche & Saulcy, 1858

Material examined: Ankara prov.: Kayaş, 10.05.2004, 874 m., 1 specimen, leg. S. Güzel; Bayındır dam env., 03.06.2004, 890 m., 1 specimen, 08.06.2004, 4 specimens, leg. S. Güzel; Beytepe, 16.06.2005, 980 m., 1 specimen, leg. S. Güzel; Şereflikoçhisar, Kale district, 22.03.2006, 985 m., 2 specimens, leg. S. Güzel; Şereflikoçhisar, 17.04.2006, 990 m., 2 specimens, leg. S. Güzel; E Şereflikoçhisar, 29.04.2006, 995 m., 5 specimens, leg. S. Güzel; Şereflikoçhisar, Hacı enbiya district, 08.05.2006, 990 m., 5 specimens, leg. S. Güzel; Gölbaşı, 11.06.2006, 975 m., 1 specimen, leg. S. Güzel; İncek, 08.06.2006, 1070 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Beynam (Gül-Zümreoğlu, 1975); Çubuk, Elmadağ, Polatlı, Ayaş (Ilıca), Bağlum, Central, Kazan, Beynam (Özdikmen et al., 2005); Central, Şereflikoçhisar-Ankara road, between Konya Makası-Şereflikoçhisar (Özdikmen, 2006).
Records in Turkey: (AD-AF-AK-AN-ANT-AY-BI-BO-BU-DE-DU-ES-EZ-IC-IP-IS-IZ-KA-KM-KN-KR-KS-KU-KY-MG-MN-NE-NI-OS-SM-SV-YO-TRA-TUR)
Remarks: The species distributes widely in Turkey. It is represented by three subspecies in Turkey. *P. caerulea baccueti* (Brullé, 1832) occurs in S and W Turkey, *P. caerulea gilvimana* Ménetries, 1832 occurs in E Central Anatolia and C parts of N Turkey and *P.*

caerulea caerulea (Scopoli, 1772) occurs in other parts of Turkey (especially European Turkey and NE Turkey). Known other subspecies, *P. caerulea bethseba* Reiche & Saulcy, 1858 occurs in Palestine, Iraq, Jordan, Lebanon and Syria.
Chorotype: Turano-European.

***Phytoecia cylindrica* (Linnaeus, 1758)**

Material examined: Ankara prov.: A.O.Ç., 21.06.2004, 870 m., 1 specimen, leg. S. Güzel; Beytepe, 07.07.2004, 985 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Salin village, Yukarı Çanlı, Yenimahalle village) (Özdikmen, 2006).
Records in Turkey: (AN-IS-IZ-KA-KO-KS-KY-NI-TRA-TUR)
Remarks: The species probably distributes rather widely in Turkey.
Chorotype: Sibero-European.

***Phytoecia geniculata* Mulsant, 1863**

Records in Ankara prov.: Gölbaşı (Örencik village) (Özdikmen, 2006).
Records in Turkey: (AD-AN-ANT-AY-BI-BS-BU-DE-ED-GA-HT-IC-IS-IZ-KA-KS-MN-OS-TRA-TUR)
Remarks: The species probably distributes rather widely in Turkey.
Chorotype: E-Mediterranean (Aegean + NE-Mediterranean + Palaestino-Cyprioto-Taurian).

***Phytoecia icterica* (Schaller, 1783)**
= ssp. *icterica* Schaller, 1783
= ssp. *annulipes* Mulsant, 1863

Material examined: Ankara prov.: A.O.Ç., 07.06.2004, 870 m., 3 specimens, 15.06.2004, 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen & Demir, 2006); Kızılcahamam (Yenimahalle village) as *P. icterica annulipes* (Özdikmen, 2006).
Records in Turkey: (AF-AN-BO-BT-BY-CO-EZ-HT-IS-KA-KAR-KN-KS-KU-OS-YO-TRA-TUR)
Remarks: The species probably distributes rather widely in Turkey. The species is represented by two subspecies in Turkey. *P. icterica annulipes* Mulsant, 1863 and the nominative *P. icterica icterica* (Schaller, 1783). For the present, the exact distribution patterns of these subspecies in Turkey need to be clarified. Therefore, *P. icterica annulipes* regarded as a separate species (e.g. Danilevsky, 2008b). The materials in this work belong to the nominative subspecies.
Chorotype: Turano-European.

***Phytoecia pubescens* Pic, 1895**

Material examined: Ankara prov.: İncek, 28.06.2006, 1085 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: The species has been reported into two different types as *P. pubescens* Pic, 1895 and *P. manicata* Reiche et Saulcy, 1858 (old records from N Turkey) from Turkey. As *P. manicata* Reiche et Saulcy, 1858: Kızılcahamam (Soğuksu National Park) (Özdikmen & Demir, 2006).
Records in Turkey: (AM-AN-KO-TUR)
Remarks: The species distributes in N Turkey. Danilevsky (2008b) stated "*According to Danilevsky (1993), Ph. pubescens (= Ph. glaphyra) was usually mixed with Ph. manicata. Ph. manicata is known only from Syria and neighbour territories and differs by spines of posterior male coxae (so can be mixed with small Ph. cylindrica). That is why the record of Ph. manicata for Caucasus (Danilevsky, Miroshnikov, 1985) was wrong. Ph. pubescens is distributed in Balcan Peninsula, Near and Middle East and is rather common in Transcaucasia*". We share Danilevsky's opinion. For this reason, reported records from Northern Turkey as *P. manicata* should be referred to as *P. pubescens*.

Chorotype: Turano-Mediterranean (Turano-E-Mediterranean).

***Phytoecia virgula* (Charpentier, 1825)**

Material examined: Ankara prov.: A.O.Ç., 13.06.2004, 870 m., 1 specimen, 21.06.2004, 1 specimen, leg. S. Güzel; Şereflikoçhisar, Gülhöyük, 22.05.2006, 980 m., 1 specimen, leg. S. Güzel; Gölbaşı, 11.06.2006, 975 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Keçiören (Breuning et Villiers, 1967); Beynam, near Eymir lake (Gül-Zümreoğlu, 1975); Bala (Öymen, 1987); Beynam, Çubuk dam, Kızılcahamam, Kazan (Orhaniye) (Özdikmen et al., 2005); Kızılcahamam (Işık Mountain), Şereflikoçhisar (Özdikmen, 2006).
Records in Turkey: (ADY-AK-AM-AN-BI-BN-BO-BR-BU-DE-ER-ES-EZ-HT-IP-IS-IZ-KA-KAR-KN-KR-KS-MN-NI-TRA-TUR)
Remarks: The species distributes rather widely in Turkey.
Chorotype: Turano-European.

***Opsilia* Mulsant, 1862**
[Type sp.: *Opsilia flavicans* Mulsant, 1862 = *Leptura coerulescens* Scopoli, 1763]
(See the remarks under the genus name *Phytoecia* Dejean, 1821)

***Opsilia coerulescens* (Scopoli, 1763)**
= ssp. *coerulescens* Scopoli, 1763
= ssp. *cretensis* Breuning, 1947

Material examined: Ankara prov.: Bağlum, 06.07.2005, 1170 m., 2 specimens, leg. S. Güzel; Şereflikoçhisar, 17.04.2006, 980 m., 1 specimen, leg. S. Güzel; Polatlı, 07.06.2006, 850 m., 1 specimen, leg. S. Güzel; Gölbaşı, 11.06.2006, 975 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Çubuk (Breuning et Villiers, 1967); Çubuk as *Opsilia coerulescens grisescens* (Breuning et Villiers, 1967); near Çubuk dam (Gül-Zümreoğlu, 1975); Central, Eymir, Çubuk, Ayaş (Ilıca, Sirkeli), Kazan (Özdikmen et al., 2005); Kızılcahamam (Soğuksu National Park, Salin village, Yenimahalle village) (Özdikmen & Demir, 2006); Kızılcahamam (Aköz village, Yukarı Çanlı, Güvem) (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AK-AM-AN-ANT-AR-ART-AY-BO-BS-BU-BY-CN-CO-DE-DI-ER-ES-EZ-GA-GU-IC-IP-IS-IZ-KA-KAR-KIR-KK-KM-KN-KS-KY-MA-MG-MN-NE-NI-OS-SM-SN-SV-TB-YO-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by the nominotypical subspecies in Turkey. The other known subspecies *Opsilia coerulescens cretensis* Breuning, 1947 occurs only in Crete.
Chorotype: Sibero-European + Mediterranean.

***Blepisanis* Pascoe, 1866**
[Type sp.: *Phytoecia melanocephala* Fabricius, 1787]
(See the remarks under the genus name *Phytoecia* Dejean, 1821)

***Blepisanis vittipennis* (Reiche, 1877)**
= ssp. *vittipennis* Reiche, 1877
= ssp. *prawei* Plavilstshikov, 1926
= ssp. *inhumeralis* Pic, 1900

Material examined: Ankara prov.: Beytepe, 15.07.2004, 985 m., 2 specimens, leg. S. Güzel; Bağlum, 06.07.2005, 1175 m., 5 specimens, 11.07.2005, 1170 m., 3 specimens, leg. S. Güzel.
Records in Ankara prov.: Ankara prov. (Breuning et Villiers, 1967); Kızılcahamam (Adlbauer, 1992); Sincan (Mülk, Ayaş Mt.) (Özdikmen & Demir, 2006); Kızılcahamam (Soğuksu National Park) (Özdikmen, 2006).
Records in Turkey: (AD-ADY-AN-ANT-BU-DE-ER-EZ-IZ-KA-KN-MN-NI-OS-YO-TUR)
Remarks: The species distributes widely in Turkey. It is represented by three subspecies in Turkey. *B. vittipennis inhumeralis* that was restored by Özdikmen & Turgut (2008b) occurs only in S Turkey, *B. vittipennis prawei* that was accepted by some authors as a separate

species occurs in NE Turkey (in addition Caucasus, Iran and Central Asia) and the nominative subspecies occurs in other parts of Turkey.
Chorotype: E-Mediterranean.

Tribe AGAPANTHIINI

***Calamobius* Guérin, 1846**
[Type sp.: *Cerambyx gracilis* Creutzer, 1799. = *Saperda filum* Rossi, 1790]

***Calamobius filum* (Rossi, 1790)**

Records in Ankara prov.: Kızılcahamam (Yenimahalle, Aköz village) (Özdikmen & Demir, 2006).
Records in Turkey: (AD-AN-ANT-BO-BS-BU-CA-GA-HT-IC-IP-IS-IZ-KA-KO-MG-MN-OS-SA-TRA-TUR)
Remarks: The species distributes rather widely in Turkey (especially west half of Turkey).
Chorotype: Turano-Europeo-Mediterranean.

***Agapanthia* Serville, 1835**
[Type sp.: *Saperda cardui* Fabricius, 1801 = *Cerambyx cardui* Linnaeus, 1767]

Subgenus *Agapanthia* Serville, 1835
[Type sp.: *Saperda cardui* Fabricius, 1801 = *Cerambyx cardui* Linnaeus, 1767]

***Agapanthia cardui* (Linnaeus, 1767)**
= ssp. *cardui* Linnaeus, 1767
= ssp. *pannonica* Kratochvil, 1985

Material examined: Ankara prov.: A.O.Ç., 07.06.2004, 870 m., 15 specimens, 13.06.2004, 4 specimens, 15.06.2004, 14 specimens, 21.06.2004, 4 specimens, leg. S. Güzel; Bayındır dam env., 09.06.2004, 895 m., 1 specimen, 23.06.2004, 1 specimen, leg. S. Güzel; Beytepe, 12.07.2004, 990 m., 1 specimen, 17.07.2004, 4 specimens, leg. S. Güzel; Bağlum, 11.07.2005, 1170 m., 1 specimen, leg. S. Güzel; between Ankara-Polatlı, 07.06.2006, 865 m., 2 specimens, leg. S. Güzel; Gölbaşı, 11.06.2006, 975 m., 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Çubuk Dam-I, Gölbaşı (Kepekli Boğazı), Ayaş Beli (Önalp, 1989); Ayaş (İlhan, İlyakut, Ilıca), Central, Bağlum, Beypazarı (Özdikmen et al., 2005); Sincan (Mülk, Ayaş Mountain) (Özdikmen & Demir, 2006); Kızılcahamam (Güvem, Aköz village), Polatlı (Özdikmen, 2006).
Records in Turkey: (AD-AN-ANT-ART-AY-BI-BN-BS-BU-BY-CA-CN-DE-DI-ED-EL-ER-ES-EZ-GU-HT-IC-IS-IZ-KA-KAR-KIR-KK-KN-KO-KS-MG-MN-OS-RI-SI-SV-TRA-TUR)
Remarks: The species distributes widely in Turkey. It is represented by both subspecies in Turkey. The "northern phenotype" or *A. cardui pannonica* Kratochvil, 1985 occurs in N Turkey and the "southern phenotype" or *A. cardui cardui* (Linnaeus, 1767) occurs mostly in S and W Turkey).
Chorotype: European + Mediterranean.

***Agapanthia fallax* Holzschuh, 1973**

Records in Ankara prov.: Ankara prov. (Özdikmen et al, 2005).
Records in Turkey: (AN-HA-MU-TUR)
Remarks: The species is endemic to Turkey and probably the species mostly distributes in SE Turkey.
Chorotype: Anatolian.

***Agapanthia frivaldszkyi* Ganglbauer, 1884**

Records in Ankara prov.: Ankara prov.: Atatürk Orman Çiftliği (Önalp, 1988).
Records in Turkey: (AM-AN-BI-?DE-IC-IP-IS-MU-NI-SA-TUR)
Remarks: The species distributes rather widely in Turkey.

Chorotype: Turano-Mediterranean (Balkano-Anatolian).

***Agapanthia violacea* (Fabricius, 1775)**

Material examined: Ankara prov.: Gölbaşı, 11.06.2006, 975 m., 1 specimen, leg. S. Güzel.
Records in Ankara prov.: Dam (Önalp, 1988); Bağlum (Özdikmen et al., 2005).
Records in Turkey: (AD-AF-AK-AN-BI-BO-BS-CO-DE-DU-ED-EZ-HT-IC-IP-IS-IZ-KA-KIR-KK-KN-KO-KR-KS-KY-MG-MN-NE-NI-SA-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey. In some previous works, *A. intermedia* Ganglbauer, 1884 was given as a synonym of *A. violacea*. But according to Svacha (2001), both are separate taxons with regard to morphologies of immature stages. This opinion was also accepted by Sama (2002). Moreover, Danilevsky shares it.
Chorotype: Turano-European or Sibero-European. Since, according to Sama (2002), records from Middle East and Central Asia need confirmation as they may refer to other closely related species.
Subgenus *Epoptes* Gistel, 1857
[Type sp.: *Saperda asphodeli* Latreille, 1804]

***Agapanthia asphodeli* (Latreille, 1804)**

Records in Ankara prov.: Ankara prov. (Önalp, 1989); Gölbaşı (Özdikmen et al., 2005); Kızılcahamam (Işık Mt., Soğuksu National Park, Aköz village) (Özdikmen, 2006).
Records in Turkey: (AD-AN-ANT-AY-BI-CA-HT-IP-IZ-YO-TUR)
Remarks: The species distributes mostly in west half of Turkey.
Chorotype: European. According to Sama (2002) "*records from Middle East need confirmation because of possible confusion with other related species (e. g. A. pustilifera Pic, 1905) and nearly all records from North Africa refer to A. zappii Sama, 1987*".

***Agapanthia dahli* (Richter, 1821)**

Records in Ankara prov.: Ankara prov. (Önalp, 1989).
Records in Turkey: (AD-AN-BS-EZ-GA-GU-HT-OS-SI-TUR)
Remarks: The species distributes rather widely in Turkey. *A. dahli nicosiensis* Pic, 1927 from Cyprus is a distinct species.
Chorotype: Turano-European or Sibero-European. Since, according to Sama (2002) most records from East Mediterranean and Central Asia of this species probably belong to different species.

***Agapanthia detrita* Kraatz, 1882**

Records in Ankara prov.: Ankara prov. (Önalp, 1989).
Records in Turkey: (AN-EZ-HT)
Remarks: The species distributes rather widely but local in Turkey. According to known distributional patterns of this species, perhaps it may be another species that is conspecific to *A. detrita* from Turkey
Chorotype: Turanian.

***Agapanthia kirbyi* (Gyllenhal, 1817)**

Records in Ankara prov.: Kızılcahamam (Azapderesi), Gölbaşı (Önalp, 1988); Kızılcahamam (Özdikmen et al., 2005); Çal Mountain (Özdikmen & Demir, 2006).
Records in Turkey: (AD-AF-AK-AM-AN-ANT-BI-BS-BT-BU-CO-ED-ER-ES-EZ-IC-IP-IZ-KA-KAR-KIR-KN-KO-KY-MN-NI-OS-SI-TO-VA-TRA-TUR)
Distribution: Europe (Spain, France, Italy, Albania, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Ukraine, Crimea, Moldavia, European Russia), Central Asia, Kazakhstan, Caucasus, Transcaucasia, Turkey, Iran, Syria, Israel.

Remarks: It has been reported from Western and Central Black Sea Parts as connected with covered geological area of the present work (*). New for Çorum province and it distributes widely in Turkey.
Chorotype: Turano-European.

***Agapanthia lateralis* Ganglbauer, 1884**
= ssp. *lateralis* Ganglbauer, 1884
= ssp. *bilateralis* Pic, 1927

Material examined: Ankara prov.: A.O.Ç., 13.06.2004, 870 m., 1 specimen, leg. S. Güzel; Bayındır dam env., 23.06.2004, 890 m., 1 specimen, leg. S. Güzel; Beytepe, 07.07.2004, 990 m., 1 specimen, 12.07.2004, 3 specimens, 15.07.2004, 1 specimen, 17.07.2004, 13 specimens, 16.06.2005, 14 specimens, leg. S. Güzel; Bağlum, 11.07.2005, 1170 m., 1 specimen, leg. S. Güzel; Şereflikoçhisar, Gülhöyük, 22.05.2006, 980 m., 1 specimen, leg. S. Güzel; İncek, 09.06.2006, 1070 m., 1 specimen, 28.06.2006, 2 specimens, leg. S. Güzel.
Records in Ankara prov.: Kızılcahamam (Adlbauer, 1988); Central, Gölbaşı, Dam, Ayaş Beli, Kızılcahamam (Kargasekmez), Azapderesi, Elmadağ, Beynam Forest (Önalp, 1989); Elmadağ, Kızılcahamam, Central, Eymir lake, Akyurt (Özdikmen et al., 2005); Çal Mountain, METU, Beştepe, Kızılcahamam (Soğuksu National Park), Kayaş (Bayındır dam env.), Beytepe (Özdikmen & Demir, 2006); Kızılcahamam (Işık Mountain, Güvem, Aköz village), Şereflikoçhisar, Çal Mountain, Şereflikoçhisar-Evren road (Özdikmen, 2006).
Records in Turkey: (AF-AG-AK-AM-AN-ANT-BI-BO-CA-CN-CO-ES-IC-IP-IS-IZ-KA-KIR-KM-KN-KR-KS-MG-MN-NE-NI-TE-TO-ZO-TRA-TUR)
Remarks: The species distributes widely in Turkey. The species is represented by the nominotypical subspecies in Turkey. Known other subspecies, *A. lateralis bilateralis* Pic, 1927 occurs in Syria.
Chorotype: E-Mediterranean.

***Agapanthia irrorata* (Fabricius, 1787)**

Records in Ankara prov.: Bala (Öymen, 1987).
Records in Turkey: (AN-IS-TUR)
Distribution: Europe (Spain, Portugal, ?France, Corsica, Italy, Sicily, Sardinia), North Africa (Morocco, Tunisia, Algeria).
Remarks: The species distributes in NW Turkey. Apparently, these records may be a different taxon (?new taxon), because *A. irrorata* occurs only in West Mediterranean area. However it is not impossible in Turkey. Since this species is very characteristic. Öymen (1987) gave a short definition of it. In addition to this, Taglianti et al. (1999) also mentioned that "this chorotype is very rarely represented in the Near East Fauna. I think that the best way for the solution of this problem is to see the specimens but I do not see the specimens and the occurrence in Turkey of this species is still doubtful for me.
Chorotype: W-Mediterranean.

***Agapanthia villosoviridescens* (De Geer, 1775)**

Records in Ankara prov.: near Eymir lake (Gül-Zümreoğlu, 1975).
Records in Turkey: (AF-AN-AY-BS-DE-ED-EZ-HA-IP-KA-SA-TRA-TUR)
Remarks: Probably the species distributes rather widely in Turkey.
Chorotype: Sibero-European.

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APPENDIX

THE SIMPLE LIST OF LONGHORNED BEETLES IN ANKARA REGION

Subfamily PRIONINAE

1. *Ergates faber* (Linnaeus, 1761)
2. *Aegosoma scabricorne* (Scopoli, 1763) **(New for Ankara)**
3. *Prionus coriarius* (Linnaeus, 1758)
4. *Mesoprionus besicanus* (Fairmaire, 1855)

Subfamily LEPTURINAE

1. *Rhamnusium graecum* Schaufuss, 1862
2. *Rhamnusium testaceipenne* Pic, 1897
3. *Rhagium inquisitor* (Linnaeus, 1758)
4. *Stenocorus quercus* (Götz, 1783)
5. *Acmaeops marginatus* (Fabricius, 1781)
6. *Dinoptera collaris* (Linnaeus, 1758)
7. *Cortodera alpina* Hampe, 1870
8. *Cortodera colchica* Reitter, 1890
9. *Cortodera differens* (Pic, 1898)
10. *Cortodera femorata* (Fabricius, 1787)
11. *Cortodera flavimana* (Waltl, 1838)
12. *Cortodera humeralis* (Schaller, 1783)
13. *Cortodera syriaca* Pic, 1901
14. *Cortodera villosa* Heyden, 1876
15. *Grammoptera abdominalis* (Stephens, 1831)
16. *Grammoptera ustulata* (Schaller, 1783)
17. *Vadonia unipunctata* (Fabricius, 1787)
18. *Pseudovadonia livida* (Fabricius, 1776)
19. *Anoplodera rufipes* (Schaller, 1783)
20. *Stictoleptura cordigera* (Füsslins, 1775)
21. *Stictoleptura tesserula* (Charpentier, 1825)
22. *Anastrangalia sanguinolenta* (Linnaeus, 1761)
23. *Pachytodes erraticus* (Dalman, 1817)
24. *Leptura quadrifasciata* Linnaeus, 1758
25. *Stenurella bifasciata* (Müller, 1776)
26. *Stenurella septempunctata* (Fabricius, 1792)

Subfamily ASEMINAE

1. *Asemum tenuicorne* Kraatz, 1879
2. *Arhopalus rusticus* (Linnaeus, 1758)
3. *Arhopalus tristis* (Fabricius, 1787)

Subfamily SPONDYLIDINAE

1. *Spondylis buprestoides* (Linnaeus, 1758)

Subfamily CERAMBYCINAE

1. *Trichoferus fasciculatus* (Faldermann, 1837)
2. *Stromatium unicolor* (Olivier, 1795)
3. *Cerambyx carinatus* (Küster, 1846)
4. *Cerambyx cerdo* Linnaeus, 1758
5. *Cerambyx dux* (Faldermann, 1837)
6. *Cerambyx scopolii* Fusslins, 1775
7. *Purpuricenus budensis* (Götz, 1783)

8. *Aromia moschata* (Linnaeus, 1758)
9. *Penichroa fasciata* (Stephens, 1831)
10. *Molorchus kiesenwetteri* Mulsant et Rey, 1861
11. *Molorchus umbellatarum* (Schreber, 1759)
12. *Stenopterus rufus* (Linnaeus, 1767)
13. *Callimus femoratus* (Germar, 1824)
14. *Certallum ebulinum* (Linnaeus, 1767)
15. *Hylotrupes bajulus* (Linnaeus, 1758)
16. *Ropalopus clavipes* (Fabricius, 1775)
17. *Phymatodes testaceus* (Linnaeus, 1758)
18. *Echinocerus floralis* (Pallas, 1773)
19. *Chlorophorus aegyptiacus* (Fabricius, 1775)
20. *Chlorophorus cursor* Rapuzzi & Sama, 1999 **(New for Ankara)**
21. *Chlorophorus hungaricus* (Seidlitz, 1891)
22. *Chlorophorus sartor* (Müller, 1766)
23. *Chlorophorus trifasciatus* (Fabricius, 1781) **(New for Ankara)**
24. *Chlorophorus varius* (Müller, 1766)
25. *Xylotrechus rusticus* (Linnaeus, 1758)
26. *Clytus arietis* (Linnaeus, 1758)
27. *Clytus rhamni* Germar, 1817
28. *Clytus schurmanni* Sama, 1996

Subfamily LAMIINAE

1. *Morimus asper* (Sulzer, 1776)
2. *Morimus funereus* (Mulsant, 1863)
3. *Morimus orientalis* (Reitter, 1894)
4. *Dorcadion carinatum* (Pallas, 1771)
5. *Dorcadion arenarium* (Scopoli, 1763)
6. *Dorcadion bangi* Heyden, 1894
7. *Dorcadion bodemeyeri* Daniel, 1900
8. *Dorcadion boluense* Breuning, 1962
9. *Dorcadion cinerarium* (Fabricius, 1787)
10. *Dorcadion divisum* Germar, 1839
11. *Dorcadion escherichi* Ganglbauer, 1897
12. *Dorcadion haemorrhoidale* Hampe, 1852
13. *Dorcadion infernale* Mulsant et Rey, 1863
14. *Dorcadion kindermanni* Waltl, 1838
15. *Dorcadion olympicum* Kraatz, 1873
16. *Dorcadion parallelum* Küster, 1847
17. *Dorcadion pararufipenne* Braun, 1976
18. *Dorcadion rufipenne* Breuning, 1946
19. *Dorcadion scabricolle* Dalman, 1817
20. *Dorcadion septemlineatum* Waltl, 1838
21. *Dorcadion subsericatum* Pic, 1901
22. *Dorcadion subvestitum* Daniel, 1900
23. *Pogonocherus decoratus* Fairmaire, 1855
24. *Acanthocinus aedilis* (Linnaeus, 1758)
25. *Leiopus femoratus* Fairmaire, 1859
26. *Tetrops praeusta* (Linnaeus, 1758)
27. *Saperda carcharias* (Linnaeus, 1758)
28. *Oberea oculata* (Linnaeus, 1758) **(New for Ankara)**
29. *Oberea erythrocephala* (Schrank, 1776)
30. *Oberea ressli* Demelt, 1963
31. *Oxylia argentata* (Ménetries, 1832)
32. *Oxylia duponcheli* (Brullé, 1832)
33. *Coptosia albovittigera* (Heyden, 1863)
34. *Helladia humeralis* (Waltl, 1838)
35. *Helladia praetextata* (Steven, 1817)

36. *Neomusaria balcanica* (Frivaldsky, 1835)
37. *Neomusaria pauliraputii* Sama, 1993
38. *Phytoecia caerulea* (Scopoli, 1772)
39. *Phytoecia cylindrica* (Linnaeus, 1758)
40. *Phytoecia geniculata* Mulsant, 1863
41. *Phytoecia icterica* (Schaller, 1783)
42. *Phytoecia pubescens* Pic, 1895
43. *Phytoecia virgula* (Charpentier, 1825)
44. *Opsilia coerulescens* (Scopoli, 1763)
45. *Blepisanis vittipennis* (Reiche, 1877)
46. *Calamobius filum* (Rossi, 1790)
47. *Agapanthia cardui* (Linnaeus, 1767)
48. *Agapanthia fallax* Holzschuh, 1973
49. *Agapanthia frivaldszkyi* Ganglbauer, 1884
50. *Agapanthia violacea* (Fabricius, 1775)
51. *Agapanthia asphodeli* (Latreille, 1804)
52. *Agapanthia dahli* (Richter, 1821)
53. *Agapanthia detrita* Kraatz, 1882
54. *Agapanthia kirbyi* (Gyllenhal, 1817)
55. *Agapanthia lateralis* Ganglbauer, 1884
56. *Agapanthia irrorata* (Fabricius, 1787)
57. *Agapanthia villosoviridescens* (De Geer, 1775)

RESISTANCE MECHANISMS TO OXYDEMETON-METHYL IN *TETRANYCHUS URTICAE* KOCH (ACARI: TETRANYCHIDAE)

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ABSTRACT: The resistance mechanisms to oxydemeton-methyl were surveyed in two Iranian strains of the two spotted spider mite, *Tetranychus urticae* Koch. Bioassay was carried out on two strains, collected from Tehran and Rasht using a dipping method. The results of bioassay indicated that resistance ratio was 20.47 for resistant strain. The activity of esterase and glutathione S transferase in resistant and susceptible strains showed that one of resistance mechanisms to oxydemeton-methyl was esterase-based resistance and glutathione S-transferase. The esterase activity of the resistant strain was 2.5 and 2.14-fold higher than those of the susceptible strain for α-naphtyl acetate (α-NA) and β-naphtyl acetate (β-NA) respectively. The kinetic characteristics acetylcholinesterase (AChE) showed that the AChE of resistant strain had lower affinity to artificial substrates; acetylthiocholine and butyrylthiocholine than that of susceptible strain. I50 of oxydemeton-methyl for resistant and susceptible strains were 2.68×10 M and 7.79×10 M respectively. The results suggested that AChE of resistant is insensitive to oxydemeton-methyl and ratio of AChE insensitivity of resistant to susceptible strain were 3.49 and 7.8-fold to oxydemeton-methyl and paraoxon, respectively.

KEY WORDS: *Tetranychus urticae*, Oxydemeton-methyl, Esterase, Insensitive acetylcholinesterase, Glutathione S-transferase

The two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae), is an important agricultural pest with a global distribution. Its phytophagous nature, high reproductive potential and short life cycle facilitate rapid resistance development to many acaricides often after a few applications (Cranham & Helle 1985; Keena & Granett, 1990; Devine et al., 2001; Stumpf & Nauen, 2001). So far resistance has been reported in several countries for compounds, such as organophosphates (OPs) (Sato et al., 1994; Anazawa et al., 2003), dicofol (Fergusson-Kolmes et al., 1991), organotins (Edge & James, 1986); hexythiazox (Herron & Rophail, 1993), clofentezine (Herron et al., 1993); fenpyroximate (Sato et al., 2004) and abamectin (Beers et al., 1998).

Insensitive AChE causing OP resistance is widespread and has been detected in *T. urticae* strains from Germany (Matsumura & Voss, 1964; Smissaert et al., 1970), Japan (Anazawa et al., 2003) and New Zealand (Ballantyne & Harrison, 1967) and in a few other tetranychid pest species, including *T. cinnabarinus* from Israel (Zahavi & tahori, 1970) and *T. kanzawai* from Japan (Kuwahara, 1982). Also the insensitivity of AChE to demeton-S-methyl, ethyl paraoxon, chlorpyrifos oxon and carbofuran was identified in a German laboratory strain of *T. urticae* and a field collected strain from Florida (Stumpf et al., 2001).

However, insensitive AChE was not the only mechanism of OP resistance in spider mites described, as some resistant strains of *T. urticae* showed an enhanced degradation of malathion, malaoxon, and ethyl parathion to nontoxic products (Herne and Brown, 1969; Matsumura and Voss, 1964). OP-resistant strains of *T. kanzawai* rapidly degraded malathion *in vitro* and the resistance was obviously attributed to high nonspecific esterase activity (Kuwahara, 1981 and 1982). Pilz et al. (1978) showed that a German dimethoate-selected laboratory strain of *T. urticae* possessed multiple mechanisms of OP resistance. In addition to an AChE insensitive to dimethoxon, the toxicity of dimethoate was enhanced by synergists, such as piperonyl butoxide indicating the involvement of cytochrome P-450-mediated oxidative detoxication.

Oxydemeton-methyl is currently used in Iran to control some pests, such as aphids and *T. urticae* in several crops. The intensive use of oxydemeton-methyl to control of *T. urticae* and aphids in greenhouse facilitates resistance development in some populations of *T. urticae* in Iran. There is no information about oxydemeton-methyl resistance in this pest in Iran. Resolution of the underlying biochemical mechanisms of resistance can play an important role in circumventing problems associated with pesticide resistance and assist in rational choices of chemicals for pesticide mixtures and rotations. The purpose of this study was to collect information about the presence of esterases, gluthathion s-transferase and insensitive acetylcholinesterases in the resistance of *T. urticae* by bioassays and biochemical assays.

MATERIAL AND METHODS

Two spotted spider mite strains

The resistant strain was collected from infected been plants grown in the research greenhouse in Plant Pests and Disease Research Institute of Iran, Tehran. A strain from Rasht was considered as a strain susceptible to oxydemeton-methyl which had no previous exposure to pesticides and was collected from *Convolvulus sp.* in University of Guilan. The mites were reared routinely on bean plants (*Phaseolus vulgaris*) grown under greenhouse conditions (25 ± 4° C, 60 ± 20 RH).

Pesticide

Oxydemeton-methyl was used as the commercial formulation in the bioassay (EC 25%) and was purchased from Bayer Crop Science, Germany

Chemicals

Acetylthiocholine iodide (ATC), S-butyrylthiocholine iodide (BTC), 5,5'-dithiobis-(2-nitrobenzoic acid, DTNB), triton X-100 were purchased from Sigma. Fast blue RR salt, α-naphtyl acetate (α-NA) and β-naphthyl acetate (β-NA) were obtained from Fluka, and oxydemeton-methyl from Accustandard. 1-chloro-2,4-dinitrobenzene (CDNB), 1,2-dichloro-4-nitrobenzene (DCNB) were purchased from Merck, Germany.

Bioassay

The toxicities of oxydemeton-methyl to the susceptible and resistant strains of two-spotted spider mite were assayed using the dipping method. The formulated oxydemeton-methyl was diluted with distilled water to generate five serial dilutions. The leaf disk (diameter 3.5cm) was immersed in the dilutions for 45s. After drying, adult mites were placed on each treated leaf disk on wet cotton in a petri dish. Up to 10 adults were placed on each leaf disk. Mortality was assessed after the treated mites were maintained at 25 ± 2° C, 70 ± 10 RH and 16:8 (L:D) for 48h. Mites that could walk at least one body length after a gentle probe with a fine brush were scored alive. Bioassay data were analyzed for LD50 values and their 95% confidence intervals (95% CL) using the POLO-PC computer program (LeOra Software 1987). Resistance factors (RF) were calculated by dividing the LD50 value of the resistant strain by the LD50 value of the susceptible strain.

Determination of esterase activity

Adults were homogenized in ice-cold 0.2 M phosphate buffer (pH 7.0) containing 0.05 % triton X-100. After the homogenates were centrifuged at 10000 g for 12 min at 4°C. The esterase activity was measured according to van Asperen's method (van Asperen, 1962). The substrate was α-NA and β-NA. Fifteen µl of supernatant was added to a microplate containing 35 µl 0.2 M, pH 7.0, phosphate buffer per well. The addition of 100 µl substrate per well (0.65 mM in buffer) initiated a reaction. After incubation for exactly 10 min at room temperature, 50 µl of fast blue RR salt was added and the microplate left in the dark for 30 min. Absorbance at 450 nm (OD450) was then measured in a microplate reader (Awareness stat fax® 3200).

Determination of glutathione S-transferase (GST)

GST activity was measured using 1-chloro-2,4-dinitrobenzene (CDNB), 1,2-dichloro-4-nitrobenzene (DCNB) and reduced GSH as substrates with slight modifications according to Habig et al. (1974) in 96-well microplates. The total reaction volume per well of a 96-well microplate was 300 µl, consisting of 100 µl, supernatant, CDNB (or DCNB) and GSH in buffer, giving final concentrations of 0.4 and 4mM of CDNB (or DCNB) and GSH, respectively. The non-enzymatic reaction of CDNB (or DCNB) with GSH measured without supernatant served as control. The change in absorbance was measured continuously for 10 min at 340nm in a Thermomax kinetic microplate reader (Awareness stat fax® 3200).

AChE kinetics

Mites were homogenized in ice-cold 0.2 M phosphate buffer (pH 7.0) containing 0.1% triton X 100. After the homogenates were centrifuged at 10000 g for 15 min at 4 °C. AChE activity was measured according to the methods of Stumpf et al. (2001) with some modifications. Fifty microliters of the enzyme source was added to each well of microplate containing 140 µl of 0.2 M phosphate buffer (pH 7.0) and 20 µl DTNB solution. Then 40 µl of ATC was added to each well. The concentrations of the substrate were changed from 0.01 mM to 10 mM to evaluate the Michaels's constant (*Km*). Optical density was measured at 415 nm with a Microplate Reader (Awareness Stat fax® 3200).

Inhibition assay

The enzyme was preincubated with inhibitor at 37°C for 15 min. After preincubation, the ATC substrate was added to the mixture (containing 0.2 M phosphate buffer (pH 7.0) and DTNB). The remaining activity was determined at 30 min following preparation of the reaction mixture. Optical density was measured at 415 nm with a Microplate Reader (Awareness stat fax® 3200). I50 values for the AChE of susceptible and resistant strains were estimated by probit analysis using the POLO-PC computer program.

RESULTS

Resistance levels in bioassay

Table 1 summaries the toxicological data for susceptible and resistant strains exposed to oxydemeton-methyl. The resistance ratio of the resistant strain was 20.47.

Activity of esterase

The measured esterase activity of the resistant strain was significantly higher than that of the susceptible strain (t-test $P < 0.001$). The esterase activity of the resistant strain was 2.5 and 2.14- fold higher than those of the susceptible strain for α-NA and β-NA respectively (Fig. 1).

Activity of GST

The measured glutathione S-transferase activity of the resistant strain was significantly higher than that of the susceptible strain (t-test $P < 0.001$). The glutathione s-transferase activity of the resistant strain was 1.75 and 1.27-fold higher than those of the susceptible strain for CDNB and DCNB, respectively (Fig. 2).

Kinetic analysis of AChE.

The effect of substrate concentrations on AChE activity were investigated using ATC and BTC. The different specificities of AChE in resistant and susceptible strains toward two substrates are summarized in Table 2. *Km* values suggest that AChE in resistant strain was kinetically different from that in susceptible strain, indicating qualitative differences among enzymes in two strains. The kinetic study indicated that AChE from the resistant strain had 1.55 and 2.16-fold lower affinities to substrates ATC and BTC than the susceptible strain, respectively. AChE of the susceptible strain showed significantly higher affinity toward BTC than AChE of the resistant strain, suggesting that a modification of the enzyme catalytic site might be present in the AChE from the resistant mite.

Inhibition of AChE by oxydemeton-methyl and paraoxon

A comparison of the I50 values of the susceptible and resistant strains showed

3.49 and 7.8-fold resistance to oxydemeton-methyl and ethyl paraoxon, respectively (Table 3, Fig. 3).

DISCUSSION

Metabolic resistance mechanisms seem to be most important in arthropod species exhibiting resistance to organophosphate and carbamate pesticides (Ghadamyari, et al., 2008 a & b; Devonshire et al., 1982; Moores et al., 1994; Kono and Tomita, 1992). Our results showed that probably glutathione S-transferase was related to oxydemeton-methyl resistance in *T. urticae*, and there is 1.75-and 1.27-fold increase in glutathione S-transferase activity in the resistant strain, when CDNB and DCNB were used as substrate respectively. GSTs are detoxification enzymes frequently associated with insecticides resistance, particularly OP resistance (Soderlund and Bloomquist, 1990; Yu, 1996). These enzymes may act as binding proteins increasing the activity of other pesticide detoxification enzymes such as esterases (Grant and Matsumura, 1994).

Also esterases have a main role in resistance of *T. urticae* to oxydemeton-methyl (fig.1). These enzymes probably sequester or degrade insecticide esters before they reach their target sites in the nervous system. This mechanism seems to be important in the insecticide resistance of *Culex* mosquitoes (Mouches et al., 1986; Kono and Tomita, 1992; Tomita et al., 1996) and *Aphis gossypii* (Suzuki et al., 1993). The relationship between the enzymes which catalyze hydrolysis of β-NA and degredation of malathion was studied in resistance and susceptible strains of *T. kanzawai* Kishida by Kuwahara (1981). Their results showed that resistance to malathion was associated with increased esterase activity at E3 and E4 bonds on which the main peak of malathion degradation was detected. Although metabolic detoxification mechanisms are implicated, insensitive AChE is considered the principal mechanism of resistance to oxydemeton-methyl in *T. urticae*. The occurrence of pesticide-insensitive AChE in spider mite was first demonstrated by Smissaert (1964). The present study indicates that the resistant strain possesses an altered AChE with decreased sensitivity to inhibition by oxydemetn-methyl and paraoxon and decreased affinity to ATC and BTC substrates. The *Km* values for ATC determined in our study were 95 and 61 μM for the insensitive and sensitive forms of AChE, respectively (Table 2). Our results agree well with those reported by Anazawa et al. (2003) with respect to the involvement of insensitive AChE in conferring OP resistance in *T. urticae*. Because AChE from the resistant strain had reduced affinity to ATC and BTC (i.e. increased *Km* values) and reduced sensitivity to inhibition by oxydemetn-methyl and paraoxon (i.e. increased I_{50} values) compared with AChE from susceptible strain, it is clear that the resistant strain possesses qualitatively altered AChE. Recent molecular investigations suggest that some amino acid substitutions in the AChE of *T. urticae* may result in different responses of the altered AChEs to different substrates and inhibitors (Anazawa et al., 2003). At present the only biochemical tests available for monitoring insensitive AChE in the field based on inhibition assays (Bourguet et al., 1996). It will be difficult to develop for mites due to their minute size (Stumpf et al., 2001). Therefore the amino acid sequences of AChE in Iranian strains need to be analyzed.

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Table1. Log dose probit-mortality data for oxydemeton-methyl against susceptible and resistant strain of *T. urticae*

Strain	Insecticide	n	LD_{50} (95% CI)[a]	Slope ± SE	χ^{2} [b]	RR[c]
Resistant	oxydemeton-methyl	245	4675.9 (4473- 4892)	10.79± 1.36	0.88	20.47
Susceptible	oxydemeton-methyl	250	228.6 (191-268)	2.5 ± 0.27	1.11	

[a]LD_{50} values and their CI are expressed in ppm formulated pesticide

[b]Values of χ^2 smaller than 7.81 ($p < 0.05$) considered to be represented satisfactory agreement between observed and expected results.

[c]Resistance ratio, LD_{50} of resistant strain/LD_{50} of susceptible strain

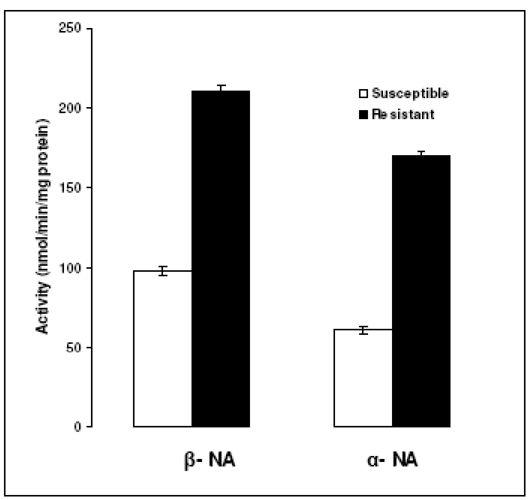

Fig.1. Esterase activity in resistant and susceptible strains of *T. urticae*

Table 2. *Km* and V_{max} values of AChE in resistant and susceptible strains of *T. urticae*.

Substrate	Strain	K_m (µM) (±SD)	V_{max} (ΔOD/30min/mite) (±SD)
ATC	resistant	95± 5.2	5 ± 0.4
	susceptible	61± 4.1	4.33 ± 0.31
BTC	resistant	337±32	3.2±0.27
	susceptible	156±23	2.9±0.23

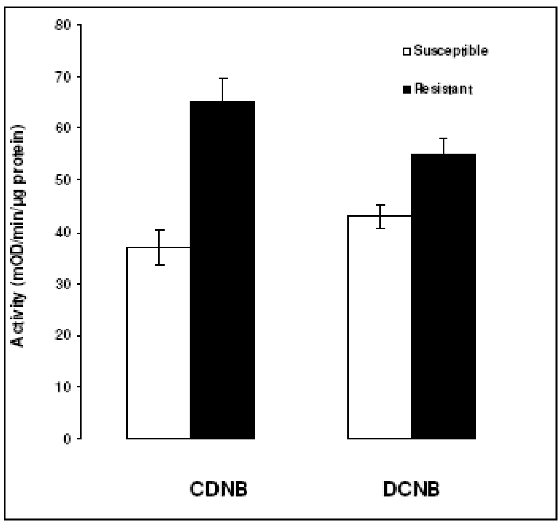

Fig.2. GST activity in resistant and susceptible strains of *T. urticae*

Table 3. I_{50} values of oxydemeton-methyl and paraoxon on AChE from susceptible and resistant strains of *T. urticae*

Inhibitor	I_{50} (M) (95%CI)		IR (95%CI)[a]
	Resistant	Susceptible	
Oxydemeton-methyl	2.68×10^{-6}	7.79×10^{-7}	3.49 (2.82-4.37)
	(2.3×10^{-6}- 3.15×10^{-6})	(6.6×10^{-7}- 9×10^{-7})	
Paraoxon	6.5×10^{-6}	8×10^{-7}	7.8(5.2- 11.8)
	(5.4×10^{-6}- 7.8×10^{-6})	(5.2×10^{-7}- 12.2×10^{-7})	

[a] Insensitivity ratio= I_{50} for resistant strain/susceptible strain and confidence interval (CI)

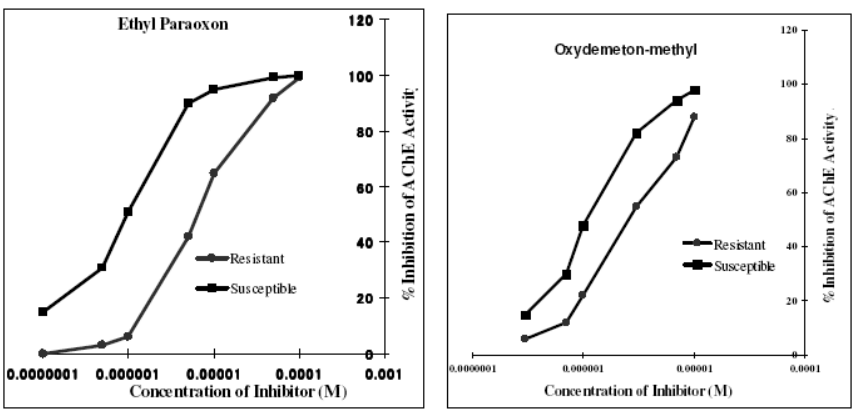

Fig. 3. Inhibition of AChE from *T. urticae* by oxydemeton-methyl and ethyl paraoxon

SUBSTITUTE NAMES FOR TWO PREOCCUPIED MOTH GENERA NAMES DESCRIBED BY J. F. G. CLARKE FROM CHILE (LEPIDOPTERA: OECOPHORIDAE)

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[Özdikmen, H. 2009. Substitute names for two preoccupied moth genera names described by J. F. G. Clarke from Chile (Lepidoptera: Oecophoridae). Munis Entomology & Zoology, 4 (1): 114-116**]**

ABSTRACT: Two junior homonym genus group names were detected among the moth genus group names. All names were described by J. F. G. Clarke from Chile. So, the following replacement names are herein proposed: *Nagehana* nom. nov. for *Retha* Clarke, 1978 and *Hozbeka* nom. nov. for *Talitha* Clarke, 1978. Accordingly, new combinations are herein proposed for the species currently included in these genus group names. *Nagehana rustica* (Clarke, 1978) comb. nov. and *Hozbeka anomala* (Clarke, 1978) comb. nov..

KEY WORDS: nomenclatural change, homonymy, replacement name, Lepidoptera, Gelechoidea, Oecophoridae.

Two previously proposed genus group names in the moth family Oecophoridae are nomenclaturally invalid, as the genus group names have already been used by a different authors in Mollusca and Thysanoptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus names.

Family OECOPHORIDAE
Subfamily OECOPHORINAE
Genus *NAGEHANA* nom. nov.

Retha Clarke, 1978. Smithsonian Contr. Zool. No. 273: 58. (Insecta: Lepidoptera: Gelechioidea: Oecophoridae: Oecophorinae). Preoccupied by *Retha* Cox, 1965. J. Paleont. 39: 731. (Mollusca: Bivallia: Hippuritacea: Caprinidae).

Remarks on nomenclatural change: The generic name *Retha* was initially introduced by Cox, 1965 for an objective replacement name for *Ethra* Matheron, 1878 that preoccupied by *Ethra* Laporte, 1833 (Coleoptera) in Bivalvia. Later Clarke, 1978 described a moth genus under the same generic name (with the type species *Retha rustica* Clarke, 1978 by original designation). *Retha* Clarke, 1978 is still used as a valid genus name in Lepidoptera (Oecophoridae). Recently Beeche (2003) described two new species from Central Chile for this genus. Thus, the genus name *Retha* Clarke, 1978 is a junior homonym of the genus *Retha* Cox, 1965. So I propose a new replacement name *Nagehana* nom. nov. for the genus name *Retha* Clarke, 1978.

Etymology: This genus name is dedicated to my student Nagehan Ramazanoğlu (Turkey).

Summary of nomenclatural changes:

Nagehana **nom. nov.**
pro *Retha* Clarke, 1978 (non Cox, 1965)

Nagehana rustica (Clarke, 1978) **comb. nov.**
from *Retha rustica* Clarke, 1978

Subfamily DEPRESSARIINAE
Genus *HOZBEKA* nom. nov.

Talitha Clarke, 1978. Smithsonian Contr. Zool. No. 273: 9. (Insecta: Lepidoptera: Gelechioidea: Oecophoridae: Depressariinae). Preoccupied by *Talitha* Faure, 1958. J. ent. Soc. sth. Afr. 21: 16. (Insecta: Thysanoptera: Phlaeothripidae: Phlaeothripinae).

Remarks on nomenclatural change: The moth genus *Talitha* Clarke, 1978 was established for a genus with the type species *Talitha anomala* Clarke, 1978 by original designation in the family Oecophoridae. It was placed in Depressariinae by Becker (1984). Nevertheless the name *Talitha* is already occupied. Faure (1958) described a thrips genus *Talitha* with the type species *Talitha fusca* Faure, 1958 in Thysanoptera. It has currently 3 species as *T. cincta* Faure, 1958, *T. fusca* Faure, 1958 *and T. grandifera* Faure, 1958. Thus the moth genus *Talitha* Clarke, 1978 is a junior homonym of *Talitha* Faure, 1958. So I suggest here that *Talitha* Clarke, 1978 should be replaced with new name *Hozbeka* as a replacement name.

Etymology: This genus name is dedicated to my student Hüseyin Özbek (Turkey).

Summary of nomenclatural changes:

Hozbeka **nom. nov.**
pro *Talitha* Clarke, 1978 (non Faure, 1958)

Hozbeka anomala (Clarke, 1978) **comb. nov.**
from *Talitha anomala* Clarke, 1978

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THREE NEW RECORDS OF *ALEUROVIGGIANUS* IACCARINO (HEMIPTERA: STERNORRHYNCHA: ALEYRODIDAE) FROM IRAN WITH IDENTIFICATION KEY

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[Ghahari, H., Ko, C.-C. & Ostovan, H. 2009. Three new records of *Aleuroviggianus* Iaccarino (Hemiptera: Sternorrhyncha: Aleyrodidae) from Iran with identification key. Munis Entomology & Zoology, 4 (1): 117-120**]**

ABSTRACT: A total of three *Aleuroviggianus* species including, *A. adrianae* Iaccarino, *A. halperini* Bink-Moenen, and *A. zonalus* Bink-Moenen were identified for the first time from Iran. Identification key, host plants and distributional data are given in this paper.

KEYWORDS: Aleyrodidae, *Aleuroviggianus*, New record, *Quercus*, Iran

The plant genus *Quercus* (Fagales: Fagaceae), commonly known as oaks, comprises species which are deciduous or evergreen trees or shrubs. There is not any literature about the exact number of *Quercus* species, but probably 500 species exist in different regions of the world (Weeda et al, 1985). Oaks have a mainly Holarctic distribution but in the Old World they extend from Europe to the Atlas Mountains of North Africa, and in the mountains of Asia they can be found as high as 3000 m above sea level (Camus 1939). In a total of 14 oak tree species including, *Q. brandtii*, *Q. calliprinos*, *Q. cardochorum*, *Q. castanefolia*, *Q. coccifera*, *Q. iberica*, *Q. infectoria*, *Q. komarovii*, *Q. libani*, *Q. macranthera*, *Q. persica*, *Q. petraea* var. *iberica*, *Q. ithaburensis*, *Q. rotundifolia* (Kiabi *et al.* 1993; Modarres Awal 1997; Ghahari et al, 2008) were identified from different regions of Iran.

The family Aleyrodidae comprising 1556 accepted species names in 161 genera (Martin and Mound 2007). The most common species which attack to the oak trees are *Aleuroviggianus* spp. This genus is a pen-Mediterranean genus with six included species, and yet none of these six had been described in Bink-Moenen and Gerling (1990) and four more by Bink-Moenen (1992). However all these species feed only on evergreen oaks (Martin et al, 2000). Totally six *Aleuroviggianus* species were identified from all over the world so far which all of them are from West Palearctic especially Mediterranean region.

The whitefly fauna of Iran is very diverse but unknown. Although, there have been a number of publications of whiteflies in different regions (Kiriukhin 1947; Zarrabi 1991, 1998a, b; Ghahari & Hatami 2001; Manzari and Alemansoor, 2005), but there has been no account of the group across the whole region. The whiteflies species which recorded from the oak leaves are *Bemisia tabaci* Gennadius (Alemansoor 1992; Ghahari et al, 2007). In the present research the genus *Aleuroviggianus* Iaccarino 1982 as one of the oaks' pests in Mediterranean and Middle East regions is studied.

MATERIALS AND METHODS

The faunstic on which our work is based have been conducted by the collection of whitefly puparia and prepared in the method of Bink (1979). The illustration of each species show the dorsal half of a pupal case on the left and the ventral side on the right, also the margin, submargin around the tracheal pore area and the vasiform orifice, along with other necessary details. The characters were described as observed in mounted pupal cases, except for the coloration and wax cover that were described from intact specimens. The terminologies used were those of Bink-Moenen (1983) and Martin (1985). Distribution data and host plants were adapted from Bink-Moenen (1992), Martin et al, (2000) and Evans (2007). The aleyrodid specimens of this paper are preserved in HGCol (Hassan Ghahari Collection).

Acronyms Depositories of *Aleuroviggianus* Types

BMCol Bink-Moenen Collection, Netherlands
BMNH British Museum Natural History Museum, London, UK
UNP Universita degli Studi di Napoli, Portici, Italy

RESULTS

Totally three *Aleuroviggianus* species including, *A. adrianae* Iaccarino, *A. halperini* Bink-Moenen, and *A. zonalus* Bink-Moenen were collected and identified for the first time from Iran. All these species were collected from the leaves of oak trees including, *Quercus rotundifolia*, *Q. iberica* and *Q. coccifera*, respectively.

Genus *Aleuroviggianus* Iaccarino 1982

Aleuroviggianus Iaccarino 1982: 37. Type species. *Aleuroviggianus adrianae* Iaccarino 1982, by original designation.

Aleuroviggianus adrianae Iaccarino 1982

Aleuroviggianus adrianae Iaccarino 1982: 38. Holotype. Italy: Portici, on Quercus ilex, UNP
Distribution. Europe and Mediterranean countries including, Greece, Corfu, Corsica, Egypt, Italy, France, Morocco, Sardinia, Sicily, Spain (Bink-Moenen, 1992; Evans, 2007).
Host plant. *Quercus ilux*, *Q. rotundifolia*, *Q. suber* (Fagaceae) (Bink-Moenen, 1992; Evans, 2007).
Material examined. Mazandaran province: Savadkooh (780 m), 9.viii.1997 (H. Ghahari) on *Quercus rotundifolia*.
Natural enemies of the world: *Amitus vesuvianus* Viggiani & Mazzone 1982 (Platygastridae); *Encarsia aleuroilicis* Viggiani 1982 (Aphelinidae) (Evans, 2007).
Comment: The pupal case is distinguishable by its black colour, tuberculate dorsum, elongate shape and the obscured lingula tip, the adult by the elongate labial tip with its almost cylindrical distal end.

Aleuroviggianus halperini Bink-Moenen 1992

Aleuroviggianus halperini Bink-Moenen 1992, in Bink-Moenen and Gerling 1991: 14. Holotype. Israel: Mt. Meron, ix.1976, R. Neeman, on Quercus calliprinos, Bink-Moenen Col.
Distribution: Europe and Mediterranean countries including, Crete, Greece, Israel, Rhodes, Turkey (Bink-Moenen, 1992; Evans, 2007).
Host plants: *Quercus calliprinos*, *Q. coccifera*, *Q. ithaburensis* (Fagaceae) (Bink-Moenen, 1992; Evans, 2007).

Material examined: Kermanshah province, Kermanshah (1294 m), 6.ix.2002 (H. Ghahari) on *Quercus iberica*. Guilan province, Rasht (39 m), 14.vii.2003 (H. Ghahari) on *Q. calliprinos*.
Comment: The general outline of the pupal case of *A. halperini* is most similar to that of *A. adrianae*, but is distinguishable by its broader shape, presence of thoracic tracheal pores in the apparent margin and thoracic tracheal combs in the real margin, elongate shape of the vasiform orifice and large exposed lingula tip. A parasitoid, *Eretmocerus* sp. was reared from *A. halperini*.

Aleuroviggianus zonalus Bink-Moenen 1992

Aleuroviggianus zonalus Bink-Moenen 1992: 33. Holotype pupal case. Greece: on *Quercus coccifera*, BMNH.
Distribution: Europe and Mediterranean countries including, Albania, Greece, Corfu, Crete, Kos, Rhodes, Turkey (Bink-Moenen, 1992; Evans, 2007).
Host plant. *Quercus coccifera* (Fagaceae) (Bink-Moenen, 1992; Evans, 2007).
Material examined: Kordestan province, Sanandaj (1500 m), 11.vi.2001 (H. Ghahari) on *Quercus coccifera*.
Comment: The pupal case of this species is easily distinguishable by the typical colour pattern and the absence of the first abdominal setae.

Key to Iranian *Aleuroviggianus* species (Pupal cases)

1- Segment VII not visible medially 2
1'- Segment VII visible medially .... *A. zonalus*
2- Lingula tip not, or just, exposed .... *A. adrianae*
2'- Lingula tip exposed .... *A. halperini*

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NOMENCLATURAL CHANGES FOR THREE PREOCCUPIED AUSTRALIAN SPIDER GENERA DESCRIBED BY R. R. FORSTER (ARACHNIDA: ARANEAE)

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[**Özdikmen, H.** 2009. Nomenclatural changes for three preoccupied Australian spider genera described by R. R. Forster (Arachnida: Araneae). Munis Entomology & Zoology, 4 (1): 121-124**]**

ABSTRACT: Three junior homonyms were detected among the Australian spider genera and the following replacement names are proposed: *Novohaurokoa* nom. nov. for *Haurokoa* Forster & Wilton, 1973 (Tengellidae); *Zelanda* nom. nov. for *Taieria* Forster, 1979 (Gnaphosidae) and *Queenslandiana* nom. nov. for *Toddiana* Forster, 1988 (Cyatholipidae). Accordingly, new combinations are herein proposed for the species currently included in these genera: *Novohaurokoa filicicola* (Forster & Wilton, 1973) comb. nov.; *Zelanda elongata* (Forster, 1979) comb. nov.; *Zelanda erebus* (Koch, 1873) comb. nov.; *Zelanda kaituna* (Forster, 1979) comb. nov.; *Zelanda miranda* (Forster, 1979) comb. nov.; *Zelanda obtusa* (Forster, 1979) comb. nov.; *Zelanda titirangia* (Ovtsharenko, Fedoryak & Zakharov, 2006) comb. nov. and *Queenslandiana daviesae* (Forster, 1988) comb. nov..

KEY WORDS: nomenclatural changes, homonymy, replacement names, Australia, New Zealand, spider, Araneae.

Three previously proposed Australian genus group names in Araneae are nomenclaturally invalid, as the genus group names have already been used by a different authors in Mollusca and Lepidoptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus names.

TAXONOMY

Family TENGELLIDAE
Genus *NOVOHAUROKOA* nom. nov.

Haurokoa Forster & Wilton, 1973. Otago Mus.Bull.No.4: 299. (Arachinda: Araneae: Tengellidae). Preoccupied by *Haurokoa* Fleming, 1955. Trans. roy. Soc. N.Z., 82, 1055. (Mollusca: Gastropoda: Cymathidae: Cymathinae).

Remarks: The name *Haurokoa* was initially introduced by Fleming, 1955 for a genus of the gastropod family Cyathidae (with the type species *Agrobuccinum* (*Haorukoa*) *woodi* Fleming, 1955 from New Zealand). It is described firstly in the genus *Agrobuccinum* Hermannsen, 1846 as a subgenus. Subsequently, Forster & Wilton, 1973 erected a new spider genus of the family Psechridae (with the type species *Haurokoa filicicola* Forster & Wilton, 1973 from New Zealand) under the same generic name (Platnick, 2008a). It was transferred by Raven & Stumkat (2003) in the family Tengellidae. Thus, the genus *Haurokoa* Forster & Wilton, 1973 is a junior homonym of the genus *Haurokoa* Fleming, 1955. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus *Haurokoa* Forster & Wilton, 1973 the new replacement name *Novohaurokoa* **nom. nov.**

Etymology: from the Latin name "nova" (meaning "new" in English) + preexisting genus name *Haurokoa*.

Summary of nomenclatural changes:

Novohaurokoa **nom. nov.**
= *Haurokoa* Forster & Wilton, 1973 (nec Fleming, 1955)

Novohaurokoa filicicola (Forster & Wilton, 1973) **comb. nov.**
from *Haurokoa filicicola* Forster & Wilton, 1973
Distr.: New Zealand

Family GNAPHOSIDAE
Genus *ZELANDA* nom. nov.

Taieria Forster, 1979. Otago Mus. Bull. No. 5: 48. (Arachnida: Araneae: Gnaphosidae). Preoccupied by *Taieria* Finlay & Marwick, 1937. Palaeont. Bull. N.Z., 15, 67. (Mollusca: Gastropoda: Cassidae).

Remarks: The generic name *Taieria* Finlay & Marwick, 1937 was proposed for a genus of Gastropoda with the type species *Taieria allani* Finlay & Marwick, 1937 from New Zealand. The genus is still used as a valid generic name as a subgenus of the genus *Galeodea* Link, 1807 in Gastropoda. Subsequently, the generic name *Taieria* Forster, 1979 was introduced for a new spider genus (with the type species *Megamyrmaekion erebum* (Koch, 1873) of the family Gnaphosidae (Platnick, 2008b). Thus, the genus *Taieria* Forster, 1979 is a junior homonym of the genus *Taieria* Finlay & Marwick, 1937. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus *Taieria* Forster, 1979 the new replacement name *Zelanda* **nom. nov.**

Etymology: from the Turkish name "Zelanda" (meaning "Zealand" in English).

Summary of nomenclatural changes:

Zelanda **nom. nov.**
= *Taieria* Forster, 1979 (nec Finlay & Marwick, 1937)

Zelanda elongata (Forster, 1979) **comb. nov.**
from *Taieria elongata* Forster, 1979
Distr.: New Zealand

Zelanda erebus (Koch, 1873) **comb. nov.**
from *Taieria erebus* (Koch, 1873)
Megamyrmaekion erebum (Koch, 1873)
Distr.: New Zealand

Zelanda kaituna (Forster, 1979) **comb. nov.**
from *Taieria kaituna* Forster, 1979
Distr.: New Zealand

Zelanda miranda (Forster, 1979) **comb. nov.**
from *Taieria miranda* Forster, 1979
Distr.: New Zealand

Zelanda obtusa (Forster, 1979) **comb. nov.**
from *Taieria obtusa* Forster, 1979
Distr.: New Zealand

Zelanda titirangia (Ovtsharenko, Fedoryak & Zakharov, 2006) **comb. nov.**
from *Taieria titirangia* Ovtsharenko, Fedoryak & Zakharov, 2006
Distr.: New Zealand

Family CYATHOLIPIDAE
Genus *QUEENSLANDIANA* nom. nov.

Toddiana Forster, 1988. Otago Mus Bull 6: 31. (Arachnida: Araneae: Cyatholipidae). Preoccupied by *Toddiana* Kiriakoff, 1973. Bull. Annls. Soc. r. ent. Belg. 109: 42. (Insecta: Lepidoptera: Noctuoidea: Notodontidae).

Remarks: The genus *Toddiana* was proposed by Kiriakoff, 1973 as an objective replacement name for the genus *Toddia* Kiriakoff, 1967 that preoccupied by the genus *Toddia* Franca, 1911 (Protozoa) with the type species *Fentonia eingana* Schaus, 1928 by original designation from China in the moth family Notodontidae. Later, the genus *Toddiana* was described by Forster, 1988 with the type species *Toddiana daviesae* Forster, 1988 by monotypy from Queensland (Platnick, 2008c). However, the name *Toddiana* Forster, 1988 is invalid under the law of homonymy, being a junior homonym of *Toddiana* Kiriakoff, 1973. In accordance with article 60 of the International Code of Zoological Nomenclature, I propose to substitute the junior homonym name *Toddiana* Forster, 1988 for the nomen novum *Queenslandiana*.

Etymology: The name is dedicated to Queensland (Australia).

Summary of nomenclatural changes:

Queenslandiana **nom. nov.**
= *Toddiana* Forster, 1988 (nec Kiriakoff, 1973)

Queenslandiana daviesae (Forster, 1988) **comb. nov.**
from *Toddiana daviesae* Forster, 1988
Distr.: Australia (Queensland)

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FAUNISTIC STUDY ON TWO SISTER PLAIN (BAFRA AND ÇARŞAMBA) AQUATIC COLEOPTERA FAUNA IN TURKEY: TWO SIMILAR GEOGRAPHY BUT RATHER DIFFERENT FAUNA, WITH A NEW RECORD

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[**İncekara, Ü., Darılmaz, M. C., Mart, A., Polat, A. & Karaca, H.** 2009. Faunistic study on two sister plain (Bafra and Çarşamba) aquatic Coleoptera fauna in Turkey: Two similar geography but rather different fauna, with a new record. Munis Entomology & Zoology, 4 (1): 125-138**]**

ABSTRACT: 50 species of aquatic Coleoptera belonging to five families and 24 genera, were collected from the Bafra and Çarşamba plain (Samsun province) in the North part of Turkey, between May 2007-June 2008 have been established and compared faunistically. Rather different fauna have been found in both plain respectively. *Helophorus strigifrons* Thomson, 1868 is recorded from Turkey for the first time. All species are newly recorded from the research area.

KEY WORDS: Aquatic Coleoptera, Faunistics, Samsun Province, Plains, Turkey.

In this study, we identified and compared the fauna of two big plains (lowlands**;** Bafra and Çarşamba) which are situated closely each other (100 kms) and which have similar climatic and geographic structure.

Kızılırmak river is the longest running water in Turkey which runs down to Bafra district, leaves behind wide and alluvial soil while falling down onto the sea from Bafra bay. This way, Bafra plains of 47727 hectares took shape. Northern parts of the plains are arid land.

The Lakes being basic habitat of water beetles in Bafra plains took shape after the hollows filled up. Among these Lakes are Karaboğaz Liman, Dutdibi, Uzungöl, Hayırlı, İncegöl, Çernek, Tombul and Balık Lakes are noteworthy. Most of these Lakes are quite rich in water products and are economically important.

Liman Lake is at a distance of 20 kms to Bafra. The Lake of 3 km size opens up to sea through several branches. Length of such branches is 2 km at some points. Liman Lake is neighboured by Balık Lake to the south and neighboured by Karaboğaz Lake to the north.

Yeşilırmak River runs down to Çarşamba district and falls down onto Black Sea from Civa Bay and, thus, gives birth to Çarşamba plains, while, at the same time, dividing up the plains in two parts. Surface area of Çarşamba plains is 89.500 hectares. 70% of the land has been rendered fit for agriculture. The remaining 30% is composed of forests, reed-beds and quicksands.

There are many Lakes in the plains, both small and large. Two large Lakes are Simenit and Akgöl. Both Lakes are used for commercial fishing.

Simenit Lake took shape after displacement of the bed of Terme brook. The Lake situated at a distance of 20 kms to Terme looks like two Lakes interconnected by means of a canal. The Lake is fed by rainfalls during winter and, from time to time, during stormy weather, is filled with overrunning sea water. Some of other Lakes of small surface area in the studied area get dry during summer and get water again during winter. Several Lakes combine at times of abundant rainfalls and, thus, turn into a single Lake. These are Dumanlı, Akmaz, Kocagöl, Sazlık, Çilme, Körırmak and Akarcık Lakes.

Both plains exhibit the characteristics of a Black Sea climate. Summer is hot and winter is warm and rainy. The number of days spent under snow is just 2 or 3. Altitude of both plains above the sea level is less than 1 meter at most of the spots. It is difficult to find permanent hydrophilous habitats beyond the Lakes. And most of the temporary habitats are rice fields. No faunistic study on the aquatic Coleoptera has been conducted in the studied area before.

MATERIALS AND METHODS

Specimens of aquatic Coleoptera were collected in various parts of two plain (Bafra ve Çarşamba) (Figs. 1a,b) in different surveys between May 2007-October 2007 and May 2008-June 2008). For collecting aquatic beetles, sweeping the water with a metal sieve or net was the main method; in some cases, a drag-type net was used. All captured samples were separated by forceps. Sorting was performed wet or dry in a flat white tray. The beetles preserved as dry or in 95% alcohol, which was replaced by 75% alcohol and 5% glycerin mix after 24 hours.

A list of species is given. For each species the detailed locality records contains sampling locations, date of sampling and total number of individuals are given. The Lakes placed in the research areas and their being main sampling stations, are indicated in figure I.

LIST OF SPECIES

BAFRA PLAIN

Family HELOPHORIDAE

Helophorus micans Falderman, 1835

Material examined: Ondokuzmayıs, Gernek Lake, 07.V.2008, 41° 38' 50K, 36° 04' 44D, 0m, 2 males. **Distribution in Turkey:** Aksaray, Antakya, Balıkesir, Burdur, Diyarbakır, Erzurum, İzmir, Rize, Trabzon and Tuz Lake (İncekara, 2001, 2004; Karaman et al. 2008).

Helophorus brevipalpis Bedel, 1881

Material examined: Kızılırmak, 30.V.2007, 41° 35' 14K, 35° 53' 66D, 14m, 17 males, 13 females; Arız, 35.VII.2007, 41° 36' 38K, 35° 50' 37D, 2m, 3 males, 7 females. **Distribution in Turkey:** Ankara, Antalya, Artvin, Bursa, Diyarbakır, Erzurum, Erzincan, İstanbul, İzmir, Kahramanmaraş, Kırklareli, Muğla, Niğde, Samsun, Sinop, Trabzon and Van (İncekara et al. 2005; Karaman et al. 2008).

Helophorus daedalus d' Orchymont, 1932

Material examined: Ondokuzmayıs, 26.VI.2007, 41° 35' 31K, 36° 06' 44D, 2m, 1 male. **Distribution in Turkey:** Diyarbakır, Erzurum, Erzincan, İzmir and Van (İncekara, 2001, 2004).

Helophorus griseus Herbst, 1793

Material examined: Ondokuzmayıs, 07.V.2008, 41° 29' 51K, 36° 04' 12D, 27 m, 1 male. **Distribution in Turkey:** Aydın, Bursa, Edirne, Erzincan Erzurum, Gümüşhane, İstanbul and Kayseri) (İncekara, 2004; Kıyak et al. 2006).

Helophorus strigifrons Thomson, 1868

Material examined: Bafra, Liman Lake, 07.V.2008, 41° 41' 09K, 36° 01' 12D, 0m, 2 males. **Remark:** *H. Strigifrons* is recorded from Turkey for the first time. Additional material also examined from another province (Sivas, Zara, Tödürge Lake, 05.VII.2003, 1 male).

Helophorus obscurus Mulsant, 1844

Material examined: Kızılırmak, 30.V.2007, 41° 35' 14K, 35° 53' 66D, 14m, 1 male. **Distribution in Turkey:** Artvin, Bolu, Bursa, Erzincan, Erzurum, İstanbul, Kırklareli, Sinop and Trabzon (İncekara et al. 2004; Karaman et al. 2008).

Helophorus aquaticus (Linnaeus, 1758)

Material examined: Kızılırmak, 30.V.2007, 41° 35' 14K, 35° 53' 66D, 14m, 2 females. **Distribution in Turkey:** Ankara, Bingöl, Bursa, Bolu, Diyarbakır, Erzurum, Erzincan, İstanbul, Kars, Kırklareli, Mardin, Muş, Rize, Sinop and Van (İncekara, 2001, 2004).

Helophorus syriacus Kuwert, 1885

Material examined: Ondokuzmayıs, 07.V.2008, 41° 29' 51K, 36° 04' 12D, 27 m, 3 males. **Distribution in Turkey:** Adana, Antakya, Amonos dağları, Denizli, Diyarbakır, Erzincan and Mardin (İncekara, 2004).

Helophorus terminassianae Angus, 1984

Material examined: Liman Lake, 07.V.2007, 41° 41' 09K, 36° 01' 12D, 0m, 1 male, 3 females, 07.V.2008, 41° 41' 09K, 36° 01' 12D, 0m, 2 males. **Distribution in Turkey:** Erzurum, Erzincan, İzmir and Konya (İncekara, 2004).

Family HYDROPHILIDAE

Hydrobius fuscipes (Linnaeus, 1758)

Material examined: Ondokuzmayıs, 07.V.2008, 41° 29' 51K, 36° 04' 12D, 27 m, 1 male. **Distribution in Turkey:** Erzincan (İncekara, 2004).

Coleostoma orbiculare (Fabricius, 1775)

Material examined: Ondokuzmayıs, Balık Lake, 41° 33' 08K, 36° 04' 52D, 0m, 3 males, 1 female, 41° 35' 16K, 36° 06' 41D, 0m, 2 males; Bafra, Gernek Lake, 07.V.2008, 41° 38' 50K, 36° 04' 44D, 0m, 2 males, 4 females, Liman Lake, 07.V.2008, 41° 41' 09K, 36° 01' 12D, 0m, 3 males, 3 females. **Distribution in Turkey:** Ankara, Erzurum, Trabzon (İncekara et al. 2003; Karaman et al. 2008).

Berosus signaticollis (Charpentier, 1825)

Material examined: Ondokuzmayıs, Balık Lake, 07.V.2008; 41° 29' 51K, 36° 04' 12D, 0m, 6 males, 11 females; Bafra, Gernek Lake, 07.V.2008, 41° 38' 50K, 36° 04' 44D, 0m, 1 male. **Distribution in Turkey:** Amasya, Antalya, Aydın, Erzincan, İzmir, Kastamonu, Kars and Ordu (İncekara et al. 2003; İncekara, 2004).

Berosus affinis Brulle, 1922

Material examined: Ondokuzmayıs, 26.VI.2007, 41° 35' 31K, 36° 06' 44D, 2m, 10 males, 8 females, Balık Lake, 41° 33' 08K, 36° 04' 52D, 0m, 4 males, 4 females, 41° 35 16K, 36° 06 41D, 0m, 16males, 21 females, Liman Lake, 29.VII.2007, 41°41 11K, 36° 01 09D, 2 males; Bafra, Gernek Lake, 29.VIII.2007, 41° 38' 53K, 36° 04' 42D, 0m, 18 males, 14 females, 26.VI.2007, 41º 38' 49K, 36º 04' 46D, 0m, 12 males, 17 females, Karaboğaz Lake, 29.VII.2007, 41º 20' 24K, 35º 48' 48D, 0m, 6 males, 8 females. **Distribution in Turkey:** Adana, Antalya, Burdur, Bursa, Çanakkale, Antakya (Hatay), Içel, Istanbul, İzmir, Kırklareli, Kocaeli, Kastamonu, Konya, Manisa, Mugla, Ordu, Samsun and Sakarya (İncekara et al. 2003).

Berosus sipinosus (Steven, 1808)

Material examined: Ondokuzmayıs, Liman Lake, 41º 41' 11K, 36º 01' 09D, 1♂, 07.V.2008, 41º 41' 09K, 36º 01' 12D, 0m, 1 male. **Distribution in Turkey:** Adana, Afyon, Ankara, Antalya, Aydın, Denizli, Edirne, Elazığ, Mersin (Erdemli), Içel, Kars, Malatya, Van (İncekara et al. 2003; Kıyak et al. 2006).

Berosus luridus (Linnaeus, 1761)

Material examined: Bafra, Gernek Lake, 07.V.2008, 41º 38' 50K, 36º 04' 44D, 0m, 2 males; Çarşamba, İhmal Lake, 07.V.2008, 41º 21' 01K, 36º 36' 47D, 0m, 1 male; Ondokuzmayıs, Balık Lake, 07.V.2008, 41º 35' 16K, 36º 06' 41D, 0m, 12 males,17 females. **Distribution in Turkey:** Erzincan, Hakkari, Ordu, Kars and Kastamonu (İncekara et al. 2003; İncekara, 2004).

Laccobius gracilis Motschulsky, 1855

Material examined: Bafra, derbent dam, 29.VII.2007, 41º 21' 43K, 35º 59' 04D, 70m, 1 male. **Distribution in Turkey:** Adana, Adıyaman, Ankara, Antakya, Antalya, Artvin, Aydın, Bayburt, Balıkesir, Bilecik, Bingöl, Bitlis, Bolu, Burdur, Bursa, Çanakkale, Çorum, Denizli, Diyarbakır, Edirne, Erzincan, Erzurum, Gaziantep, Giresun, Hakkari, Isparta, İstanbul, İzmir, Kars, Kastamonu, Kayseri, Manisa, Mardin, Mersin, Muğla, Muş, Niğde, Ordu, Rize, Sinop, Sivas, Tatvan, Trabzon and Van (İncekara et al. 2003; İncekara, 2004).

Laccobius obscuratus aegaeus Gentili, 1974

Material examined: Bafra, Derbent Dam, 29.VII.2007, 41º 21' 43K, 35º 49' 04D, 70m, 7 males, 12 females. **Distribution in Turkey:** Adana, Ankara, Antalya, Artvin, Aydın, Bitlis, Bolu Burdur, Bursa, Çanakkale, Çorum, Denizli, Erzurum, Erzincan, Gümüşhane, İstanbul, İzmir, İzmit, Kastamonu, Kırklareli, Konya, Manisa, Mersin, Muğla, Ordu, Osmaniye, Rize, Sinop, Trabzon and Van (İncekara et al. 2003, Karaman et al. 2008).

Laccobius syriacus Guillebeau, 1896

Material examined: Bafra, Derbent Dam, 29.VII.2007, 41º 21' 43K, 35º 49' 04D, 70m, 16 males, 19 females, 29.VII.2007, 40º 54' 19K, 35º 59' 00D, 868m, 4 males, 7 females; Doğanca, 29.VII.2007, 41º 35' 23K, 35º 56' 00D, 13m, 6 males, 3 females. **Distribution in Turkey:** Adana, Ankara, Antalya, Antakya, Artvin, Aydın, Bayburt, Bitlis, Burdur, Hakkari Çorum, Denizli, Diyarbakır, Edirne, Eğirdir, Gaziantep, Gümüşhane, Erzurum, Erzincan, Hakkari, Isparta, İzmir, Kars, Kayseri, Kahramanmaraş, Kastamonu, Konya, Mardin, Mersin, Muğla, Ordu, Osmaniye, Rize, Samsun, Sinop, Şanlıurfa, Trabzon and Van (İncekara et al. 2003; İncekara, 2004).

Laccobius striatulus (Fabricius, 1801)

Material examined: Bafra, Derbent Dam, 29.VII.2007, 41º 21' 43K, 35º 49' 04D, 70m, 3 males, 4 females; Liman Lake, 31.V.2007, 41º 41' 11K, 36º 05' 05D, 0m, 32 males, 13 females. **Distribution in Turkey:** Adapazarı, Ankara, Antakya, Antalya, Artvin, Bayburt, Bitlis, Bolu, Bursa, Çanakkale, Erzurum, Erzincan, Eskişehir, Gümüşhane, Isparta, İstanbul, İzmit, İzmir, Kütahya, Konya, Malatya, Manisa, Muğla, Rize, Sivas, Trabzon and Van (İncekara et al. 2003; İncekara, 2004; Karaman et al. 2008).

Hydrochara dichroma (Fairmaire, 1892)

Material examined: Ondokuzmayıs, Balık Lake, 41º 33' 08K, 36º 04' 52D, 0m, 1 male; Karaboğaz Lake, 29.VII.2007, 41º 20' 24K, 35º 48' 48D, 0m, 1 male; Bafra, Gernek Lake, 07.V.2008, 41º 38' 50K, 36º 04' 44D, 0m, 1 male; Liman Lake, 07.V.2008, 41º 41' 09K, 36º 01' 12D, 0m, 3 males, 2 females. **Distribution in Turkey:** Adana, Ankara, Erzincan, Erzurum and İstanbul) (İncekara *et al.* 2003; İncekara, 2001, 2004).

Paracymus sucutelleris Rosenhauer, 1856

Material examined: Ondokuzmayıs, Balık Lake, 41° 33' 08K, 36° 04' 52D, 0m, 1 male, 26.VI.2007, 41° 35' 31K, 36° 06' 44D, 2m, 3 males, 4 females, 07.V.2008, 41° 35' 16K, 36° 06' 41D, 0m, 8 males,17 females. **Distribution in Turkey:** Bingöl (Mart et al. 2006).

Limnoxenuıs niger (Gamelin, 1790)

Material examined: Ondokuzmayıs, Balık Lake, 07.V.2008, 41 35 10K, 36 0642D, 4 males, 6 females. **Remark:** Distribution of this species in Turkey was presented by İncekara et al. (2003) without detailed locality. After then, a record was reported from south-west Anatolia by Kıyak et al. (2006). This species was very abundant in the research area (especially in the Çarşamba plain).

Hydrophilus piceus (Linnaeus, 1758)

Material examined: Ondokuzmayıs, Balık Lake, 29.VIII.2007, 41° 35' 15K, 36° 06' 42D, 0m, 2 females; Karaboğaz Lake, 29.VII.2007, 41° 20' 24K, 35° 48' 48D, 0m, 1 male. **Distribution in Turkey:** Erzurum, Denizli (İncekara et al. 2003; Kıyak et al. 2006).

Helochares obscurus (Müller, 1776)

Material examined: Ondokuzmayıs, 26.VI.2006, 41° 35' 31K, 36° 06' 44D, 2m, 2 males, Balık Lake, 22.VI.2007, 41° 33' 08K, 36° 04' 52D, 0m, 3 males, 1 female; Bafra, Gernek Lake, 07.V.2008, 41° 38' 50K, 36° 04' 44D, 0m, 6 males, 14 females. **Distribution in Turkey:** Aydın (Kıyak et al. 2006). **Remark:** Besides the research area, we have also examined much additional material from Amasya, Artvin, Bayburt, Bingöl, Çorum, Giresun, Gümüşhane, Erzincan, Erzurum, Ordu, Rize, Tokat and Trabzon provinces.

Family DYTISCIDAE

Hydaticus leander (Rossi, 1790)

Material examined: Bafra, Karaboğaz Lake, 29.7.2007, 41° 40' 24K, 35° 48' 48D, 0 m. **Distribution in Turkey:** İzmir (Guéorguiev, 1981; Nilsson, 2003).

Hydaticus transversalis laevisculptus Zaitzev, 1910

Material examined: Bafra, Karaboğaz Lake, 29.7.2007, 41° 40' 24K, 35° 48' 48D, 0 m. **Distribution in Turkey:** Adana, Denizli, Kütahya (Guéorguiev, 1981; Nilsson, 2003; Kıyak et.al., 2007).

Bidessus nasutus (Sharp, 1887)

Material examined: Bafra, Liman Lake, 26.6.2007, 41° 41' 10K, 36° 01' 10D, 0 m. **Distribution in Turkey:** Afyon, Konya (Guéorguiev, 1981; Nilsson, 2003).

Hydroglyphus geminus (Fabricius, 1792)

Material examined: Bafra, Karaboğaz Lake, 29.7.2007, 41° 40' 24K, 35° 48' 48D, 0 m; Ondokuzmayıs, Balık Lake, 26.6.2007, 41° 33' 08K, 36° 04' 52D, 0 m, 29.7.2007, 41° 35' 16K, 36° 06' 41D, 0 m; Gernek Lake, 29.7.2007, 41° 38' 50K, 36° 04' 45D, 0 m, 26.6.2007, 41° 38' 49K, 36° 04' 46D, 0 m; Liman Lake, 29.7.2007, 41° 41' 11K, 36° 01' 09D, 0 m, 5.2007, 41° 41' 11K, 36° 01' 05D, 0 m. **Distribution in Turkey:** Adana, Afyon, Aksaray, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bolu, Bursa, Edirne, Eskişehir, Gümüşhane, Isparta, İçel, İzmir, Kastamonu, Kayseri, Kilis, Konya, Manisa, Muğla, Rize, Toros Mountains, Trabzon (Guéorguiev,1981; Darılmaz & Kıyak, 2006; Kıyak et.al., 2007; Erman & Erman, 2008).

Hydroporus marginatus (Duftschmid, 1805)

Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41° 33' 07K, 36° 04' 52K, 0 m. **Distribution in Turkey:** Ankara, Erzurum, Gümüşhane, Kars, Konya, Muğla, Sivas, Trabzon (Guéorguiev, 1981; Kıyak et.al, 2007; Erman et.al., 2007).

Hydrovatus cuspidatus (Kunze, 1818)

Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41° 33' 07K, 36° 04' 52K, 0 m, 29.7.2007, 41° 35' 16K, 36° 06' 41D, 0 m; Bafra, Gernek Lake, 29.7.2007, 41° 38' 50K, 36° 04' 45D, 0 m; Liman Lake, 30.5.2007, 41° 41' 11K, 36° 01' 05D, 0 m. **Distribution in Turkey:** Afyon, Toros Mountains (Guéorguiev, 1981).

Hygrotus parallellogrammus (Ahrens, 1812)
Material examined: Bafra, Gernek Lake, 26.6.2007, 41° 38 49K, 36° 04 46D, 0 m. **Distribution in Turkey:** Afyon, Ankara, Erzurum, Konya, Kütahya, Toros Mountains, Tuzgölü (Guéorguiev, 1981; Erman et.al., 2007).

Hygrotus inaequalis (Fabricius, 1777)
Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41° 33' 07K, 36° 04' 52K, 0 m, 29.7.2007, 41° 35' 16K, 36° 06' 41D, 0 m; Bafra, Liman Lake, 29.7.2007, 41° 41' 11K, 36° 01' 09D, 0 m, 30.5.2007, 41° 41' 11K, 36° 01' 05D, 0 m; Doğanca, 29.7.2007, 41° 35' 23K, 35° 56' 00D, 10 m. **Distribution in Turkey:** Afyon, Artvin, Bolu, Erzurum, Isparta, Konya, Manisa (Guéorguiev, 1981; Balfour-Browne, 1963; Erman et.al., 2007; Erman & Erman, 2008).

Laccophilus minutus (Linnaeus, 1758)
Material examined: Bafra, Karaboğaz Lake, 29.7.2007, 41° 40' 24K, 35° 48' 48D, 0 m, Doğanca, 29.7.2007, 41° 35' 23K, 35° 56' 00D, 10 m; Ondokuzmayıs, Balık Lake, 30.5.2007, 41° 33' 07K, 36° 04' 52K, 0 m. **Distribution in Turkey:** Afyon, Aksaray, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bolu, Burdur, Bursa, Denizli, Erzurum, Gümüşhane, Isparta, İzmir, Kayseri, Konya, Manisa, Rize, Sinop, Sivas, Toros Mountains, Trabzon (Guéorguiev,1981; Darılmaz & Kıyak, 2006; Kıyak et.al., 2007; Erman et.al., 2007; Erman & Erman, 2008).

Laccophilus poecilus (Klug, 1834)
Material examined: Bafra, Liman Lake, 29.7.2007, 41° 41' 11K, 36° 01' 09D, 0 m, 26.6.2007, 41° 41' 10K, 36° 01' 10D, 0 m, 30.5.2007, 41° 41' 11K, 36° 01' 05D, 0 m; Ondokuzmayıs, Balık Lake, 29.7.2007, 41° 35' 16K, 36° 06' 41D, 0 m. **Distribution in Turkey:** Adana, Afyon, Antalya, Aydın, Bolu, Erzurum, Isparta, İzmir, Konya, Manisa and Rize (Guéorguiev, 1981; Kıyak et.al., 2007; Erman et.al., 2007; Erman & Erman, 2008).

Family NOTERIDAE
Noterus clavicornis (De Geer, 1774)
Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41 33 07K, 36 04 52K, 0 m, 29.7.2007, 41 35 16K, 36 06 41D, 0 m; Bafra, Liman Lake, 26.6.2007, 41 41 10K, 36 01 10D, 0 m, 30.5.2007, 41 41 11K, 36 01 05D, 0 m, 29.7.2007, 41 41 11K, 36 01 09D, 0 m; Gernek Lake, 26.6.2007, 41 38 49K, 36 04 46D, 0 m, 29.7.2007, 41 38 50K, 36 04 45D, 0 m. **Distribution in Turkey:** Aksaray, Ankara, Antalya, Aydın, Balıkesir, Bilecik, Bolu, Isparta, İzmir, Kayseri, Konya, Manisa (Guéorguiev, 1968, 1981; Balfour-Browne, 1963; Nilsson, 2003; Kıyak et.al., 2007).

Noterus crassicornis (O.F. Müller, 1776)
Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41 33 07K, 36 04 52K, 0 m. **Distribution in Turkey:** Adana, Isparta (Guéorguiev, 1981; Nilsson, 2003).

ÇARŞAMBA PLAIN

Family HELOPHORIDAE
*****Helophorus griseus*** Herbst, 1793
Material examined: Terme, Gölünyazı iskelesi, 29.V.2007, 41° 15' 14K, 36° 57' 55D, 0m, 3 males, 4 females; Çarşamba, Kaz Lake, 29.V.2007, 41° 21' 01K, 36° 36' 47D, 0m, 3 males, 1 female.

*****Helophorus brevipalpis*** Bedel, 1881
Material examined: Terme, Gölünyazı iskelesi, 29.V.2007, 41° 15' 14K, 36° 57' 55D, 0m, 13 males, 8 females; Dörtyol, 29.V.2007, 41° 12' 43K, 36° 43' 13D, 4m, 8 males, 12 females; Çarşamba, İhmal Lake, 07.V.2008, 41° 21' 01K, 36° 36' 47D, 0m, 2 males, 4 females.

Helophorus minutus Fabricius, 1775

Material examined: Kaz Lake, 29.V.2007, 41° 21' 01K, 36° 36' 47D, 0m, 8 males, 7 females; Dörtyol, 29.V.2007, 41° 12' 43K, 36° 43' 13D, 4m, 3 males, 7 females. **Distribution in Turkey:** Antalya and İstanbul (İncekara et al. 2004).

* ***Helophorus obscurus*** Mulsant, 1844

Material examined: Terme, Gölünyazı iskelesi, 29.V.2007, 41° 15' 14K, 36° 57' 55D, 0m, 18 males, 21 females; Dörtyol, 29.V.2007, 41° 12' 43K, 36° 43' 13D, 4m, 7 males, 13 females.

Helophorus strigifrons* Thomson, 1868

Material examined: İhmal Lake, 07.V.2008, 41° 21' 01K, 36° 36' 47D, 0m, 3 males, 2 females.

****Helophorus aquaticus*** (Linnaeus, 1758)

Material examined: Terme, Gölünyazı iskelesi, 29.V.2007, 41° 15' 14K, 36° 57' 55D, 0m, 4 males, 2 females; Akgöl yanı, 06.V.2008, 41° 14' 18K, 36° 58' 29D, 0m, 5 male, 3 females.

Family HYDROPHILIDAE

****Hydrobius fuscipes*** (Linnaeus, 1758)

Material examined: Terme, Akgöl yanı, 06.V.2008, 41° 14' 18K, 36° 58' 29D, 0m, 1 males.

****Coleostoma orbiculare*** (Fabricius, 1775)

Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 1 female; Terme, Simenit Lake, 26.VI.2007, 41° 17' 42K, 36° 54' 53D, 0m, 2 males, 1 females, 29.V.2007, 41° 17' 42K, 36° 54' 53D, 0m, 12 males, 17 females, 29.VIII.2007, 41° 17' 42K, 36° 54' 53D, 0m, 1 male, 1 female; Akgöl yanı, 06.V.2008, 41° 14' 18K, 36° 58' 29D, 0m, 1 male, 3 females.

****Berosus signaticollis*** (Charpentier, 1825)

Material examined: Terme, Akgöl, 26.VI.2007, 41° 16' 55K, 36° 56' 14D, 0m, 3 males, 3 females.

****Berosus affinis*** Brulle, 1922

Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 26 males, 28 females, Kaz Lake, 08.VII.2007, 41° 23' 17K, 36° 54' 13D, 0m, 3 males; Terme, Akgöl, 26.VI.2007, 41° 16' 55K, 36° 56' 14D, 0m, 1 male; Simenit Lake, 26.VI.2007, 41° 17' 42K, 36° 54' 53D, 0m, 2 males, 3 females.

****Berosus sipinosus*** (Steven, 1808)

Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 22 males, 30 females, 29.VIII.2007, 41° 21' 08K, 36° 36' 49D, 0m, 2 males, 5♀♀, 07.V.2008, 1 female .

****Berosus luridus*** (Linnaeus, 1761)

Material examined: Terme, Simenit Lake, 26.VI.2007, 41° 17' 42K, 36° 54' 53D, 0m, 1 male; Akgöl yanı, 06.V.2008, 41° 14' 18K, 36° 58' 29D, 0m, 2 females, 06.V.2008, 41° 16' 54K, 36° 56' 14D, 0m, 3 males.

****Laccobius gracilis*** Motschulsky, 1855

Material examined: Çarşamba, Dörtyol, 29.V.2007, 41° 12' 43K, 36° 43' 13 D, 4m, 2 males, 2 females.

****Laccobius syriacus*** Guillebeau, 1896

Material examined: Terme, Akgöl, 36.VI.2007, 41° 16' 55K, 36° 56' 14D, 0m, 2 males, 5 females; Gölyazı, Balkanlı, 28.VII.2007, 41° 14' 17K, 36° 58' 29D, 0m, 1 male.

Hydrochara dichroma (Fairmaire, 1892)
Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 1 female.

Paracymus aeneus Germar, 1824
Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 3 males, 4 females, Kaz Lake, 08.VII.2007, 41° 23' 17K, 36° 54' 13D, 0m, 3 males; Simenit Lake, 29.VII.2007, 41° 17' 42K, 36° 54' 53D, 0m, 1 male. **Distribution in Turkey:** without detailed locality (İncekara et al. 2003).

***Paracymus sucutelleris** Rosenhauer, 1856
Material examined: Terme, Simenit Lake, 29.V.2007, 41° 17' 42K, 36° 54' 53D, 0m, 3 males, 1 female; 29.V.2007, 41° 21' 01K, 36° 36' 47D, 0m, 3 males, 4 females; Gölünyazı iskelesi, 29.V.2007, 41° 15' 14K, 36° 57' 55D, 0m, 38 males, 41 females, Çarşamba, İhmal Lake, 07.V.2008, 41° 21' 01K, 36° 36' 47D, 0m, 12 males, 3 females.

Limnoxenus niger (Gamelin, 1790)
Material examined: Çarşamba, İhmal Lake, 26.VI.2007, 41° 21' 01K, 36° 36' 47D, 0m, 1 male, 07.V.2008, 13 males, 4 females; Terme, Simenit Lake, 26.VI.2007, 41° 17' 42K, 36° 54' 53D, 0m, 4 males, 2 females.

Helochares obscurus (Müller, 1776)
Material examined: Terme, Akgöl, 26.VI.2007, 41° 16' 55K, 36° 56' 14D, 0m, 6 males, 12 females, 06.V.2008, 41° 16' 54K, 36° 56' 14D, 0m, 1 male; Gölünyazı iskelesi, 06.V.2008, 41° 15' 14K, 36° 57' 55D, 0m, 8 males, 12 females; Akgöl yanı, 06.V.2008, 41° 14' 18K, 36° 58' 29D, 0m, 1 male; Simenit Lake, 29.VII.2007, 41° 17' 42K, 36° 54' 53D, 0m, 2 males.

Hydrophilus piceus (Linnaeus, 1758)
Material examined: Terme, Simenit Lake, 29.V.2007, 41° 17' 42K, 36° 54' 53D, 0m, 1 male, 29.VII.2007, 41° 17' 42K, 36° 54' 53D, 0m, 3 male, 2 females.

Hydrophilus atterimus Eschscoltz, 1822
Material examined: Terme, Akgöl, 06.V.2008, 41° 16' 54K, 36° 56' 14D, 0m, 1 female. **Distribution in Turkey:** Erzurum (İncekara et al. 2003). **Remark:** The first record of *H. atterimus was* given by İncekara et al. (2003). In this study, second record is given for Turkey.

Family DYTISCIDAE

Agabus dilatatus (Brullé, 1832)
Material examined: Çarşamba, Kaz Lake, 29.5.2007, 41° 21' 01K, 36° 36' 47D, 0 m. **Distribution in Turkey:** Adana, Ankara, Antalya, Bolu, Bursa, Gümüşhane, Isparta, İçel, İzmir, Kocaeli, Konya, Kütahya, Rize, Toros Mountains, Trabzon, Van (Balfour-Browne, 1963; Guéorguiev,1968; 1981; Nilsson, 2003).

Agabus nebulosus (Forster, 1771)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m. **Distribution in Turkey:** Afyon, Antalya, Aydın, Burdur, Bursa, Denizli, İstanbul, İzmir, Muğla, Sinop, Toros Mountains, Trabzon (Guéorguiev, 1981; Nilsson, 2003; Kıyak et.al., 2007).

Colymbetes fuscus (Linnaeus, 1758)
Material examined: Terme, Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0 m. **Distribution in Turkey:** Afyon, Aksaray, Aydın, Burdur, İzmir, Konya (Guéorguiev, 1981; Nilsson, 2003; Darılmaz & Kıyak, 2006; Kıyak et.al, 2007).

Graphoderus cinereus (Linnaeus, 1758)
Material examined: Terme, Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0 m. **Distribution in Turkey:** Afyon, Ağrı (Guéorguiev, 1981; Nilsson, 2003; Kıyak et.al., 2007).

*****Bidessus nasutus*** (Sharp, 1887)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m.

*****Hydroglyphus geminus*** (Fabricius, 1792)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Simenit Lake, 26.6.2007, 41° 14' 19K, 36° 58' 29D, 0 m, 29.8.2007, 41° 17' 42K, 36° 54' 53K, 0 m; Çarşamba, İhmal Lake, 26.6.2007, 41° 21' 01K, 36° 36' 47D, 0 m.

*****Hydroporus marginatus*** (Duftschmid, 1805)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Simenit Lake, 26.6.2007, 41° 14' 19K, 36° 58' 29D, 0m.

Hydroporus palustris (Linnaeus, 1761)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Ladik, Gölünyazı Lake, 31.5.2007, 40° 54' 17K, 35° 59' 05D, 863 m; Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53K, 0 m. **Distribution in Turkey:** Asie mineure, Erzurum (Guéorguiev, 1981; Erman et.al, 2007).

Hydroporus planus (Fabricius, 1781)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m. **Distribution in Turkey:** Antalya, Balıkesir, Bursa, Erzurum, İstanbul, Kars, Toros Mountains, Trabzon (Guéorguiev, 1981; Kıyak et.al, 2007; Erman et.al., 2007).

Porhydrus lineatus (Fabricius, 1775)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0 m, 26.6.2007, 41° 14' 19K, 36° 58 29D, 0m; Gölyazı, Akgöl, 28.8.2007, 41° 16 54K, 36° 56' 15D, 0 m. **Distribution in Turkey:** Trabzon (Guéorguiev, 1981).

*****Hygrotus inaequalis*** (Fabricius, 1777)
Material examined: Terme, Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0 m; Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Gölyazı, Akgöl, 28.8.2007, 41° 16' 54K, 36° 56' 15D, 0 m.

Hyphydrus ovatus (Linnaeus, 1761)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m. **Distribution in Turkey:** Amasya, Bolu, Erzurum (Balfour-Browne, 1963; Guéorguiev,1981; Biström, 1982; Erman et. al., 2007).

*****Laccophilus minutus*** (Linnaeus, 1758)
Material examined: Terme, Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0, 26.6.2007, 41° 17' 14K, 36° 54' 15D, 0 m; m; Terme, Gölyazı, Akgöl, 28.8.2007, 41° 16' 54K, 36° 56' 15D, 0 m.

*****Laccophilus poecilus*** (Klug, 1834)
Material examined: Terme, Gölünyazı iskelesi, 29.5.2007, 41° 15' 14K, 36° 57' 55D, 0 m; Simenit Lake, 29.8.2007, 41° 17' 42K, 36° 54' 53D, 0 m, 29.8.2007, 41° 17' 42K, 36° 54' 53K, 0 m; Gölyazı, Akgöl, 28.8.2007, 41° 16' 54K, 36° 56' 15D, 0 m.

Family NOTERIDAE
*****Noterus clavicornis*** (De Geer, 1774)
Material examined: Terme, Simenit Lake, 29.8.2007, 41 17 42K, 36 54 53K, 0 m, 26.6.2007, 41 17 14K, 36 54 15D, 0 m, 26.6.2007, 41 14 19K, 36 58 29D, 0m.

*__Noterus crassicornis__ (O.F. Müller, 1776)

Material examined: Ondokuzmayıs, Balık Lake, 30.5.2007, 41 33 07K, 36 04 52K, 0 m.

Family HALIPLIDAE

Peltodytes caesus (Duftschmid, 1805)

Material examined: Terme, Gölyazı, Akgöl, 28.8.2007, 41 16 54K, 36 56 18D, 0 m; Gölyazı, 28.8.2007, 41 15 16K, 365753D, 0 m; Simenit Lake, 29.8.2007, 41 17 42K, 36 54 53K, 0 m, 26.6.2007, 41 14 14K, 36 58 29D, 0m. **Distribution in Turkey:** Adana, Afyon, Aksaray, Aydın, Balıkesir, Bolu, Eskişehir, Isparta, İzmir, Konya, Toros Mountains (Guéorguiev, 1968, 1981; Vondel, 2003; Darılmaz & Kıyak, 2006).

Haliplus ruficollis (De Geer, 1774)

Material examined: Terme, Gölyazı, Akgöl, 28.8.2007, 41 16 54K, 36 56 18D, 0 m. **Distribution in Turkey:** Without detailed locality data (Guéorguiev, 1981; Vondel, 2003). **Remarks:** This species is confirmed for Turkey and the first detailed records are given.

*Locality information presented in detail before.

DISCUSSION

Totally, 50 species of aquatic Coleoptera belonging to 5 families and 25 genera were determined in the research area. Of these, 22 species are Adephaga and 28 are Polyphaga member. Besides the newly recorded for the Turkish fauna, *H. strigifrons*, all species are recorded from the research area for the first time.

12 genera of the family Dytiscidae were found in both plain. Of these, 7 genera placed in Bafra plain and of 9 in Çarşamba plain. Only 4 genara (*Bidessus*, *Hydroglyphus*, *Hydroporus* and *Laccophilus*) are common for both plains.

1 Noterid genus (*Noterus*) was determined in both plains. Two *Noterus* species (*N. clavicornis and N. crassicornis*) were common for both plains.

2 Haliplid genera (*Peltodytes and Haliplus*) were found in Çarşamba plain only. Naturally, the species *Peltodytes caesus* and *Haliplus* (*H.*) *ruficollis* belonging to these genera were not represented in the Bafra plain.

The Hydrophilidae family was represented with 9 genera and 17 species in the research area. All genera were found in both plain, but species were different. While the species *Laccobius (D.) obscuratus* and *L. striatulus* were not represented in Çarşamba plain, the species *Paracymus aeneus* and *Hydrophilus atterimus* were not represented in Bafra plain.

Although the Helophoridae are a large family consisting of a single subfamily only of a single genus, *Helophorus*, poorly represented in the research area. Totally, 10 species found in both plain. While the species *H. terminassianae*, *H. daedalus*, *H. syriacus*, *H. micans* and *H. griseus* were not represented in Çarşamba plain, the species *H. minutus* was not represented in Bafra plain.

Generally, it is thought that similar geographies and habitats are represented by the similar fauna, but this does not occur in every condition as is seen from this study.

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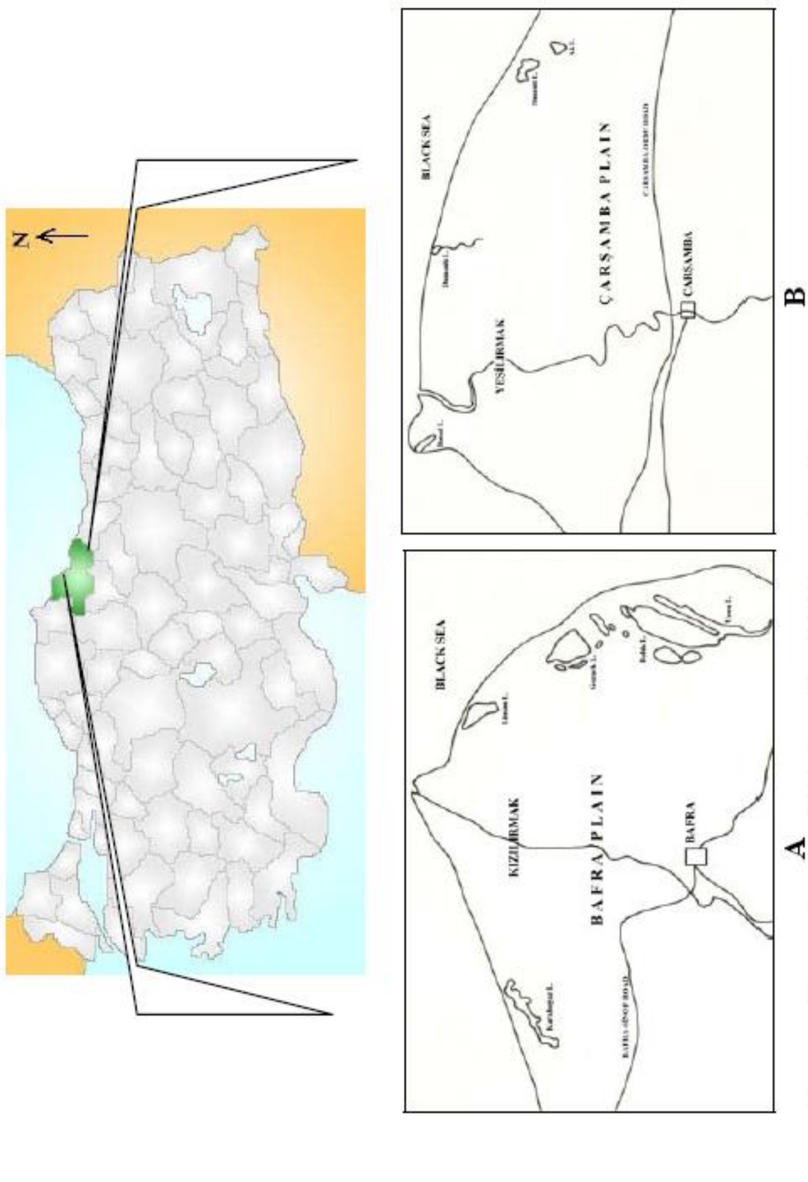

Figure 1. Research area. A) Bafra plain. B) Çarşamba plain.

Table I. Comparision of the species (Adephaga) number and variety of both plains.

DYTISCIDAE		NOTERIDAE		HALIPLIDAE	
BAFRA	ÇARŞAMBA	BAFRA	ÇARŞAMBA	BAFRA	ÇARŞAMBA
Hydaticus leander	*Agabus dilatatus*	*Noterus clavicornis*	*Noterus clavicornis*	-	*Peltodytes caesus*
H. transversalis laevisculptus	*Agabus nebulosus*	*N. crassicornis*	*N. crassicornis*	-	*Haliplus ruficollis*
Bidessus nasutus	*Colymbetes fuscus*	-	-	-	-
Hydroglyphus geminus	*Graphoderus cinereus*	-	-	-	-
Hydroporus marginatus	*Bidessus nasutus*	-	-	-	-
Hydrovatus cuspidatus	*Hydroglyphus geminus*	-	-	-	-
Hygrotus parallellogrammus	*Hydroporus marginatus*	-	-	-	-
H. inaequalis	*H. palustris*	-	-	-	-
Laccophilus minutus	*H. planus*	-	-	-	-
L. poecilus	*Porhydrus lineatus*	-	-	-	-
-	*H. inaequalis*	-	-	-	-
-	*Hyphydrus ovatus*	-	-	-	-
-	*Laccophilus minutus*	-	-	-	-
-	*L. poecilus*	-	-	-	-

Table II. Comparision of the species (Polyphaga) number and variety of both plains.

HYDROPHILIDAE		HELOPHORIDAE	
BAFRA	**ÇARŞAMBA**	**BAFRA**	**ÇARŞAMBA**
Hydrobius fuscipes	*Hydrobius fuscipes*	*Helophorus brevipalpis*	*Helophorus griseus*
Coleostoma orbculare	*Coleostoma orbicılare*	*H. strigifrons*	*H. minutus*
Berosus signaticolis	*Berosus signaticolis*	*H. obscurus*	*H. brevipalpis*
B. affinis	*B. affinis*	*H. aquaticus*	*H. obscurus*
B. sipinosus	*B. sipinosus*	*H. terminassianae*	*H. strigifrons*
B. luridus	*B. luridus*	*H. daedalus*	*H. aquaticus*
Laccobilis gracilis	*Laccobilis gracilis*	*H. syriacus*	-
L. syriacus	*L. syriacus*	*H. micans*	-
L. striatulus	*Hydrochara dichroma*	*H. griseus*	-
Laccobius obscuratus	*Paracymus aeneus*	-	-
Hydrochara dichroma	*P. sucutelleris*	-	-
Paracymus sucutelleris	*Limnoxenus niger*	-	-
Limnoxenus niger	*Helochares obscurus*	-	-
Hydrophilus piceus	*Hydrophilus piceus*	-	-
Helochares obscurus	*H. atterimus*	-	-

NOMENCLATURAL CHANGES FOR FIVE PREOCCUPIED SCARAB BEETLE GENUS GROUP NAMES (COLEOPTERA: SCARABAEIDAE)

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[Özdikmen, H. 2009. Nomenclatural changes for five preoccupied scarab beetle genus group names (Coleoptera: Scarabaeidae). Munis Entomology & Zoology, 4 (1): 139-147**]**

ABSTRACT: Five junior homonyms were detected among the scarab beetle genera and the following replacement names are proposed: in Dynastinae: *Carneoryctes* nom. nov. for *Cryptoryctes* Carne, 1957; *Carneodon* nom. nov. for *Neodon* Carne, 1957; in Scarabaeinae: *Amartinezus* nom. nov. for *Eurysternodes* Martinez, 1988; in Rutelinae: *Strigidia* Burmeister, 1844 substitute name for *Odontognathus* Laporte, 1840 and in Melolonthinae: *Lutfius* nom. nov. for *Colpomorpha* Szito, 1994. Accordingly, new combinations are herein proposed for the species currently included in these genera: *Carneoryctes ater* (Lea, 1917) comb. nov.; *Carneoryctes brittoni* (Carne, 1957) comb. nov.; *Carneoryctes griseopilosus* (Lea, 1917) comb. nov.; *Carneoryctes minchami* (Carne, 1981) comb. nov.; *Carneoryctes montrosus* (Blackburn, 1895) comb. nov.; *Carneoryctes nigripennis* (Lea, 1917) comb. nov.; *Carneoryctes peterseni* (Endrodi, 1967) comb. nov.; *Carneoryctes pimbus* (Carne, 1957) comb. nov.; *Carneoryctes psilus* (Carne, 1957) comb. nov.; *Carneoryctes semiclavus* (Lea, 1917) comb. nov.; *Carneoryctes sulcatus* (Arrow, 1914) comb. nov.; *Carneoryctes tectus* (Blackburn, 1892) comb. nov.; *Carneoryctes tricornutus* (Howden & Maly, 2005) comb. nov.; *Carneoryctes trifidus* (Blackburn, 1895) comb. nov.; *Carneoryctes truncatus* (Carne, 1957) comb. nov.; *Carneoryctes wingarus* (Carne, 1957) comb. nov.; *Carneodon bidens* (Blackburn, 1896) comb. nov.; *Carneodon glauerti* (Carne, 1957) comb. nov.; *Carneodon intermedius* (Blackburn, 1896) comb. nov.; *Carneodon laevicollis* (Macleay, 1873) comb. nov.; *Carneodon laevipennis* (Blackburn, 1896) comb. nov.; *Carneodon laevis* (Burmeister, 1847) comb. nov.; *Carneodon meyricki* (Blackburn, 1896) comb. nov.; *Carneodon occidentalis* (Macleay, 1888) comb. nov.; *Carneodon pecuarius* (Reiche, 1860) comb. nov.; *Carneodon simplex* (Carne, 1957) comb. nov., *Amartinezus velutinus* (Bates, 1887) comb. nov. and *Lutfius parvus* (Szito, 1994) comb. nov..

KEY WORDS: nomenclatural changes, homonymy, replacement names, Coleoptera, Scarabaeidae, Dynastinae, Scarabaeinae, Rutelinae, Melolonthinae.

Five previously proposed scarab beetle genus group names are nomenclaturally invalid, as the genus group names have already been used by a different authors in Mammalia, Pisces, Acari and Insecta. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus group names.

TAXONOMY
Family SCARABAEIDAE

Subfamily DYNASTINAE
Genus *CARNEORYCTES* nom. nov.

Cryptoryctes Carne, 1957. A systematic revision of the Australian Dynastinae. C.S.I.R.O. Melbourne: 154. (İnsecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Dynastinae).

Preoccupied by *Cryptoryctes* Reed, 1954. J. Paleont., 28, 103. (Mammalia: Eutheria: Lipotyphla: Micropternodontidae).

Remarks: The name *Cryptoryctes* was initially introduced by Reed, 1954 for a genus of the mammals family Micropternodontinae (with the type species *Cryptoryctes kayi* Reed, 1954). This genus is not extant. It was assigned to Micropternodontidae by Reed (1954) and McKenna & Bell (1997). Subsequently, Carne, 1957 erected a new Australian scarab beetle genus of the family Scarabaeidae (with the type species *Pseudoryctes tectus* Blackburn, 1892 by original designation under the same generic name. Thus, the genus *Cryptoryctes* Carne, 1957 is a junior homonym of the genus *Cryptoryctes* Reed, 1954. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus *Cryptoryctes* Carne, 1957 the new replacement name *Carneoryctes* **nom. nov.**

Etymology: The name is dedicated to P. B. Carne who is current author of the genus name *Cryptoryctes*.

Summary of nomenclatural changes:

Carneoryctes **nom. nov.**
pro *Cryptoryctes* Carne, 1957 (nec Reed, 1954)

Carneoryctes ater (Lea, 1917) **comb. nov.**
from *Cryptoryctes ater* (Lea, 1917)
Pseudoryctes ater Lea, 1917
Distr.: Australian (S Australia)

Carneoryctes brittoni (Carne, 1957) **comb. nov.**
from *Cryptoryctes brittoni* Carne, 1957
Distr.: Australian (W Australia)

Carneoryctes griseopilosus (Lea, 1917) **comb. nov.**
from *Cryptoryctes griseopilosus* (Lea, 1917)
Pseudoryctes griseopilosus Lea, 1917
= *Pseudoryctes friseopilosus* Lea, 1917
Distr.: Australian (S Australia)

Carneoryctes minchami (Carne, 1981) **comb. nov.**
from *Cryptoryctes minchami* Carne, 1981
Distr.: Australian (S Australia)

Carneoryctes montrosus (Blackburn, 1895) **comb. nov.**
from *Cryptoryctes montrosus* (Blackburn, 1895)
Pseudoryctes montrosus Blackburn, 1895
Distr.: Australian (W Australia)

Carneoryctes nigripennis (Lea, 1917) **comb. nov.**
from *Cryptoryctes nigripennis* (Lea, 1917)
Pseudoryctes nigripennis Lea, 1917
Distr.: Australian (Queensland)

Carneoryctes peterseni (Endrodi, 1967) **comb. nov.**
from *Cryptoryctes peterseni* Endrodi, 1967
Distr.: Australian (Bismarc Archipel)

Carneoryctes pimbus (Carne, 1957) **comb. nov.**
from *Cryptoryctes pimbus* Carne, 1957
Distr.: Australian (C Australia)

Carneoryctes psilus (Carne, 1957) **comb. nov.**
from *Cryptoryctes psilus* Carne, 1957
Distr.: Australian (W Australia)

Carneoryctes semiclavus (Lea, 1917) **comb. nov.**
from *Cryptoryctes semiclavus* (Lea, 1917)
Pseudoryctes semiclavus Lea, 1917
Distr.: Australian (S Australia)

Carneoryctes sulcatus (Arrow, 1914) **comb. nov.**
from *Cryptoryctes sulcatus* (Arrow, 1914)
Pseudoryctes sulcatus Arrow, 1914
Distr.: Australian (Queensland)

Carneoryctes tectus (Blackburn, 1892) **comb. nov.**
from *Cryptoryctes tectus* (Blackburn, 1892)
Pseudoryctes tectus Blackburn, 1892
Distr.: Australian (S Australia)

Carneoryctes tricornutus (Howden & Maly, 2005) **comb. nov.**
from *Cryptoryctes tricornutus* Howden & Maly, 2005
Distr.: Australian (S Australia)

Carneoryctes trifidus (Blackburn, 1895) **comb. nov.**
from *Cryptoryctes trifidus* (Blackburn, 1895)
Pseudoryctes trifidus Blackburn, 1895
Distr.: Australian (Queensland)

Carneoryctes truncatus (Carne, 1957) **comb. nov.**
from *Cryptoryctes truncatus* Carne, 1957
Distr.: Australian (Queensland)

Carneoryctes wingarus (Carne, 1957) **comb. nov.**
from *Cryptoryctes wingarus* Carne, 1957
Distr.: Australian (W Australia)

Genus *CARNEODON* nom. nov.

Neodon Carne, 1957. A systematic revision of the Australian Dynastinae. C.S.I.R.O. Melbourne: 41, 46. (İnsecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Dynastinae). Preoccupied by *Neodon* Horsfield, 1841. J. Asiat. Soc. Bengal 10. (Mammalia: Rodentia: Muroidea: Cricetidae: Arvicolinae).

Remarks: The generic name *Neodon* was proposed by Horsfield, 1841 with the type species *Neodon sikimensis* Horsfield, 1841 in Mammalia. Wilson & Reeder (2005) gave it as a genus. They stated that "*it maintained as a genus by some specialists (Ellerman, 1941; Hinton, 1923, 1926a; Zagorodnyuk, 1990, 1992c), as a subgenus of Pitymys by others (Corbet, 1978c; Ellerman, 1941; Ellerman and Morrison-Scott,* *1951), or a subgenus of Microtus (G. M. Allen, 1940; Gromov and Erjabeva, 1995; Gromov and Polyakov, 1977; Musser and Carleton, 1993; Pavlinov et al., 1995a). Hinton (1923) included forresti, irene, oniscus (= irene), and carruthersi (= juldaschi) in Neodon*". Later, the scarab beetle genus *Neodon* was described by Carne, 1957 with the type species *Cheiroplatys pecuarius* Reiche, 1860 by original designation. However, the name *Neodon* Carne, 1957 is invalid under the law of homonymy, being a junior homonym of *Neodon* Horsfield, 1841. In accordance with article 60 of the International Code of Zoological Nomenclature, I propose to substitute the junior homonym name *Neodon* Carne, 1957 for the nomen novum *Carneodon*.

Etymology: The name is dedicated to P. B. Carne who is current author of the genus name *Neodon*.

Summary of nomenclatural changes:

Carneodon **nom. nov.**
pro *Neodon* Carne, 1957 (nec Horsfield, 1841)

Carneodon bidens (Blackburn, 1896) **comb. nov.**
from *Neodon bidens* (Blackburn, 1896)
Isodon bidens Blackburn, 1896
Distr.: Australian (Queensland, C Australia)

Carneodon glauerti (Carne, 1957) **comb. nov.**
from *Neodon glauerti* Carne, 1957
Distr.: Australian (NW and C Australia)

Carneodon intermedius (Blackburn, 1896) **comb. nov.**
from *Neodon intermedius* (Blackburn, 1896)
Isodon intermedius Blackburn, 1896
Distr.: Australian (NW Australia and New South Wales)

Carneodon laevicollis (Macleay, 1873) **comb. nov.**
from *Neodon laevicollis* (Macleay, 1873)
Isodon laevicollis Macleay, 1873
Distr.: Australian

Carneodon laevipennis (Blackburn, 1896) **comb. nov.**
from *Neodon laevipennis* (Blackburn, 1896)
Isodon laevipennis Blackburn, 1896
Distr.: Australian (NW Australia and Queensland)

Carneodon laevis (Burmeister, 1847) **comb. nov.**
from *Neodon laevis* (Burmeister, 1847)
Pimelopus laevis Burmeister, 1847
Isodon novitius Blackburn, 1897
Distr.: Australian (W Australia and Queensland)

Carneodon meyricki (Blackburn, 1896) **comb. nov.**
from *Neodon meyricki* (Blackburn, 1896)
Isodon meyricki Blackburn, 1896
Distr.: Australian (W Australia)

Carneodon occidentalis (Macleay, 1888) **comb. nov.**
from *Neodon occidentalis* (Macleay, 1888)
Cheiroplatys occidentalis Macleay, 1888
Distr.: Australian (NW Australia)

Carneodon pecuarius (Reiche, 1860) **comb. nov.**
from *Neodon pecuarius* (Reiche, 1860)
Cheiroplatys pecuarius Reiche, 1860
= *Isodon puncticollis* Macleay, 1871
= *Isodon subcornutus* Fairmaire, 1879
= *Heteronychus lucidus* Macleay, 1888
= *Isodon picipennis* Macleay, 1888
= *Trissodon denticeps* Arrow, 1941
Distr.: Australian (Australia)

Carneodon simplex (Carne, 1957) **comb. nov.**
from *Neodon simplex* Carne, 1957
Distr.: Australian (W Australia)

Subfamily SCARABAEINAE
Genus *AMARTINEZUS* nom. nov.

Eurysternodes Martinez, 1988. Entomol Basil 12: 281. (Insecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Scarabaeinae). Preoccupied by *Eurysternodes* Schuster & Summer, 1978. International J. Acarol. 4: 303. (Acari: Parasitiformes: Mesostigmata: Diarthrophalloidea: Diarthrophallidae).

Remarks: The generic name *Eurysternodes* Schuster & Summer, 1978 was proposed for a genus of Acari with the type species *Brachytremella tragardhi* Womersley, 1961. The genus is still used as a valid generic name in the family Diarthrophallidae. Subsequently, the generic name *Eurysternodes* Martinez, 1988 was introduced for a new scarab beetle genus group (with the type species *Eurysternodes velutinus* Bates, 1887) of the family Scarabaeidae. *Eurysternodes* Martinez, 1988 was accepted by some authors (e.g. Vaz-De-Mello, 2000) as a subgenus of the genus *Eurysternus* Dalman, 1824. Thus, the generic name *Eurysternodes* Martinez, 1988 is a junior homonym of the genus *Eurysternodes* Schuster & Summer, 1978. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus *Eurysternodes* Martinez, 1988 the new replacement name *Amartinezus* **nom. nov.**

Etymology: The name is dedicated to A. Martinez who is current author of the preexisting generic name *Eurysternodes*.

Summary of nomenclatural changes:

Amartinezus **nom. nov.**
pro *Eurysternodes* Martinez, 1988 (nec Schuster & Summer, 1978)

Amartinezus velutinus (Bates, 1887) **comb. nov.**
from *Eurysternodes velutinus* (Bates, 1887)
Eurysternus velutinus Bates, 1887
= *Eurysternus hypocrita* Balthasar, 1939

Distr.: Neotropical (Panama, Colombia, French Guiana, Suriname, Guyana, Ecuador, Peru, Brasil, Mexico, Venezuela, Bolivia)

Subfamily RUTELINAE
Genus *PELIDNOTA* Macleay, 1819
Subgenus *STRIGIDIA* Burmeister, 1844 new name

Odontognathus Laporte, 1840. H. N. Anim. artic. (Col.), 2, 137. (Insecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Rutelinae). Preoccupied by *Odontognathus* Lacepède, 1800. Hist. Nat. Poiss., 2, 218. (Chordata: Actinopterygii: Clupeiformes: Clupeidae).

Remarks: The fish genus *Odontognathus* was erected by Lacepède, 1800 with the type species *Odontognathus mucronatum* Lacepède, 1800 by monotypy. It is still used as a valid generic name and it has three species currently. Later, the scarab beetle generic name *Odontognathus* was proposed by Laporte, 1840 with the type species *Odontognathus unicolor* Laporte, 1840 that is a synonym of the species *Pelidnota* (*Odontognathus*) *cuprea* (Germar, 1828). In 1975, this genus was placed by Hardy in the genus *Pelidnota* Macleay, 1819 as a subgenus. However, the name *Odontognathus* Laporte, 1840 is invalid under the law of homonymy, being a junior homonym of *Odontognathus* Lacepède, 1800.
The generic name *Odontognathus* Laporte, 1840 (type species: *O. unicolor* Laporte, 1840) has three subjective junior synonyms as *Strigidia* Burmeister, 1844 (type species: *Pelidnota cuprea* Germar, 1824); *Delipnia* Casey, 1915 (type species: *Pelidnota belti* Sharp, 1877) and *Ganonota* Ohaus, 1915 (type species: *Rutela cuprea* Germar, 1824). So, in accordance with the International Code of Zoological Nomenclature, I propose to substitute the junior homonym name *Odontognathus* Laporte, 1840 for the oldest name "senior subjective synonym name" *Strigidia* Burmeister, 1844 as a replacement name.

Summary of nomenclatural changes:

Genus *Pelidnota* Macleay, 1819
syn. *Aglycoptera* Sharp, 1885 (type species: *A. lacerdae* Sharp, 1885)
syn. *Pelidnota* (*Pelidnotidia*) Casey, 1915 (type species: *P. strigosa* Laporte, 1840)

This genus includes approximately 120 species (incl. two incertae sedis species).

Subgenus *Pelidnota* Macleay, 1819
syn. *Aglycoptera* Sharp, 1885 (type species: *A. lacerdae* Sharp, 1885)
syn. *Pelidnota* (*Pelidnotidia*) Casey, 1915 (type species: *P. strigosa* Laporte, 1840)

This subgenus includes 47 species.

Subgenus *Chalcoplethis* Burmeister, 1844 (type species: *Chrysophora kirbyi* Gray, 1832)
syn. *Epichalcoplethis* F. Bates, 1904 (type species: *Pelidnota velutipes* Arrow, 1900)

This subgenus includes 23 species.

Subgenus *Strigidia* Burmeister, 1844 **substitute name**
syn. *Odontognathus* Laporte, 1840 (type species: *O. unicolor* Laporte, 1840)
syn. *Strigidia* Burmeister, 1844 (type species: *Pelidnota cuprea* Germar, 1824)
syn. *Delipnia* Casey, 1915 (type species: *Pelidnota belti* Sharp, 1877)
syn. *Ganonota* Ohaus, 1915 (type species: *Rutela cuprea* Germar, 1824)

This subgenus includes 46 species. The species list of this subgenus as follows:

Pelidnota acutipennis Bates, 1904
Pelidnota adrianae Martinez, 1982
Pelidnota assumpta Ohaus, 1928
Pelidnota belti Sharp, 1877
Pelidnota bivittata (Swederus, 1787)
Pelidnota boyi Ohaus, 1928
Pelidnota crassipes Ohaus, 1905
Pelidnota cuprea (Germar, 1824)
Pelidnota cupripes Perty, 1832
Pelidnota discicollis Ohaus, 1912
Pelidnota dubia Bates, 1904
Pelidnota ebenina (Blanchard, 1842)
Pelidnota flavovittata Perty, 1832
Pelidnota fusciventris Ohaus, 1905
Pelidnota gabrielae Martinez, 1979
Pelidnota glaberrima Blanchard, 1850
Pelidnota gounellei Ohaus, 1908
Pelidnota gracilis (Gory, 1834)
Pelidnota impressicollis Ohaus, 1925
Pelidnota labyrinthophallica Solis & Moron, 1994
Pelidnota liturella (Kirby, 1818)
Pelidnota matogrossensis Frey, 1976
Pelidnota nadiae Martinez, 1978
Pelidnota nitescens Vigors, 1825
Pelidnota ohausi Frey, 1976
Pelidnota plicipennis Ohaus, 1934
Pelidnota pubes Ohaus, 1913
Pelidnota pulchella (Kirby, 1818)
Pelidnota purpurea Burmeister, 1844
Pelidnota quadripunctata Bates, 1904
Pelidnota riedeli (Ohaus, 1905)
Pelidnota rubripennis (Burmeister, 1844)
Pelidnota santidomini Ohaus, 1905
Pelidnota sericeicollis Frey, 1976
Pelidnota similis Ohaus, 1908
Pelidnota soederstroemi Ohaus, 1908
Pelidnota striatopunctata (Kirsch, 1885)
Pelidnota testaceovirens Blanchard, 1850
Pelidnota tibialis Burmeister, 1844
Pelidnota uncinata Ohaus, 1930
Pelidnota vitalisi Ohaus, 1925
Pelidnota vitticollis Burmeister, 1844
Pelidnota xanthopyga Hardy, 1975
Pelidnota xanthospila Germar, 1824
Pelidnota yungana Ohaus, 1934
Pelidnota zikani Ohaus, 1922

Subfamily MELOLONTHINAE
Genus *LUTFIUS* nom. nov.

Colpomorpha Szito, 1994. Journal of the Australian Entomological Society 33(4), 30 November: 363. (Insecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Melolonthinae). Preoccupied by *Colpomorpha* Meyrick, 1929. Exot. Microlep., 3, 528. (Insecta: Lepidoptera: Gelechoidea: Oecophoridae: Oecophorinae).

Remarks: The moth genus *Colpomorha* was established by Meyrick, 1929 with the type species *Colpomorpha orthomeris* Meyrick, 1929 by monotypy in Lepidoptera. It was described in the "Gelechiadae" and it was transferred to the Oecophoridae by Clarke (1955). It is still used as a valid generic name. Subsequently, the Australian scarab beetle generic name *Colpomorpha* was proposed by Szito, 1994 with the type species *Colpomorpha parva* Szito, 1994 by monotypy and original designation in Melolonthinae. However, the name *Colpomorpha* Szito, 1994 is invalid under the law of homonymy, being a junior homonym of *Colpomorpha* Meyrick, 1929. So, in accordance with the article 60 International Code of Zoological Nomenclature, I propose to substitute the junior homonym name *Colpomorpha* Szito, 1994 for the nomen novum *Lutfius* as a replacement name.

Etymology: The name is dedicated to my friend Lütfi Özden (Turkey). It is masculine in gender.

Summary of nomenclatural changes:

Lutfius **nom. nov.**
pro *Colpomorpha* Szito, 1994 (nec Meyrick, 1929)

Lutfius parvus (Szito, 1994) **comb. nov.**
from *Colpomorpha parva* Szito, 1994
Distr.: Australian (W Australia)

Note: I know that Dr. Andras Szito (Australia) is alive. This status on homonymy was informed by me to Dr. Andras Szito who is the current author of the genus name at least two years ago. Paper on this genus was prepared by me. Then it was sent to Dr. Szito. Finally we came to an agreement to publish it in the Australian Journal of Entomology. However, I have not been in communication with Dr. Szito since then, despite all my efforts. So I have decided to publish it here.

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ODONATA (INSECTA) FROM NORTHERN IRAN, WITH COMMENTS ON THEIR PRESENCE IN RICE FIELDS

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ABSTRACT: Odonata are considered effective predators to control pest organisms in rice fields. In the rice fields and other sites located in Northern Iran (Mazandaran Province) during 2003-2006, the 30 species from 19 genera and 8 families of Odonata (both suborders Zygoptera and Anisoptera) were collected and evaluated.

KEY WORDS: Odonata, Rice field, Northern Iran, Mazandaran province

Rice is the primary food for half the people in the world, providing more calories than any other single food. Several pests cause damage and yield loss on this crop (Datta and Khush, 2002). Pesticides can control many of the rice pests, but because of environmental risks, crop infection and killing of beneficial insects (natural enemies and pollinators) are not efficient and safe method (Khan et al., 1991). There are several natural predators in the rice fields that if conserved, can play an effective role in decreasing the pest population density (Mohyuddin, 1990; Bonhof et al., 1997). Larvae and adults of the Odonata are considered efficient predators in the rice fields (Heinrichs, 1994; Alonso Mejia and Marquez, 1994).

Rice fields, together with their contiguous aquatic habitats and dry land comprise a rich mosaic of rapidly changing ecotones, harboring a rich biological diversity, maintained by rapid colonization as well as by rapid reproduction and growth of organisms (Fernando, 1996). The variety of organisms inhabiting the rice field ecosystems includes a rich composition of fauna and flora. These organisms colonize the rice fields by their resting stages in soil, by air and via irrigation water (Fernando, 1993). The fauna are dominated by micro-, meso- and macro- invertebrates (especially arthropods) inhabiting the vegetation, water and soil sub-habitats of the rice fields, while vertebrates are also associated with rice fields. The aquatic phase of rice fields generally harbors a varied group of aquatic animals. Those that inhabit the vegetation are mainly the arthropod insects and spiders. In addition, many species of amphibians, reptiles, birds and mammals visit the rice fields for feeding, from surrounding areas, and are generally considered as temporary or ephemeral inhabitants (Bambaradeniya et al., 1998). In relation to the rice crop, the fauna and flora in rice fields include pests, their natural enemies (predators and parasitoids) and neutral forms.

The arthropod natural enemies of rice insect pests include a wide range of predators and parasitoids that are important biological control agents. Predators include a variety of spiders, and insects such as carabid beetles, aquatic and terrestrial predatory bugs and dragon flies (Bambaradeniya and Amerasinghe, 2003).

Odonata Fabricius, 1793 are an order of aquatic palaeopterous insects. There are about 6,500 extant species in just over 600 genera. Adult odonates are medium to large in size, often conspicuous and/or brightly colored insects and are aerial predators hunting by sight. They generally are found at or near fresh water although some species roam widely and may be found far from their breeding sites (Norling and Sahlen, 1997). Odonate larvae are non-discriminate hunters which can eat any animal as large as or smaller than themselves, including their own species. Small vertebrates such as tadpoles and juvenile forms of fish are not immune from attack (Novelo et al., 2002). Prey may be stalked or ambushed. Captured prey is pulled back using powerful muscles in the labium and chewed by strong mandibles (Papazian, 1994).

The fauna of Iranian Odonata is quite poorly studied as only 95 species and subspecies have been recorded so far (Heidari and Dumont, 2002). Among the different crop fields, rice fields are the semi-aquatic ecosystems that are suitable for reproduction and survival of Odonata. The fauna of insects as potential prey of Odonata is very diverse in rice fields, which should make them optimal habitats for Odonata. The fauna of dragonflies and damselflies was studied in the rice fields of Northern Iran (Mazandaran Province), and additional specimens were collected from other habitats in this province.

MATERIALS AND METHODS

The materials were collected from the rice seedlings, and around hedges and grasses of Northern Iran through 2003-2006. The sampled regions in this study were Ghaemshahr, Sari, Amol, Savadkooh, Behshahr, Joibar, Mahmood-Abad, Fereydon-Kenar, Babol, Chalus, Noor and Nooshahr. After collecting the materials, they were killed by the cyanide, wings were spread, pinned and labeled (locality, date of collection) and identified preliminary by different scientific resources and identification keys (Spuris, 1967; Belshev, 1973; Hammond, 1983; Westfall, 1987; Askew, 1988; Kalkman, 2006). Then the materials were sent to the authorized taxonomists including, Dr. Geert De Knijf (Instituut voor Natuur- en Bosonderzoek, Research Institute for Nature and Forest, Belgium) and Dr. Marc Bernard (Société Linnéenne de Bordeaux, France) for identification or confirmation. All the materials were collected by the first, second and third authors, and also many obtained data from different collections were used in this paper. Also, the specimens are deposited in the collections of the mentioned specialists.

RESULTS

A total of 30 species of 19 genera and 8 families were recorded from Northern Iran (Mazandaran province; fig. 1). Of these, 22 species were collected in the rice fields surveyed. The list of Odonata species from rice fields of Northern Iran is given below.

LIST OF ODONATA FROM NORTHERN IRAN

SUBORDER ZYGOPTERA

CALOPTERYGIDAE

Calopteryx splendens orientalis Selys, 1887
Material examined: Ghaemshahr (2♂, 1♀), August 2004 and September 2005; Sari (2♀), July 2005.

COENAGRIONIDAE

Coenagrion vanbrinkae Lohmann, 1993
Material examined: Ghaemshahr (Rice field) (2♀), June 2004.

Ischnura elegans ebneri Schmidt, 1838
Material examined: Ghaemshahr (Rice field) (1♀), April 2003; Sari (Rice field) (1♂), August 2005.

Ischnura forcipata Morton, 1907
Material examined: Sari (Rice field) (1♂), July 2005; Amol (Rice field) (1♀, 1♂), June 2005.

Ischnura pumilio (Charpentier, 1825)
Material examined: Savadkooh (Rice field) (1♀), May 2003.

Pseudagrion decorum (Rambur, 1842)
Material examined: Ghaemshahr (Rice field) (1♂), July 2005; Behshahr (Rice field) (1♀), September 2004.

Pyrrhosoma nymphula (Sulzer, 1776)
Material examined: Ghaemshahr (1♀), August 2004; Amol (1♂), September 2005.

EUPHAEIDAE

Epallage fatime (Charpentier, 1840)
Material examined: Savadkooh (1♂), June 2005; Joibar (1♂), August 2005.

PLATYCNEMIDIDAE

Platycnemis dealbata Selys & Hagen, 1850
Material examined: Sari (Rice field) (1♀, 1♂), June 2004.

SUBORDER ANISOPTERA

AESHNIDAE

Aeshna affinis Vander Linden, 1820
Material examined: Savadkooh (Rice field) (1♀), Sept. 2005.

Aeshna mixta Latreille, 1805
Material examined: Amol (Rice field) (1♂, 1♀), September 2004, 2005; Ghaemshahr (Rice field) (1♀), October 2005.

Anax parthenope (Selys, 1839)
Material examined: Behshahr (Rice field) (1♀, 1♂), July and August 2005; Amol (Rice field) (2♀), September 2005.

Anax imperator Leach, 1815
Material examined: Savadkooh (Rice field) (1♂), August 2004.

Brachytron pratense (Müller, 1764)
Material examined: Joibar (1♀), May 2005; Ghaemshahr (1♂), August 2005.

CORDULIIDAE

Somatochlora flavomaculata (Vander Linden, 1825)
Material examined: Mahmood-Abad (Rice field) (1♂), August 2003; Fereydon-Kenar (Rice field) (1♂), September 2003.

GOMPHIDAE

Anormogomphus kiritshenkoi Bartenef, 1913
Material examined: Sari (1♀, 1♂), April 2003; Amol (2♂), July 2004.

Onychogomphus forcipatus albotibialis (Schmidt, 1954)
Material examined: Ghaemshahr (1♂), September 2005.

LIBELLULIDAE

Orthetrum albistylum (Selys, 1848)
Material examined: Savadkooh (Rice field) (1♀), July 2005.

Orthetrum luzonicum (Brauer, 1868)
Material examined: Ghaemshahr (Rice field) (1♀), August 2005.

Orthetrum sabina (Drury, 1773)
Material examined: Babol (1♂, 2♀), August, July and September 2005; Behshahr (2♀), June, 2004; November 2005; Ghaemshahr (2♂, 2♀) September 2002, July 2005, February 2005; Amol (Rice field) (3♂, 1♀), September 2004, September 2005, February 2005; Sari (2♂), July 2004.

Libellula depressa Linnaeus, 1758
Material examined: Amol (Rice field) (1♂), July 2005; Sari (1♂), August 2005; Savadkooh (Rice field) (1♂), August 2005.

Sympetrum sanguineum (Müller, 1764)
Material examined: Savadkooh (Rice field) (1♂), June 2004.

Sympetrum striolatum striolatum (Charpentier, 1840)
Material examined: Babol (2♂), Sept. 2005; Amol (2♂), August - July 2004; Amol (Rice field) (2♀) May and September 2005; Behshahr (2♀, 2♂), September 2005; Sari (3♀, 1♂), September 2005; Ghaemshahr (3♀, 5♂), April 2006. .

Sympetrum vulgatum decoloratum (Selys, 1884)
Material examined: Ghaemshahr (Rice field) (2♂), September 2005; Chalus (Rice field) (1♀), August 2005.

Crocothemis erythraea (Brullé, 1832)
Material examined: Ghaemshahr (1♂), June 2005; Amol (3♂), September 2005.

Crocothemis servilia (Drury, 1773)
Material examined: Ghaemshahr (2♂), July and Sept. 2005; Savadkooh (2♀), June 2004 and Dec. 2005; Ghaemshahr (1♀), May 2004; Babol (1♂), September 2005; Amol (Rice field) (2♀, 1♂), September 2005; Behshahr (2♂), September 2005.

Diplacodes lefebvrii (Rambur, 1842)
Material examined: Amol (Rice field) (1♀), November 2004; Savadkooh (Rice field) (1♀), August 2005.

Trithemis annulata (Palisot de Beauvois, 1807)
Material examined: Mahmood-Abad (Rice field) (2♀), September 2004; Amol (Rice field) (1♀), June 2005.

Trithemis arteriosa (Burmeister, 1839)
Material examined: Fereydon-Kenar (Rice field) (1♀), November 2005; Noor (Rice field) (1♂), July 2004.

Trithemis festiva (Rambur, 1842)
Material examined: Nooshahr (Rice field) (1♂), September 2004; Chalus (2♂), November 2003; Savadkooh (Rice field) (1♂), August 2005.

DISCUSSION

Among the 8 families reported in this paper, the two families including, Libellulidae and Coenagrionidae with 13 and 6 species, respectively are more diverse taxa in terms of the number of species in Northern Iran. Also, of the 30 collected species from rice fields and around grasslands of Northern Iran, three species included, *Sympetrum striolatum*, *Orthetrum sabina* and *Crocothemis servilia* are dominant species and probably have a more efficient role in the control of rice pests. *S. striolatum* is the most cosmopolitan and dominant species in Mazandaran province. About the importance of *Sympetrum* species in biological control, the predatory capacities and efficiencies of *S. frequens* dragonfly nymphs on *Anopheles sinensis* mosquito larvae were evaluated in the laboratory as part of a series of studies on their prey-predator relationship in rice fields (Urabe *et al.*, 1986). Urabe *et al.* (1986) showed that the 8^{th}, 9^{th} and 19^{th} instar nymphs of *S. frequens* consumed 12, 19 and 28 individuals of the 4^{th} instar larvae or more than 100 individuals of the 2^{nd} instar larvae of *A. sinensis* per day, respectively, when the prey larvae were plentiful. During the 30-day period between the 8^{th} and 10^{th} nymphal instars (except for 3 or 4 days just before emergence), the nymph of *S. frequens* consumed an average of 524 individuals of 4^{th} instar larvae of *A. sinensis*.

This research deals with the fauna of Odonata in a part of Iran; Iran is a large country incorporating various geographical regions and climates; consequently it would be expected that a large number of additional species and new records are to be expected to occur in country. For example in Turkey, a species frequently present in rice fields is *Sympetrum depressiusculum*. Since it was recorded from South Eastern Armenia, it is very probably also present in Iran. However, although the Odonata fauna of Turkey was studied rather well (Demirsoy, 1995; Kalkman, 2006; Salur and Kıyak, 2000, 2006; Salur and Özsarac, 2004; Miroğlu and Kartal, 2008), but there are a few faunistic papers on Iranian fauna (Blom, 1982; Heidari and Dumont, 2002). Therefore it is very necessary to work on this interesting and beneficial taxon in Iran.

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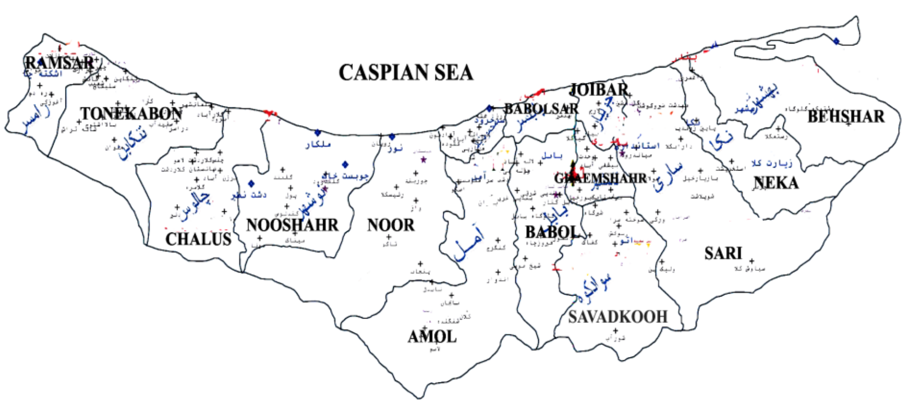

Fig. 1. The map of Mazandaran province (Northern Iran) included all the regions and cities.

NOMENCLATURAL CHANGES FOR TWENTY TRILOBITES GENERA

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ABSTRACT: Twenty junior homonyms were detected among the Trilobites genera and the following replacement names are proposed: Order Agnostida: *Yakutiana* nom. nov. for *Pseudophalacroma* Pokrovskaya, 1958 (Ptychagnostidae); *Morocconus* nom. nov. for *Cephalopyge* Geyer, 1988 (Weymouthiidae); Order Asaphida: *Russiana* nom. nov. for *Scintilla* Pegel, 1986 (Anomocaridae); *Sunocavia* nom. nov. for *Cavia* Sun, 1993 (Remopleurididae); Order Lichida: *Karslanus* nom. nov. for *Ariaspis* Wolfart, 1974 (Damesellidae); *Belenopyge* Pek & Vanek, 1991 subtitute name for *Lobopyge* Pribyl & Erben, 1952 (Lichidae); Order Phacopida: *Wuoaspis* nom. nov. for *Coronaspis* Wu, 1990 (Encrinuridae); Order Proetida: *Hahnus* nom. nov. for *Eometopus* Hahn & Hahn, 1996 (Brachymetopidae); *Engelomorrisia* nom. nov. for *Capricornia* Engel & Morris, 1996; *Yuanjia* nom. nov. for *Haasia* Yuan, 1988 and *Spatulata* nom. nov. for *Spatulina* Osmólska, 1962 (Proetidae); *Pseudobirmanites* Li, 1978 subtitute name for *Madygenia* Petrurina, 1975 (Rorringtoniidae); Order Ptychopariida: *Demuma* nom. nov. for *Pruvostina* Hupé, 1952 (Bigotinidae); *Novocatharia* nom. nov. for *Catharia* Alvaro & Vizcaino, 2003 (Conocoryphidae); *Geyerorodes* nom. nov. for *Orodes* Geyer, 1990 (Ellipsocephalidae); *Enixus* nom. nov. for *Schistocephalus* Chernysheva, 1956 (Palaeolenidae); *Palmerara* nom. nov. for *Nyella* Palmer, 1979 (Ptychopariidae); *Pinarella* nom. nov. for *Pensacola* Palmer & Gatehouse, 1972 (Yunnanocephalidae); Family uncertain: *Indiligens* nom. nov. for *Hospes* Stubblefield, 1927 and *Indigestus* nom. nov. for *Hybocephalus* Remelé, 1885. Accordingly, new combinations are herein proposed for the type species currently included in these genera respectively: *Yakutiana crebra* (Pokrovskaya, 1958) comb. nov.; *Morocconus notabilis* (Geyer, 1988) comb. nov.; *Russiana polita* (Pegel, 1986) comb. nov.; *Sunocavia dactyloides* (Guo & Duan, 1978) comb. nov.; *Karslanus parteaculeatus* (Wolfart, 1974) comb. nov.; *Belenopyge branikensis* (Barrande, 1872) comb. nov.; *Wuoaspis changningensis* (W. Zhang, 1974) comb. nov.; *Hahnus maximowae* (Hahn & Hahn, 1982) comb. nov.; *Engelomorrisia queenslandica* (Engel & Morris, 1996) comb. nov.; *Yuanjia wildungensis* (Richter, 1913) comb. nov.; *Spatulata spatulata* (Woodward, 1902) comb. nov.; *Pseudobirmanites suavis* (Petrurina, 1975) comb. nov.; *Demuma nicklesi* (Hupé, 1952) comb. nov.; *Novocatharia ferralsensis* (Courtessole, 1967) comb. nov.; *Geyerorodes schmitti* (Geyer, 1990) comb. nov.; *Enixus enigmaticus* (Chernysheva, 1956) comb. nov.; *Palmerara granosa* (Resser, 1939) comb. nov.; *Pinarella isolata* (Palmer & Gatehouse, 1972) comb. nov.; *Indiligens clonograpti* (Stubblefield, 1927) comb. nov. and *Indigestus hauchecornei* (Remelé, 1885) comb. nov.

KEY WORDS: nomenclatural changes, homonymy, replacement names, Trilobites.

In an effort to reduce the number of homonyms in Trilobites, I systematically checked the generic names published. I found twenty trilobites genera whose names had been previously published for other taxa, making them junior homonyms. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose replacement names for these genus group names.

TAXONOMY

Order AGNOSTIDA
Family PTYCHAGNOSTIDAE
Genus *YAKUTIANA* nom. nov.

Pseudophalacroma Pokrovskaya, 1958. Trudy geol. Inst., Leningr. 16: 79. (Trilobita: Agnostida: Agnostina: Agnostoidea: Ptychagnostidae). Preoccupied by *Pseudophalacroma* Jörgensen, 1923. Rep. Danish Ocean. Exped. 1908-10, 7, J. 2, 3. (Protozoa: Phytomastihophorea: Dinoflagellida: Dinophysidae).

Remarks: Pokrovskaya (1958) proposed the generic name *Pseudophalacroma* as a genus of trilobites with the type species *Pseudophalacroma crebra* Pokrovskaya, 1958 from Dzhakhtarsky Horizon, Yakutia, E Siberia, Russia. It is a valid genus name (Jell & Adrain, 2003). Unfortunately, the generic name was already preoccupied by Jörgensen (1923), who had proposed the genus name *Pseudophalacroma* as a protozoon genus with the type species *Phalacroma nasutum* von Stein, 1883. Thus, the genus group name *Pseudophalacroma* Pokrovskaya, 1958 is a junior homonym of the generic name *Pseudophalacroma* Jörgensen, 1883. I propose a new replacement name *Yakutiana* **nom. nov.** for *Pseudophalacroma* Pokrovskaya, 1958. The name is from the type locality Yakutia.

Summary of nomenclatural changes:

Yakutiana **nom. nov.**
pro *Pseudophalacroma* Pokrovskaya, 1958 (non Jörgensen, 1883)

Yakutiana crebra (Pokrovskaya, 1958) **comb. nov.**
from *Pseudophalacroma crebra* Pokrovskaya, 1958

Family WEYMOUTHIIDAE
Genus *MOROCCONUS* nom. nov.

Cephalopyge Geyer, 1988. Neues Jahrb. Geol. Palaeontol. Abh. B 177 (1): 123. (Trilobita: Agnostida: Eodiscina: Eodiscoidea: Weymouthiidae). Preoccupied by *Cephalopyge* Hanel, 1905. Zool. Jahrb., Syst., 21, 451. (Mollusca: Gastropoda: Opisthobranchia: Nudibranchia: Phylliroidae).

Remarks: The name *Cephalopyge* was initially introduced by Hanel, 1905 for a gastropod genus (with the type species *Phylliroe trematoides* Chun, 1889). It is still used as a valid genus name (Bouchet et al., 2001). Subsequently, Geyer, 1988 described a trilobite genus of the family Weymouthiidae (with the type species *Cephalopyge notabilis* Geyer, 1988 from Jbel Wawrmast Fm, Anti-Atlas, Morocco) under the same generic name. It is a valid genus name (Jell & Adrain, 2003). Thus, the genus *Cephalopyge* Geyer, 1988 is a junior homonym of the genus *Cephalopyge* Hanel, 1905. I propose a new replacement name *Morocconus* **nom. nov.** for *Cephalopyge* Geyer, 1988. The name is from the type locality Morocco.

Summary of nomenclatural changes:

Morocconus **nom. nov.**
pro *Cephalopyge* Geyer, 1988 (non Hanel, 1905)

Morocconus notabilis (Geyer, 1988) **comb. nov.**
from *Cephalopyge notabilis* Geyer, 1988

Order ASAPHIDA
Family ANOMOCARIDAE
Genus *RUSSIANA* nom. nov.

Scintilla Pegel, 1986. In Gintsinger, Fefelov, Vinkman, Tarnovsky, Zhuravleva & Pegel 1986, Akad Nauk SSSR Sib Otd Inst Geol Geofiz Tr 669: 106. ((Trilobita: Asaphida: Asaphina: Anomocaroidea: Anomocaridae). Preoccupied by *Scintilla* Deshayes, 1856. Proc. zool. Soc. London, 23, 1855, 171. (Mollusca: Bivalvia: Heterodonta: Veneroida: Galeommatoidea: Galeommatidae).

Remarks: The mollusk genus *Scintilla* was erected by Deshayes, 1856 with the type species *Scintilla philippinensis* Deshayes, 1856 by subsequent designation. Later, the genus *Scintilla* was described by Pegel, 1986 with the type species *Scintilla polita* Pegel, 1986 from Shangansk Fm, Tuva, Russia. It is a valid genus name (Jell & Adrain, 2003). However, the name *Scintilla* Pegel, 1986 is invalid under the law of homonymy, being a junior homonym of *Scintilla* Deshayes, 1856. I propose to substitute the junior homonym name *Scintilla* Pegel, 1986 for the nomen novum *Russiana*. The name is from the type locality Russia.

Summary of nomenclatural changes:

Russiana **nom. nov.**
pro *Scintilla* Pegel, 1986 (non Deshayes, 1856)

Russiana polita (Pegel, 1986) **comb. nov.**
from *Scintilla polita* Pegel, 1986

Family REMOPLEURIDIDAE
Genus *SUNOCAVIA* nom. nov.

Cavia Sun, 1993. Prof. Pap. Stratigr. Palaeontol. 24: 28. (Trilobita: Asaphida: Asaphina: Remopleurıdoidea: Remopleurididae). Preoccupied by *Cavia* Pallas, 1766. Misc. Zool., 30. (Mammalia: Theria: Rodentia: Caviidae: Caviinae).

Remarks: Firstly, the genus *Cavia* was established by Pallas, 1766 for a mammal genus with the type species *Cavia porcellus* Linnaeus, 1758. It is still used as a valid genus name. It is the type genus for the family group names Caviidae and Caviinae. Later, the name *Cavia* was proposed by Sun, 1993 for a trilobite genus with the type species *Haniwa dactyloides* Guo & Duan, 1978 from Fengshan Fm, Hebei, China. It is a valid genus name (Jell & Adrain, 2003). However, the name *Cavia* Sun, 1993 is invalid under the law of homonymy, being a junior homonym of *Cavia* Pallas, 1766. I propose to substitute the junior homonym name *Cavia* Sun, 1993 for the nomen novum *Sunocavia*. The name is dedicated to Hongbing Sun who is the current author of the preexisting genus name *Cavia*.

Summary of nomenclatural changes:

Sunocavia **nom. nov.**
pro *Cavia* Sun, 1993 (non Pallas, 1766)

Sunocavia dactyloides (Guo & Duan, 1978) **comb. nov.**
from *Cavia dactyloides* (Guo & Duan, 1978)
Haniwa dactyloides Guo & Duan, 1978

Order LICHIDA
Family DAMESELLIDAE
Genus *KARSLANUS* nom. nov.

Ariaspis Wolfart, 1974. Geol.Jb.(B) 8: 130. (Trilobita: Lichida: Lichina: Dameselloidea: Damesellidae). Preoccupied by *Ariaspis* Denison, 1963. Fieldiana, Geol. 14 (7): 120. (Chordata: Pteraspidomorphi: Pteraspidomorphes).

Remarks: The name *Ariaspis* was initially introduced by Denison, 1963 for a fossil fish genus (with the type species *Ariaspis ornata* Denison, 1963). It is not extant. It was assigned to Pteraspidomorphes by Sepkoski (2002). Subsequently, Wolfart, 1974 described a trilobite genus of the family Damesellidae (with the type species *Ariaspis parteaculeata* Wolfart, 1974 from Surkh Bum, Afghanistan) under the same generic name. It is a valid genus name in Damesellidae (Jell & Adrain, 2003). Thus, the genus *Ariaspis* Wolfart, 1974 is a junior homonym of the genus *Ariaspis* Denison, 1963. I propose a new replacement name *Karslanus* **nom. nov.** for *Ariaspis* Wolfart, 1974. The name is dedicated to my student Kemal Arslan (Turkey). The name is masculine in gender.

Summary of nomenclatural changes:

Karslanus **nom. nov.**
pro *Ariaspis* Wolfart, 1974 (non Denison, 1963)

Karslanus parteaculeatus (Wolfart, 1974) **comb. nov.**
from *Ariaspis parteaculeata* Wolfart, 1974

Family LICHIDAE
Genus *BELENOPYGE* Pek & Vanek, 1991 substitute name

Lobopyge Pribyl & Erben, 1952. Paläont. Z., 26, (3-4), 158. (Trilobita: Lichida: Lichina: Lichoidea: Lichidae). Preoccupied by *Lobopyge* Attems, 1951. Rev. Zool. Bot. afr., 44, 391. (Diplopoda: Polydesmida: Polydesmidea: Pyrgodesmidae).

Remarks: Firstly, the genus *Lobopyge* was established by Attems, 1951 for a millipede genus with the type species *Lobopyge papillata* Attems, 1951. It is still used as a valid genus name (Jeekel, 1971). Later, the generic name *Lobopyge* was proposed by Pribyl & Erben, 1952 for a trilobite with the type species *Lichas branikensis* Barrande, 1872 from Dvorce-Prokop Fm, Czech Republic. It is a valid genus name (Jell & Adrain, 2003). However, the name *Lobopyge* Pribyl & Erben, 1952 is invalid under the law of homonymy, being a junior homonym of *Lobopyge* Attems, 1951. *Lobopyge* Pribyl & Erben, 1952 has a junior subjective synonym as *Belenopyge* Pek & Vanek, 1991(with the type species *Lichas balliviani* Kozlowski, 1923 from Belén Fm, Bolivia). It was synonymized by Ebach & Ahyong (2001). So

I propose to substitute the junior homonym name *Lobopyge* Pribyl & Erben, 1952 for the name *Belenopyge* Pek & Van, 1991.

Summary of nomenclatural changes:

Belenopyge Pek & Vanek, 1991 **subtitute name**
pro *Lobopyge* Pribyl & Erben, 1952 (non Attems, 1951)

Belenopyge branikensis (Barrande, 1872) **comb. nov.**
from *Lobopyge branikensis* (Barrande, 1872)
Lichas branikensis Barrande, 1872
Lichas balliviani Kozlowski, 1923
Belenopyge balliviani (Kozlowski, 1923)

Order PHACOPIDA
Family ENCRINURIDAE
Genus *WUOASPIS* nom. nov.

Coronaspis Wu, 1990. Acta Palaeontol Sin 29 (5): 544. (Trilobita: Phacopida: Cheirurina: Cheiruroidea: Encrinuridae). Preoccupied by *Coronaspis* MacGillivray, 1921. The Coccidae, 312, 362. (Insecta: Hemiptera: Diaspididae).

Remarks: The generic name *Coronaspis* MacGillivray, 1921 was proposed for an hemipteran genus (with the type species *Chionaspis coronifera* Green, 1905). Subsequently, the generic name *Coronaspis* Wu, 1990 was introduced for a new trilobite genus (with the type species *Coronocephalus changningensis* W. Zhang, 1974 from Xiushan Fm, Sichuan, China. It is a valid genus name (Jell & Adrain, 2003). Thus, the genus *Coronaspis* Wu, 1990 is a junior homonym of the generic name *Coronaspis* MacGillivray, 1921. I propose for the genus *Coronaspis* Wu, 1990 the new replacement name *Wuoaspis* **nom. nov.** The name is dedicated to Hongji Wu who is current author of the preexisting generic name *Coronaspis*.

Summary of nomenclatural changes:

Wuoaspis **nom. nov.**
pro *Coronaspis* Wu, 1990 (non MacGillivray, 1921)

Wuoaspis changningensis (W. Zhang, 1974) **comb. nov.**
from *Coronaspis changningensis* (W. Zhang, 1974)
Coronocephalus changningensis W. Zhang, 1974

Order PROETIDA
Family BRACHYMETOPIDAE
Genus *HAHNUS* nom. nov.

Eometopus Hahn & Hahn, 1996. Cour Forschungsinst Senckenb 195, 26 November: 142. (Trilobita: Proetida: Proetina: Aulacopleuroidea: Brachymetopidae). Preoccupied by *Eometopus* Small & Lynn, 1985. In Lee & Bovee [Eds]. An illustrated guide to the Protozoa. Society of Protozoologists, Kansas: 430. (Protozoa: Ciliophora: Spirotrichea: Armophorida: Metopidae).

Remarks: Firstly, the genus *Eometopus* was established by Small & Lynn, 1985 for a protozoon genus with the type species *Eometopus simolex* Small & Lynn, 1985. It is still used as a valid genus name. Later, the generic name *Eometopus* was proposed by Hahn & Hahn, 1996 for a trilobite genus with the type taxon *Brachymetopus ouralicus maximowae* Hahn & Hahn, 1982 from Mugodshar Mts, Kazakhstan. It is a valid genus name (Jell & Adrain, 2003). However, the name *Eometopus* Hahn & Hahn, 1996 is invalid under the law of homonymy, being a junior homonym of *Eometopus* Small & Lynn, 1985. I propose to substitute the junior homonym name *Eometopus* Hahn & Hahn, 1996 for the nomen novum *Hahnus*. The name is dedicated to the surname of G. Hahn and R. Hahn who are current authors of the preexisting genus name *Eometopus*. It is masculine in gender.

Summary of nomenclatural changes:

Hahnus **nom. nov.**
pro *Eometopus* Hahn & Hahn, 1996 (non Small & Lynn, 1985)

Hahnus maximowae (Hahn & Hahn, 1982) **comb. nov.**
from *Eometopus maximowae* (Hahn & Hahn, 1982)
Brachymetopus ouralicus maximowae Hahn & Hahn, 1982

Family PROETIDAE
Genus *ENGELOMORRISIA* nom. nov.

Capricornia Engel & Morris, 1996. Geol. Palaeontol. 30, 31 Juli: 125. (Trilobita: Proetida: Proetina: Proetoidea: Proetidae). Preoccupied by *Capricornia* Obraztsov, 1960. Beitr. Ent. 10: 474. (Insecta: Lepidoptera: Tortricoidea: Tortricidae).

Remarks: Engel & Morris (1996) proposed the generic name *Capricornia* as a subgenus of *Bollandia* Reed, 1943 with the type species *Bollandia* (*Capricornia*) *queenslandica* Engel & Morris, 1996 from Neils Creek Clastics, Queensland, Australia. It is a valid genus name in Proteidae (Jell & Adrain, 2003). Unfortunately, the generic name was already preoccupied by Obraztsov (1960), who had proposed the genus name *Capricornia* as an objective replacement name of the preoccupied genus *Melodes* Guenée, 1845 with the type species *Carpocapsa boisduvaliana* Duponchel , 1836 in the moth family Tortricidae. Thus, the genus group name *Capricornia* Engel & Morris, 1996 is a junior homonym of the generic name *Capricornia* Obraztsov, 1960. I propose a new replacement name *Engelomorrisia* **nom. nov.** for *Capricornia* Engel & Morris, 1996. The name is dedicated to B. A. Engel and N. Morris who are the current authors of the preexisting generic name *Capricornia*.

Summary of nomenclatural changes:

Engelomorrisia **nom. nov.**
pro *Capricornia* Engel & Morris, 1996 (non Obraztsov, 1960)

Engelomorrisia queenslandica (Engel & Morris, 1996) **comb. nov.**
from *Capricornia queenslandica* Engel & Morris, 1996

Genus *YUANJIA* nom. nov.

Haasia Yuan, 1988. Palaeontogr Abt A Palaeozool-Stratigr 201 (1-3): 82. (Trilobita: Proetida: Proetina: Proetoidea: Proetidae). Preoccupied by *Haasia* Bollman, 1893. Bull. U.S. nat. Mus., No. 46, 158. (Diplopoda: Chordeumatida: Anthogonidae).

Remarks: The millipede genus *Haasia* was erected by Bollman, 1893 with the type species *Craspedosoma troglodytes* Latzel, 1884. It is a valid genus name (e. g. Jeekel, 1971). Later, the genus *Haasia* was described by Yuan, 1988 with the type species *Cyrtosymbole wildungensis* Richter, 1913 from *Wocklumeria*-Stufe, Rhenish Massif, Germany. It is a valid genus name (Jell & Adrain, 2003). However, the name *Haasia* Yuan, 1988 is invalid under the law of homonymy, being a junior homonym of *Haasia* Bollman, 1893. I propose to substitute the junior homonym name *Haasia* Yuan, 1988 for the nomen novum *Yuanjia*. The name is dedicated to Jinliang Yuan who is current author name of the preexisting genus *Haasia*.

Summary of nomenclatural changes:

Yuanjia **nom. nov.**
pro *Haasia* Yuan, 1988 (non Bollman, 1893)

Yuanjia wildungensis (Richter, 1913) **comb. nov.**
from *Haasia wildungensis* (Richter, 1913)
Cyrtosymbole wildungensis Richter, 1913

Genus *SPATULATA* nom. nov.

Spatulina Osmólska, 1962. Acta palaeont. pol. 7: 181. (Trilobita: Proetida: Proetina: Proetoidea: Proetidae). Preoccupied by *Spatulina* Szilády, 1942. Mitt. münchen. ent. Ges., 32, 625. (Insecta: Diptera: Brachycera: Rhagionidae).

Remarks: The name *Spatulina* was initially introduced by Szilády, 1942 for a fly genus (with the type species *Spatulina engeli* Szilády, 1942 by monotypy). It is stil used as a valid genus name in Diptera. Subsequently, Osmólska, 1962 described a new trilobite genus (with the type species *Phillipsia spatulata* Woodward, 1902 from Coddon Hill Chert Fm, England) under the same generic name. It is a valid genus name in Proetidae (Jell & Adrain, 2003). Thus, the genus *Spatulina* Osmólska, 1962 is a junior homonym of the genus *Spatulina* Szilády, 1942. I propose a new replacement name *Spatulata* **nom. nov.** for *Spatulina* Osmólska, 1962. The name is from the current species name for tautonymy.

Summary of nomenclatural changes:

Spatulata **nom. nov.**
pro *Spatulina* Osmólska, 1962 (non Szilády, 1942)

Spatulata spatulata (Woodward, 1902) **comb. nov.**
from *Spatulina spatulata* (Woodward, 1902)
Phillipsia spatulata Woodward, 1902

Family RORRINGTONIIDAE
Genus *PSEUDOBIRMANITES* Li, 1978

Madygenia Petrunina, 1975. In Repina et al., in Repina, Yaskovitch et al., Trudy Inst. Geol. Geofiz. sib. Otd. 278: 229. (Trilobita: Proetida: Proetina: Aulacopleuroidea: Rorringtoniidae). Preoccupied by *Madygenia* Sharov, 1968. Trudy paleont.Inst. 118: 171. (Insecta: Orthoptera: Ensifera: Oedischioidea: Proparagryllacrididae: Madygeniinae).

Remarks: Firstly, the genus *Madygenia* was established by Sharov, 1968 for fossil Orthoptera with the type species *Madygenia orientalis* Sharov, 1968 by monotypy and original designation. It is still used as a valid genus name. It is the type genus of the subfamily Madygeniinae Gorochov, 1987. Later, the generic name *Madygenia* was described by Petrurina, 1975 for a new trilobite genus with the type species *Madygenia suavis* Petrurina, 1975 from *Kielanella-Tretaspis* Zone, Turkestan. Also, it is stil used as a valid genus name (Jell & Adrain, 2003). However, the name *Madygenia* Petrurina, 1975 is invalid under the law of homonymy, being a junior homonym of *Madygenia* Sharov, 1968. On the other side, *Madygenia* Petrurina, 1975 has a junior subjective synonym as *Pseudobirmanites* Li, 1978 (with the type species *Pseudobirmanites leiboensis* Li, 1978 from Linxing Fm, S Sichuan, China). It was synonymized by Adrain in Jell & Adrain (2003). So I propose to substitute the junior homonym name *Madygenia* Petrurina, 1975 for the name *Pseudobirmanites* Li, 1978.

Summary of nomenclatural changes:

Pseudobirmanites Li, 1978 **subtitute name**
pro *Madygenia* Petrurina, 1975 (non Sharov, 1968)

Pseudobirmanites suavis (Petrurina, 1975) **comb. nov.**
from *Madygenia suavis* Petrurina, 1975
Pseudobirmanites leiboensis Li, 1978

Order PTYCHOPARIIDA
Family BIGOTINIDAE
Genus *DEMUMA* nom. nov.

Pruvostina Hupé, 1952. C.R. Acad. Sci., Paris, 235, 480. [n.n.]; 1953, Notes Serv. Min. Maroc, no. 103 (1952), 222. (Trilobita: Ptychopariida: Ptychopariina: Ellipsocephaloidea: Bigotinidae). Preoccupied by *Pruvostina* Scott & Summerson, 1943. Amer. J. Sci., 241, 670. (Crustacea: Ostracoda).

Remarks: The genus *Pruvostina* was erected by Scott & Summerson, 1943 with the type species *Pruvostina wanlassi* Scott & Summerson, 1943 in Crustacea. Later, the genus *Pruvostina* was described by Hupé, 1952 with the type species *Pruvostina nicklesi* Hupé, 1952 from Amouslek Fm, Morocco. It is a valid genus name in Bigotinidae (Jell & Adrain, 2003). However, the name *Pruvostina* Hupé, 1952 is invalid under the law of homonymy, being a junior homonym of *Pruvostina* Scott & Summerson, 1943. So I propose to substitute the junior homonym name *Pruvostina* Hupé, 1952 for the name *Demuma* **nom. nov.** The name is from the Latin word “demum” (meaning “complete, completely, exact, exactly, certain or certainly” in English).

Summary of nomenclatural changes:

Demuma **nom. nov.**
pro *Pruvostina* Hupé, 1952 (non Scott & Summerson, 1943)

Demuma nicklesi (Hupé, 1952) **comb. nov.**
from *Pruvostina nicklesi* Hupé, 1952

Family CONOCORYPHIDAE
Genus *NOVOCATHARIA* nom. nov.

Catharia Alvaro & Vizcaino, 2003. Spec. Pap. Palaeontol. 70, October: 129. (Trilobita: Ptychopariida: Ptychopariina: Ptychoparioidea: Conocoryphidae). Preoccupied by *Catharia* Lederer, 1863. Wien. ent. Monatschr., 7, 353. (Insecta: Lepidoptera: Pyraloidea: Crambidae: Cathariinae).

Remarks: The name *Catharia* was initially introduced by Lederer, 1863 for a moth genus (with the type species *Hercyna pyrenaealis* Duponchel, 1843 by monotypy). It is a valid genus name as the type genus of the subfamily Cathariinae Minet, 1981 in the family Crambidae. Subsequently, Alvaro & Vizcaino, 2003 described a trilobite genus of the family Conocoryphidae (with the type species *Conocoryphe ferralsensis* Courtessole, 1967 from Coulouma Formation, *Eccaparadoxides macrocercus* Zone (Upper Languedocian, Middle Cambrian), southern Mountagne Noire, France and Iberian Chains) under the same generic name. It is a valid genus name in Conocoryphidae. Thus, the genus *Catharia* Alvaro & Vizcaino, 2003 is a junior homonym of the genus *Catharia* Lederer, 1863. I propose a new replacement name *Novocatharia* **nom. nov.** for *Catharia* Alvaro & Vizcaino, 2003. The name is from the Latin word "nova" (meaning "new" in English) + the preexisting genus name *Catharia*.

Summary of nomenclatural changes:

Novocatharia **nom. nov.**
pro *Catharia* Alvaro & Vizcaino, 2003 (non Lederer, 1863)

Novocatharia ferralsensis (Courtessole, 1967) **comb. nov.**
from *Catharia ferralsensis* (Courtessole, 1967)
Conocoryphe ferralsensis Courtessole, 1967

Family ELLIPSOCEPHALIDAE
Genus *GEYERORODES* nom. nov.

Orodes Geyer, 1990. Beringeria 3: 199. (Trilobita: Ptychopariida: Ptychopariina: Ellipsocephaloidea: Ellipsocephalidae). Preoccupied by *Orodes* Jacoby, 1891. Biol. Centr. Amer., Zool., Col., 6 (1), Suppl., 276. (Insecta: Coleoptera: Chrysomeloidea: Chrysomelidae).

Remarks: Geyer (1990) proposed the genus name *Orodes* with the type species *Orodes schmitti* Geyer, 1990 from Asrir Fm, Morocco. It is a valid genus name in Ellipsocephalidae (Jell & Adrain, 2003). Unfortunately, the generic name was already preoccupied by Jacoby (1891), who had described the genus *Orodes* in the beetle family Chrysomelidae with the type species *Orodes nigropictus* Jacoby, 1891. Thus, the genus *Orodes* Geyer, 1990 is a junior homonym of the generic name *Orodes* Jacoby, 1891. I propose a new replacement name *Geyerorodes* **nom. nov.** for *Orodes* Geyer, 1990. The name is dedicated to the G. Geyer who is the current author of the preexisting generic name *Orodes*.

Summary of nomenclatural changes:

Geyerorodes **nom. nov.**
pro *Orodes* Geyer, 1990 (non Jacoby, 1891)

Geyerorodes schmitti (Geyer, 1990) **comb. nov.**
from *Orodes schmitti* Geyer, 1990

Family PALAEOLENIDAE
Genus *ENIXUS* nom. nov.

Schistocephalus Chernysheva, 1956. In Kiparisova, Markovski & Radchenko (Eds). Materials on paleontology. New families and genera. Ministr. Geol. Okran Nedr Moscow: Vses. nauchno-issled. Geol. Inst. (VSEGEI) 12: 147. (Trilobita: Ptychopariida: Ptychopariina: Ellipsocephaloidea: Palaeolenidae). Preoccupied by *Schistocephalus* Creplin, 1829. N. Obs. de Entozois, 90. (Platyhelminthes: Cestoda: Pseudophyllidea: Diphyllobothriidae: Ligulinae).

Remarks: Chernysheva (1956) established a trilobite genus *Schistocephalus* with the type species *Schistocephalus enigmaticus* Chernysheva, 1956 from Amga River, E Yakutia, Russia. It is a valid genus name in Palaeolenidae (Jell & Adrain, 2003). Unfortunately, the generic name was already preoccupied by Creplin (1829), who had described the genus *Schistocephalus* with the type species *Schistocephalus dimorphus* Creplin, 1829 in Cestoda. Thus, the genus *Schistocephalus* Chernysheva, 1956 is a junior homonym of the generic name *Schistocephalus* Creplin, 1829. I propose a new replacement name *Enixus* **nom. nov.** for *Schistocephalus* Chernysheva, 1956. The name is from the Latin word "enixus" (meaning "zealous" in English).

Summary of nomenclatural changes:

Enixus **nom. nov.**
pro *Schistocephalus* Chernysheva, 1956 (non Creplin, 1829)

Enixus enigmaticus (Chernysheva, 1956) **comb. nov.**
from *Schistocephalus enigmaticus* Chernysheva, 1956

Family PTYCHOPARIIDAE
Genus *PALMERARA* nom. nov.

Nyella Palmer, 1979. In Palmer & Halley, Professional Pap. U.S. geol. Surv. No. 1047: 110. (Trilobita: Ptychopariida: Ptychopariina: Ptychoparioidea: Ptychopariidae). Preoccupied by *Nyella* Oke, 1931. Proc. roy. Soc. Victoria, 43, 200. (Insecta: Coleoptera: Curculionoidea: Curculionidae).

Remarks: Palmer (1979) proposed the generic name *Nyella* as a genus of trilobites with the type species *Poulsenia granosa* Resser, 1939 from Langston Lst, Idaho, USA. It is a valid genus name in Ptychopariidae (Jell & Adrain, 2003). Unfortunately, the generic name was already preoccupied by Oke (1931), who had proposed the genus name *Nyella* as a genus of beetles with the type species *Nyella tuberculata* Oke, 1931 in the beetle family Curculionidae. Thus, the genus group name *Nyella* Palmer, 1979 is a junior homonym of the generic name *Nyella* Oke, 1931. I propose a new replacement name *Palmerara* **nom. nov.** for *Nyella* Palmer, 1979. The name is dedicated to the A. R. Palmer who is the current author of the preexisting generic name *Nyella*.

Summary of nomenclatural changes:

Palmerara **nom. nov.**
pro *Nyella* Palmer, 1979 (non Oke, 1931)

Palmerara granosa (Resser, 1939) **comb. nov.**
from *Nyella granosa* (Resser, 1939)
Poulsenia granosa Resser, 1939

Family YUNNANOCEPHALIDAE
Genus *PINARELLA* nom. nov.

Pensacola Palmer & Gatehouse, 1972. Prof.Pap.U.S.geol.Surv. 456-D: D28. (Trilobita: Ptychopariida: Ptychopariina: Ellipsocephaloidea: Yunnanocephalidae). Preoccupied by *Pensacola* Peckham & Peckham, 1885. Proc. nat. Hist. Soc. Wisconsin, 1885, 84. (Arachnida: Araneae: Salticidae).

Remarks: The generic name *Pensacola* Peckham & Peckham, 1885 was proposed for a genus of spider family Salticidae (with the type species *Pensacola signata* Peckham & Peckham, 1885). Subsequently, the generic name *Pensacola* Palmer & Gatehouse, 1972 was introduced for a new trilobite genus (with the type species *Pensacola isolata* Palmer & Gatehouse, 1972 from *Chorbusulina wilkesi* Faunule, Antarctica) of the family Yunnanocephalidae. It is a valid genus name (Jell & Adrain, 2003). Thus, the genus *Pensacola* Palmer & Gatehouse, 1972 is a junior homonym of the generic name *Pensacola* Peckham & Peckham, 1885. I propose for the genus *Pensacola* Palmer & Gatehouse, 1972 the new replacement name *Pinarella* **nom. nov.** The name is dedicated to my student Pınar Özbek (Turkey). The name is feminine in gender.

Summary of nomenclatural changes:

Pinarella **nom. nov.**
pro *Pensacola* Palmer & Gatehouse, 1972 (non Peckham & Peckham, 1885)

Pinarella isolata (Palmer & Gatehouse, 1972) **comb. nov.**
from *Pensacola isolata* Palmer & Gatehouse, 1972

Family UNCERTAIN
Genus *INDILIGENS* nom. nov.

Hospes Stubblefield, 1927. In Stubblefield & Bulman, 1927, Quart. J. geol. Soc., 83 (1), 128. (Trilobita). Preoccupied by *Hospes* Jordan, 1894. Novit. zool., 1, 182. (Insecta: Coleoptera: Cerambycoidea: Cerambycidae).

Remarks: The generic name *Hospes* Jordan, 1894 was proposed for a genus of longicorn beetle family Cerambycidae. The African genus name is still used as a valid name and, it has four species as *Hospes longitarsis* Aurivillius, 1907; *Hospes nitidicollis* Jordan, 1894; *Hospes punctatus* Jordan, 1894 and *Hospes tomentosus* Schmidt, 1922. Subsequently, the generic name *Hospes* Stubblefield, 1927 was introduced for a new trilobite genus (with the type species *Hospes clonograpti* Stubblefield, 1927 from Shineton Sh Fm, England. It is a valid genus name (Jell & Adrain, 2003). Thus, the genus *Hospes* Stubblefield, 1927 is a junior homonym of the generic name *Hospes* Jordan, 1894. I propose for the genus *Hospes*

Stubblefield, 1927 the new replacement name *Indiligens* **nom. nov.** The name is from the Latin word "indiligens" (meaning "neglected" in English).

Summary of nomenclatural changes:

Indiligens **nom. nov.**
pro *Hospes* Stubblefield, 1927 (non Jordan, 1894)

Indiligens clonograpti (Stubblefield, 1927) **comb. nov.**
from *Hospes clonograpti* Stubblefield, 1927

Family UNCERTAIN
Genus *INDIGESTUS* nom. nov.

Hybocephalus Remelé, 1885. Z. dtsch. geol. Ges., 37, 1032. (Trilobita). Preoccupied by *Hybocephalus* Motschulsky, 1851. Bull. Soc. imp. Nat. Moscou, 24 (2), 482; Schaufuss 1882, Ann. Mus. Stor. nat. Genova, 18, 353. (Crustacea: Ostracoda).

Remarks: The genus *Hybocephalus* was erected by Motschulsky, 1851 in Coleoptera. It is still used as a valid name (e. g. Tree of life web project, 2007) and, it is the type genus of *Hybocephalini* Raffray, 1890 (Pselaphinae). Later, the genus *Hybocephalus* was described by Remelé, 1885 with the type species *Hybocephalus hauchecornei* Remelé, 1885 from Upper Red Orthoceras Limestone, Eberswalde, E Germany. It is a valid genus name (Jell & Adrain, 2003). However, the name *Hybocephalus* Remelé, 1885 is invalid under the law of homonymy, being a junior homonym of *Hybocephalus* Motschulsky, 1851. So I propose to substitute the junior homonym name *Hybocephalus* Remelé, 1885 for the name *Indigestus* **nom. nov.** The name is from the Latin word "indigestus" (meaning "out of order" in English).

Summary of nomenclatural changes:

Indigestus **nom. nov.**
pro *Hybocephalus* Remelé, 1885 (non Motschulsky, 1851)

Indigestus hauchecornei (Remelé, 1885) **comb. nov.**
from *Hybocephalus hauchecornei* Remelé, 1885

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Order	Family	Junior homonym	Senior homonym	Replacement name
AGNOSTIDA	PTYCHAGNOSTIDAE	*Pseudophalacroma* Pokrovskaya, 1958	*Pseudophalacroma* Jörgensen, 1923 (Protozoa)	*Yakutiana* **nom. nov.**
AGNOSTIDA	WEYMOUTHIIDAE	*Cephalopyge* Geyer, 1988	*Cephalopyge* Hanel, 1905 (Mollusca)	*Morocconus* **nom. nov.**
ASAPHIDA	ANOMOCARIDAE	*Scintilla* Pegel, 1986	*Scintilla* Deshayes, 1856 (Mollusca)	*Russiana* **nom. nov.**
ASAPHIDA	REMOPLEURIDIDAE	*Cavia* Sun, 1993	*Cavia* Pallas, 1766 (Mammalia)	*Sunocavia* **nom. nov.**
LICHIDA	DAMESELLIDAE	*Ariaspis* Wolfart, 1974	*Ariaspis* Denison, 1963 (Chordata)	*Karslanus* **nom. nov.**
LICHIDA	LICHIDAE	*Lobopyge* Pribyl & Erben, 1952	*Lobopyge* Attems, 1951 (Diplopoda)	*Belenopyge* Pek & Vanek, 1991 **subtitute name**
PHACOPIDA	ENCRINURIDAE	*Coronaspis* Wu, 1990	*Coronaspis* MacGillivray, 1921 (Hemiptera)	*Wuoaspis* **nom. nov.**
PROETIDA	BRACHYMETOPIDAE	*Eometopus* Hahn & Hahn, 1996	*Eometopus* Small & Lynn, 1985 (Protozoa)	*Hahnus* **nom. nov.**
PROETIDA	PROETIDAE	*Capricornia* Engel & Morris, 1996	*Capricornia* Obraztsov, 1960 (Lepidoptera)	*Engelomorrisia* **nom. nov.**
PROETIDA	PROETIDAE	*Haasia* Yuan, 1988	*Haasia* Bollman, 1893 (Diplopoda)	*Yuanjia* **nom. nov.**

Order	Family	Junior homonym	Senior homonym	Replacement name
PROETIDA	PROETIDAE	*Spatulina* Osmólska, 1962	*Spatulina* Szilády, 1942 (Diptera)	*Spatulata* **nom. nov.**
PROETIDA	RORRINGTONIIDAE	*Madygenia* Petrurina, 1975	*Madygenia* Sharov, 1968 (Orthoptera)	*Pseudobirmanites* Li, 1978 **subtitute name**
PTYCHOPARIIDA	BIGOTINIDAE	*Pruvostina* Hupé, 1952	*Pruvostina* Scott & Summerson, 1943 (Crustacea)	*Demuma* **nom. nov.**
PTYCHOPARIIDA	CONOCORYPHIDAE	*Catharia* Alvaro & Vizcaino, 2003	*Catharia* Lederer, 1863 (Lepidoptera)	*Novocatharia* **nom. nov.**
PTYCHOPARIIDA	ELLIPSOCEPHALIDAE	*Orodes* Geyer, 1990	*Orodes* Jacoby, 1891 (Coleoptera)	*Geyerorodes* **nom. nov.**
PTYCHOPARIIDA	PALAEOLENIDAE	*Schistocephalus* Chernysheva, 1956	*Schistocephalus* Creplin, 1829 (Cestoda)	*Enixus* **nom. nov.**
PTYCHOPARIIDA	PTYCHOPARIIDAE	*Nyella* Palmer, 1979	*Nyella* Oke, 1931 (Coleoptera)	*Palmerara* **nom. nov.**
PTYCHOPARIIDA	YUNNANOCEPHALIDAE	*Pensacola* Palmer & Gatehouse, 1972	*Pensacola* Peckham & Peckham, 1885 (Araneae)	*Pinarella* **nom. nov.**
	UNCERTAIN	*Hospes* Stubblefield, 1927	*Hospes* Jordan, 1894 (Coleoptera)	*Indiligens* **nom. nov.**
	UNCERTAIN	*Hybocephalus* Remelé, 1885	*Hybocephalus* Motschulsky, 1851 (Crustacea)	*Indigestus* **nom. nov.**

THE EFFECTS OF FEEDING ON DIFFERENT POPLAR CLONES ON SOME BIOCHEMICAL PROPERTIES OF GYPSY MOTH LARVAE

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[Daryaei, M. G., Darvishi, S. & Etebari, K. 2009. The effects of feeding on different Poplar Clones on some biochemical properties of Gypsy moth larvae. Munis Entomology & Zoology, 4 (1): 172-179**]**

ABSTRACT: Gypsy moth (*Lymantria dispar* L.) is one of the most important pests in northern forests of Iran. For better understanding of the interaction between the pest and plant, the biochemical traits of larval body including glucose, cholesterol, protein, urea and also activity levels of alanin and aspartate amino transferase (ALT & AST) were measured in the 4th instar larvae fed by different clones of *Populus deltoiedes, P. euramerican* and *P. caspica*. Larval feeding on different clones of poplar caused considerable biochemical changes in their body. The results showed that glucose fluctuated in the body of these larvae from 35 to 93.3 mg/dl and its highest amount was observed in the larvae fed by *P. e. triplo*. Feeding on the leaves of *P. deltoiedes* caused cholesterol enhancement and in all the treatments ALT and AST activity levels followed the same pattern and AST was always higher than ALT. A considerable correlation was shown between these two enzymes while their activity levels were lower in the larvae fed on *P. euramerican* and *P. caspica*. Data outlined a negative correlation between glucose and other compounds in a way that if the metabolism was in the favor of carbohydrates, proteins and sterols decreased.

KEYWORDS: Gypsy moth, *Lymantria dispar, Populus,* Biochemical traits

Short-rotation woody crops are being developed as a sustainable system that simultaneously produces a renewable feedback for bioproducts and a suite of environmental and rural development benefits (Nordman et al., 2005). Poplars with high rate of biomass production are appealing as short-rotation woody crops and also they can be used for phytoremediation, carbon sequestration and erosion control (Coyle et al., 2006). Poplars like any other plant are not excluded from the damages of pests and pathogens and are invaded with many pests through the year which some of defoliating insects like gypsy moth (*Lymantria dispar*) can significantly reduce the yield of biomass production and negatively impact their sustainability (Daryaei et al., 2008).

Utilizing pest-resistant cultivars or a mixture of clones in integrated pest management is one of the best approaches for pest damage suppression. Because plants alter feeding efficiency of the insects with different methods and they use this system as a defending mechanism. Therefore analyzing the changes in the amount and type of larval feeding could be used as a tool for recognizing resistance mechanisms within plants.

Feeding of an organism supplies the energy for growth, development, reproduction and many of its other needs (Chapman, 1998). Most of the insect species have similar nutritional needs because of the similarities in the main chemical compounds and also metabolic pathways of their body. Amino acids, proteins, lipids, carbohydrates, nucleic acid, minerals, vitamins and water are the most important nutritional needs of the insects which they are able to make some of these nutrients by themselves and some of their needs has to be provided by eating foods or by symbiotic organisms which they harbour (Etebari et al., 2004).

Biochemical compounds of larval body change after feeding on different diets and these changes could be used as a marker to study biological reactions. Feeding from plants with different chemical characteristics changes the biochemistry of larval body in different ways. It has been reported that gypsy moth larvae which are reared on diet with low nitrogen had higher carbohydrates compared to the larvae fed by high nitrogenous diets (Stockhoff, 1991).

Intraspecific variation in insect performance on aspen has been linked to variation in foliar chemistry. It was reported that esterase and glutathione transferase activities in insect body were induced by leaf phenolic glycosides and also performance of gypsy moth larvae is strongly influenced by variation in level of these compounds (Hemming and Lindroth, 2000). Therefore the interaction of feeding on different poplar varieties and biochemical characteristics of gypsy moth larvae were studied to gain a better understanding of the factors and reasons for its host preference.

MATERIALS AND METHODS

Gypsy moth eggs were collected at mid April 2007 from Guisom region, in north of Iran, from poplar, alder and ironwood with a smooth stalk and then were transferred to the lab. The eggs were hatched in 25 ± 5 ^{o}C by the end of spring. The caterpillar was reared on different poplar clones included 5 from *P. deltoiedes* (*P. d.* 72/51, *P. d.* 77/51, *P. d.* 73/51, *P. d.* 79/51 and *P. d.* 69/55) and 4 clones from *P. euramerican* Dode (*P. e. triplo, P. e. castanzo*, *P. e.* 92/40 and *P. e.* 45/51) with the single local species of Iran, *P. caspica*.

Larvae were reared on each clone from the beginning and the larval growth rate was measured based on the manipulated method of (Waldbauer, 1968).

After the 3rd molting, in the first day of forth instar, 10 larvae were collected randomly and were homogenized. 300 mg of the samples were diluted with 1ml of phosphate buffer and after 10 min the samples were centrifuged with 14000 rpm. Supernatant were transferred to new tubes and were kept in -20 ^{o}C for biochemical analysis.

Biochemical Analysis

The method of Lowry et al. (1951) was used for the total protein estimation. Haemolymph was diluted with distilled water and was added to alkaline copper reagent in microtubes. After 10 minutes 0.5 ml of Folin Ciocalteu's reagent was added to the mixture and microtubes were shaken thoroughly. The tubes were kept 20 minutes in room temperature for color development. The readings were taken on the spectrophotometer at 650 nm. For the reference, standard Bovine Serum Albumen (BSA) (Fatty acid free) was used. The concentration of urea was determined by measuring ammonia produced from urea, using a commercial urea assay kit (Chemenzyme Co., Iran). To measure the total cholesterol of haemolymph, Richmond (1973) method was conducted. The principles of this method are based on hydrolysis of cholesterol esters by cholesterol oxidase, cholesterol esterase and peroxidase. Glucose was analyzed as described by Sigert (1987). Alanine aminotransferase (ALT) (EC 2.6.1.2) and aspartate aminotransferase (AST) (EC 2.6.1.1) were measured utilizing Thomas (1998) procedure.

Statistical Analysis

Collected data were subjected to statistical analysis of variance test for significant differences in the measured parameters. For all analysis of variance the Tukey-Kramer test at 5% significant level was used in randomized complete blocks designed by SAS statistical program (SAS, 1997).

RESULTS AND DISCUSSION

Glucose was much higher in the larvae fed on *P. e. triplo* and it fluctuated from 35 to 93.3 mg/dl. Its amount in the larvae fed on *P. d.* 79/51 and *P. d.* 72/51 was lower than other groups. Therefore feeding from *P. deltoids* caused relative decrease of glucose in larval body (Fig 1). Generally glucose enhancement in lepidopteran larvae has a direct correlation by carbohydrates quantity. Larvae with better nutrition have usually higher amount of this compound.

The amount of glucose can be a representative aspect of carbohydrate metabolism. Satake et al., (2000) showed that the quality of the food taken by lepidopteran larvae would have considerable effect on the haemolymph glucose. Daryaei et al, (2008) demonstrated that the larval performance and nutritional indices were improved when larva were fed by clones with *P. euramerican* parentage. As it has been indicated in the current data, glucose was higher in this group of larvae and this outlines that larvae with optimum diet and higher absorption of carbohydrates could increase the level of nutrient for their growth.

Feeding on the leaves of *P. deltoids* caused cholesterol increase in the larval body (Fig 2). The highest amount of this compound was measured in the larvae fed by *P. d.* 79/51. The analysis of correlation coefficient among biochemical compounds showed that cholesterol and glucose have a negative correlation (0.446) in a way that with the decrease of cholesterol in gypsy moth larvae its glucose content increases (Table 1). This indicates that lipid and carbohydrate metabolic pathways are activated in completely different conditions. This is while there are positive correlation between cholesterol and other compounds particularly protein and urea. Cholesterol reduction has an inverse relation with larval growth rate. It could be assumed that with the increase of growth and other biological indices, sterols absorbed from food, enter metabolic cycles because of their involvement in many biological reactions as substrates. Shekari et al. (2008) showed that the cholesterol content in the body of elm leaf beetle was related to the amount of food consumption and absorption. The beetles with better nutrition had a higher amount of this compound in their body.

Feeding on different poplar clones has a significant effect on protein and urea of gypsy moth larvae (Fig 3). Protein in different groups fluctuated between 10.1-16.6 mg/dl but there were no logical relation between the growth rate of larvae and this compound in their body (Fig 5). Urea differed between 4.5-10.6 in this group. Protein and urea indicated significant correlation with cholesterol which their coefficients were 0.911 and 0.598 but there were no considerable correlation between protein and urea. It has been reported that protein content in the larval body of gypsy moth has a direct relation with the amount of nitrogen in diet (Stockhoff, 1991). Insects that use low level nitrogenous diets eat more to compensate N deficiency and this causes the insects to be affected by allelochemicals and hence many of their biological performances reduce.

Hemming and Lindorth (2000) demonstrated that gypsy moths are very susceptible to phenolic glycosides. And these compounds have negative effect on insect performance because insects need to use much more energy to compensate their effects. Daryaei et al. (2008) showed that food consumption in the gypsy moth larvae fed on *P. e. triplo* was higher than other groups but as current results indicate although their food consumption is high, many biochemical compounds of their body is lower than other treatments and that is because of usage of energy for detoxification.

Proteins, being the key organic constituents, could be expected to play a role in the compensatory mechanisms of insects during different stress conditions. Also it has been shown that different stresses can decrease the amount of total protein in lepidopteran larva (Etebari et al., 2007; Shekari et al., 2008). This could be due to the break down of protein into amino acids, so with the entrance of these amino acids as a keto acid to TCA cycle, they will help to supply energy for the insect. So, protein depletion in tissues may constitute a physiological mechanism and might play a role in compensatory mechanisms under oxidative stress, to provide intermediates to the Krebs cycle, by retaining free amino acid content in haemolymph (Nath et al., 1997).

Aminotransferases activity was higher in the larvae fed by different clones of *P. deltoids* (Fig 4) while AST was always higher than ALT in all the larvae. The transaminases are the important components of amino acid catabolism, which is mainly involved in transferring an amino group from one amino acid to another keto acid. The AST and ALT serve as a strategic link between the carbohydrate and protein metabolism and are known to be altered during various physiological conditions (Etebari et al., 2007).

Comparison of the results of this research with other studies demonstrated that gypsy moth larvae need to utilize a high amount of energy to overcome the low oxidative pressure of different compounds in the poplar leaves and reach maximum performance. It could be concluded that high growth rate does not cause the enhancement of many nutrients in the larval body. Generally, in lepidopteran larvae with improvement of feeding condition and absorption, biochemical compounds increase in the larval body, however in this species such results were not obtained. Therefore the pattern of changes of these compounds could not change according to the specific type of the host plant (*P. deltoides* and *P. euroamricana*) and usually the changes were independent of each other.

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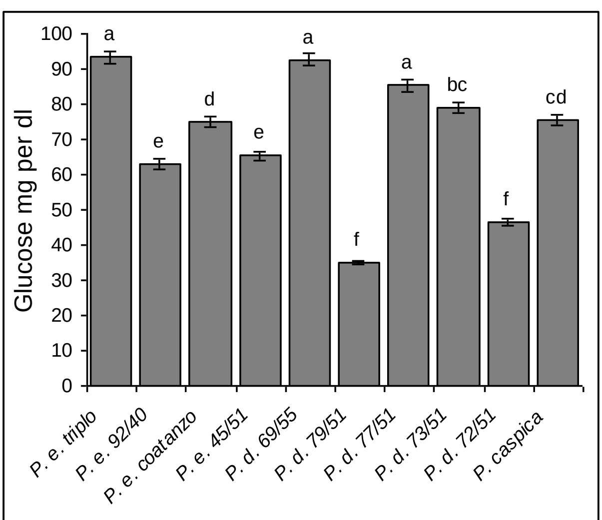

Figure 1. The amount of glucose in gypsy moth caterpillar feed by different poplar clones.

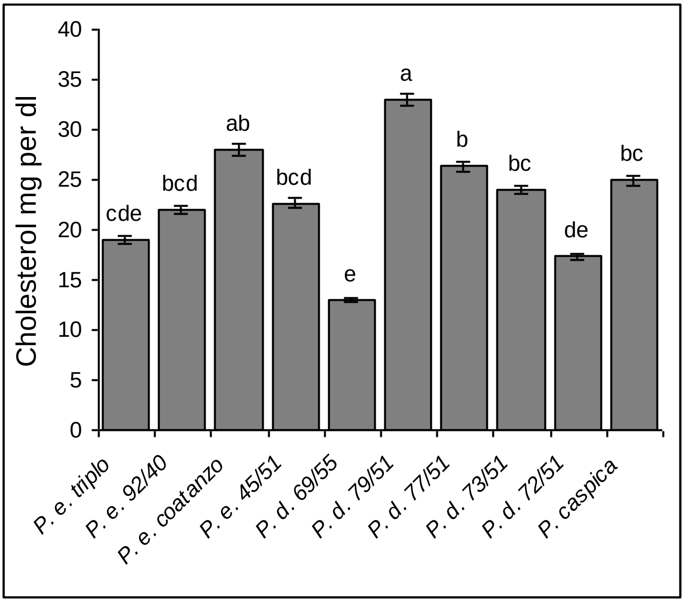

Figure 2. The amount of cholesterol in gypsy moth caterpillar feed by different poplar clones.

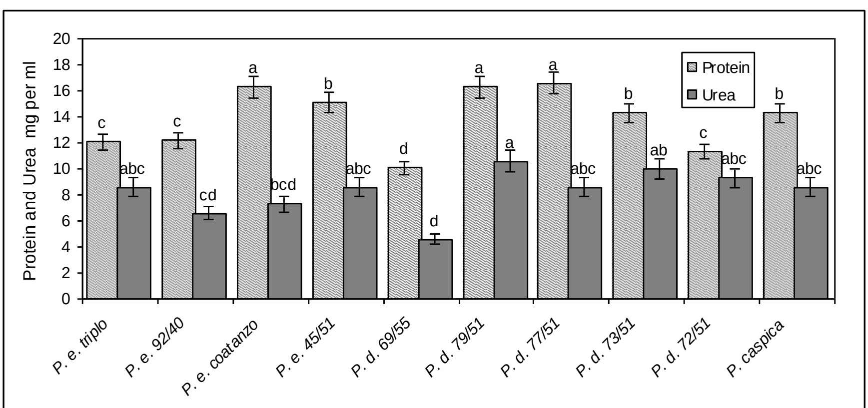

Figure 3. The amount of protein and urea in gypsy moth caterpillar feed by different poplar clones.

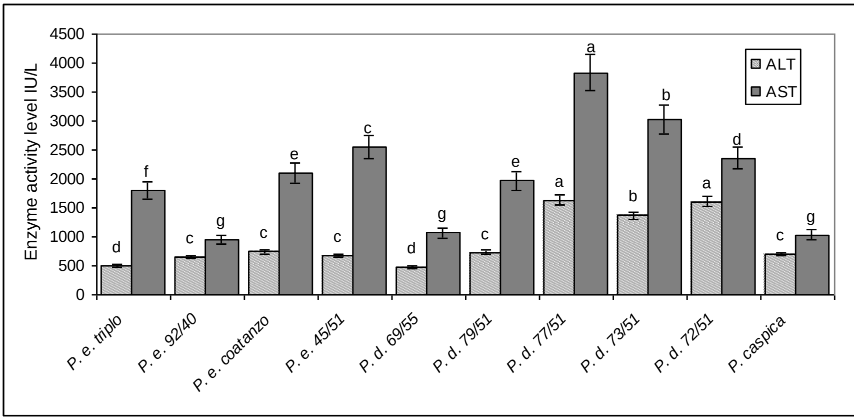

Figure 4. The activity level of ALT and AST in gypsy moth caterpillar feed by different poplar clones.

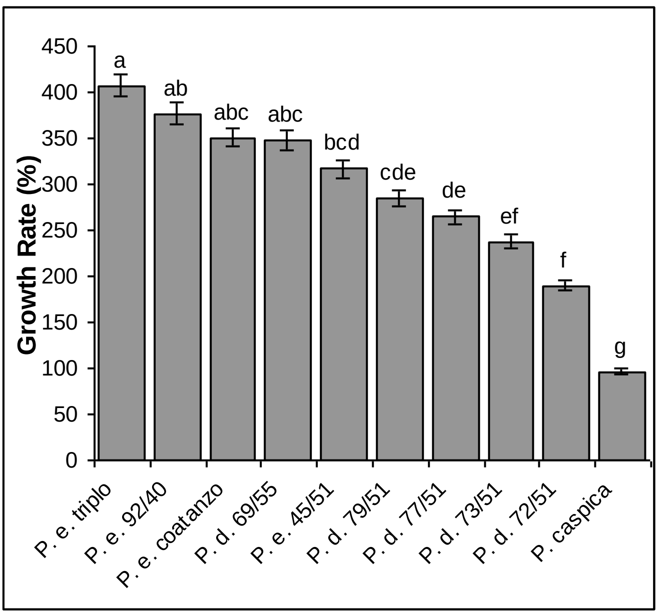

Figure 5. the growth rate of 4th instar larvae of Gypsy moth on different poplar clones.

Table 1- The correlation matrix among biochemical parameters of gypsy moth larva

	Glucose	Cholesterol	Protein	urea	ALT	AST
Glucose	1					
Cholesterol	- 0.446	1				
Protein	- 0.217	0.911 **	1			
Urea	- 0.516	0.598 *	0.524	1		
ALT	- 0.175	0.097	0.211	0.470	1	
AST	0.023	0.302	0.548	0.521	0.770 **	1

SUBSTITUTE NAMES FOR FOUR PREOCCUPIED MILLIPEDE GENERA (DIPLOPODA)

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[Özdikmen, H. 2009. Substitute names for four preoccupied millipede genera (Diplopoda). Munis Entomology & Zoology, 4 (1): 180-183**]**

ABSTRACT: Four junior homonyms were detected among the millipedes genera and the following replacement names are proposed: Order Polydesmida: *Vigilia* nom. nov. pro *Curimagua* Hoffman, 1982; *Delirus* nom. nov. pro *Cylindromus* Loomis, 1977 and *Lippus* nom. nov. pro *Paratylopus* Korsos & Golovatch, 1989; Order Spirostreptida : *Umbraticus* nom. nov. pro *Tomogonus* Demange, 1971. Accordingly, new combinations are herein proposed for the species currently included in these genera respectively: *Vigilia granulata* (Hoffman, 1982) comb. nov.; *Delirus uniporus* (Loomis, 1977) comb. nov.; *Lippus strongylosomoides* (Korsos & Golovatch, 1989) comb. nov.; *Umbraticus implicatus* (Demange, 1978) comb. nov.; *Umbraticus intortus* (Demange, 1971) comb. nov.; *Umbraticus involutus* (Demange & Mauries, 1975) comb. nov.; *Umbraticus lamottei* (Demange & Mauries, 1975) comb. nov.; *Umbraticus schuberti* (Demange & Mauries, 1975) comb. nov. and *Umbraticus subgrundus* (Demange, 1971) comb. nov.

KEY WORDS: nomenclatural changes, homonymy, replacement names, Diplopoda.

Four proposed genus names in Diplopoda are nomenclaturally invalid, as the genus group names has already been used by a different authors in Araneae, Coleoptera and Mammalia. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these generic names.

TAXONOMY

Class DIPLOPODA

Order POLYDESMIDA

Family CHELODESMIDAE
Genus *VIGILIA* nom. nov.

Curimagua Hoffman, 1982. Journal nat. Hist. 16 (5): 645. (Diplopoda: Polydesmida: Leptodesmidea: Chelodesmoidea: Chelodesmidae: Chelodesminae: Batodesmini). Preoccupied by *Curimagua* Forster & Platnick, 1977. Am. Mus. Novit. No.2619: 24. (Arachnida: Araneae: Symphytognathidae).

Remarks: Hoffman (1982) proposed the generic name *Curimagua* as a genus of millipedes with the type species *Curimagua granulata* Hoffman, 1982 by original designation from Venezuela (Edo. Falcon, Serrania de San Luis, Curimagua valley) in Diplopoda. It is a valid genus name (Shelley et al., 2000). Unfortunately, the generic name was already preoccupied by Forster & Platnick (1977), who had proposed the genus name *Curimagua* as a spider genus with the type species *Curimagua chapmani* Forster & Platnick, 1977 in Araneae. Thus, the genus group name *Curimagua* Hoffman, 1982 is a junior homonym of the generic name *Curimagua* Forster & Platnick, 1977. So I propose a new replacement name *Vigilia* **nom. nov.** for *Curimagua* Hoffman, 1982. The name is from the Latin word "vigilia" (meaning "watch, watchfulness" in English).

Summary of nomenclatural changes:

Vigilia **nom. nov.**
pro *Curimagua* Hoffman, 1982 (non Forster & Platnick, 1977)

Vigilia granulata (Hoffman, 1982) **comb. nov.**
from *Curimagua granulata* Hoffman, 1982

Genus *DELIRUS* nom. nov.

Cylindromus Loomis, 1977. Flo. Ent. 60: 21. (Diplopoda: Polydesmida: Leptodesmidea: Chelodesmoidea: Chelodesmidae: Chelodesminae: tribe uncertain). Preoccupied by *Cylindromus* Aurivillius, 1891. Nouv. Arch. Mus. Paris, (3) 7, 213. (Insecta: Coleoptera: Curculionoidea: Curculionidae).

Remarks: The name *Cylindromus* was initially introduced by Aurivillius, 1891 for a beetle genus (with the type species *Cylindromus plumbeus* Aurivillius, 1891 in Coleoptera. It is still used as a valid genus name (Alonso-Zarazaga & Lyal, 1999). Subsequently, Loomis, 1977 described a new millipede genus (with the type species *Cylindromus uniporus* Loomis, 1977 by original designation from Puerto Rico) under the same generic name. It is a valid genus name. Thus, the genus *Cylindromus* Loomis, 1977 is a junior homonym of the genus *Cylindromus* Aurivillius, 1891. So I propose a new replacement name *Delirus* **nom. nov.** for *Cylindromus* Loomis, 1977. The name is from the Latin word "delirus" (meaning "crazy" in English).

Summary of nomenclatural changes:

Delirus **nom. nov.**
pro *Cylindromus* Loomis, 1977 (non Aurivillius, 1891)

Delirus uniporus (Loomis, 1977) **comb. nov.**
from *Cylindromus uniporus* Loomis, 1977

Family PARADOXOSOMATIDAE
Genus *LIPPUS* nom. nov.

Paratylopus Korsos & Golovatch, 1989. Acta Zool. Hung. 35 (3-4): 215. (Diplopoda: Polydesmida: Strongylosomatidea: Strongylosomatoidea: Paradoxosomatidae: Paradoxosomatinae: Sulciferini). Preoccupied by *Paratylopus* Matthew, 1904. Bull. Amer. Mus. nat. Hist., 20, 211. (Mammalia: Artiodactyla: Ruminantia: Tylopoda: Camelidae: Poebrotheriinae).

Remarks: The fossil mammal generic name *Paratylopus* was proposed by Matthew, 1904 with the type species *Miolabis primaevus* Matthew, 1904 in Mammalia. Later, the genus *Paratylopus* was described by Korsos & Golovatch, 1989 for millipedes with the type species *Paratylopus strongylosomoides* Korsos & Golovatch, 1989 by original designation from Vietnam (Prov. Vinh phu, Tam dao, north of the village). It is a valid genus name. However, the name *Paratylopus* Korsos & Golovatch, 1989 is invalid under the law of homonymy, being a junior homonym of *Paratylopus* Matthew, 1904. So I propose to substitute the junior homonym name *Paratylopus* Korsos & Golovatch, 1989 for the nomen novum *Lippus*. The name is from the Latin word "lippus" (meaning "sleepy" in English).

Summary of nomenclatural changes:

Lippus **nom. nov.**
pro *Paratylopus* Korsos & Golovatch, 1989 (non Matthew, 1904)

Lippus strongylosomoides (Korsos & Golovatch, 1989) **comb. nov.**
from *Paratylopus strongylosomoides* Korsos & Golovatch, 1989

Order SPIROSTREPTIDA

Family SPIROSTREPTIDAE
Genus *UMBRATICUS* nom. nov.

Tomogonus Demange, 1971. Mem. Inst. fond. Afr. noire No.86: 208. (Diplopoda: Spirostreptida: Spirostreptidea: Spirostreptoidea: Spirostreptidae: Spirostreptinae: Spirostreptini). Preoccupied by *Tomogonus* d'Orbigny, 1904. Ann. Mus. Stor. nat. Genova, 41, 254. (Insecta: Coleoptera: Scarabaeoidea: Scarabaeidae: Coprinae: Onthophagini).

Remarks: Firstly, the African beetle genus *Tomogonus* was established by d'Orbigny, 1904 with the type species *Tomogonus crassus* d'Orbigny, 1904 in Coleoptera. It is still used as a valid genus name (Mathison et al., 2008). Subsequently, the generic name *Tomogonus* was proposed by Demange, 1971 for a millipede genus with the type species *Tomogonus intortus* Demange, 1971 by original designation from Sierra Leone (Loma Mountains). It is a valid genus name (Shelley et al., 2000). However, the name *Tomogonus* Demange, 1971 is invalid under the law of homonymy, being a junior homonym of *Tomogonus* d'Orbigny, 1904. So I propose to substitute the junior homonym name *Tomogonus* Demange, 1971 for the new name *Umbraticus* **nom. nov.**. The name is from the Latin word "umbraticus" (meaning "like shadow or like umbra" in English).

Summary of nomenclatural changes:

Umbraticus **nom. nov.**
pro *Tomogonus* Demange, 1971 (non Orbigny, 1904)

Umbraticus implicatus (Demange, 1978) **comb. nov.**
from *Tomogonus implicatus* (Demange, 1978)

Umbraticus intortus (Demange, 1971) **comb. nov.**
from *Tomogonus intortus* Demange, 1971

Umbraticus involutus (Demange & Mauries, 1975) **comb. nov.**
from *Tomogonus involutus* (Demange & Mauries, 1975)

Umbraticus lamottei (Demange & Mauries, 1975) **comb. nov.**
from *Tomogonus lamottei* Demange & Mauries, 1975

Umbraticus schuberti (Demange & Mauries, 1975) **comb. nov.**
from *Tomogonus schuberti* (Demange & Mauries, 1975)

Umbraticus subgrundus (Demange, 1971) **comb. nov.**
from *Tomogonus subgrundus* Demange, 1971

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FAUNISTIC NOTES ON FORMICIDAE (INSECTA: HYMENOPTERA) OF RICE FIELDS AND SURROUNDING GRASSLANDS IN NORTHERN IRAN

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[Ghahari, H., Collingwood, C.A., Tabari, M. & Ostovan, H. 2009. Faunistic notes on Formicidae (Insecta: Hymenoptera) of rice fields and surrounding grasslands of northern Iran. Munis Entomology & Zoology, 4 (1): 184-189**]**

ABSTRACT: The fauna of ants (Hymenoptera: Formicidae) was studied in rice fields of Northern Iran, Mazandaran province through 2000 until 2006. In a total of 39 species from 17 genera and 3 subfamilies were identified. Of these 34 species and subspecies are new records for the Iranian fauna.

KEY WORDS: Formicidae, Fauna, Rice field, Northern Iran

Rice field is one of the rare agroecosystems which included both arid and aquatic ecosystems; in this case the fauna of insects is more diverse than the other agroecosystems (Bambaradeniya and Amerasinghe, 2003). There are several pests in the rice fields that in absence of management programs damage the crop severely (Heinrichs, 1994). Besides, there are several natural enemies (especially predators and parasitoids) in the rice fields of the world that decrease the population density of the pests significantly (Mohyuddin, 1990). One of these powerful predators is ants (Hymenoptera: Formicidae) (Bonhof et al., 1997). Ants, with an estimated world population of 10^{15} adults, are most abundant in most climates especially the tropics where in rain forests they may represent between one third and half of the insect biomass (Fittkau and Klinge, 1973). In view of their abundance, their stability as populations, and their feeding habits, ants have a major influence in many habitats. As predators of pests, they may be useful in pest management, but such positive attributes must be weighed against possible disadvantages (Way and Khoo, 1992).

Important attributes of useful ant species are listed by Risch & Caroll (1982) as follows: *a*. they are very responsive to prey density; *b*. they can remain abundant even when prey is scarce because they can cannibalize their brood and, most importantly, use honey dew-producing Homoptera as a stable source of energy; *c*. they can store food and hence continue to capture prey even if it is not immediately needed; *d*. besides killing pests, they can deter many others including some too large to be successfully captured; *e*. they can be managed to enhance their abundance, distribution, and contacts with prey. Other useful criteria for ants as biological control agents include broad habitat range and choice of species that are unlikely to be out-competed by other ants (Majer, 1986). Finnegan (1974) lists desirable characteristics of certain *Formica* spp., some of which are relevant to other ants, including the ability to hunt at different levels and to concentrate increasingly on a particular prey species as its population increases. Polygyny is a useful attribute because colony fragments can easily be transferred to establish new colonies (Way and Khoo, 1992). All the literatures on beneficial and potentially beneficial ants especially the ants' role in biological control and pest management were reviewed by Way and Khoo (1992).

Iran is a large country incorporating various geographical regions and climates; therefore it would be expected that there are a diverse fauna of ants in this region. But the fauna of this important and large family was studied very poorly in Iran (Modarres Awal, 1997; Ghasemi et al., 2000; Alipanah and Dejakam, 2000; Alipanah et al., 2000; Tahmasebi et al., 2000; Tahmasebi and Alipanah, 2002; Alipanah, 2004; Askarzadeh et al., 2004). The goal of this paper which is a part of large project as "Iranian Formicidae" is introducing the ants' fauna in different Iranian agroecosystems.

METHODS

Totally 20 plastic pitfall traps, 8.5×10 cm (diameter × depth), were installed at 10 m intervals in different rice fields and were part-filled with ethanol 75%. The traps were emptied weekly for three crop seasons and the fallen beetles were collected and identified. In addition to the pitfall traps, sweepings were conducted randomly in different rice fields of Northern Iran. Also several samplings were conducted after harvesting the crops in autumns and winters by the mentioned methods.

SPECIES LIST

Totally 39 species of the 17 genera (*Camponotus*, *Cataglyphis*, *Formica*, *Lasius*, *Lepisiota*, *Plagiolepis*, *Polyrhachis*, *Aphaenogaster*, *Cardiocondyla*, *Crematogaster*, *Messor*, *Monomorium*, *Pheidole*, *Solenopsis*, *Tetramorium*, *Linepithema*, *Tapinoma*) and three subfamilies (Formicinae, Myrmicinae and Dolichoderinae) were collected and identified from Mazandaran Province. Almost the materials were collected by the senior author and are deposited in the collection of the second author.

Family Formicidae
Subfamily Formicinae

Camponotus oasium Forel, 1890
Ghaemshahr (Ahangarkola), November 2001; Joibar (Divkola); August 2002.
****Camponotus xerxes*** Forel, 1904
Amol, June 2005; Ghaemshahr (Sarokola), April 2006.
****Cataglyphis auratus*** Menozzi, 1992
Amol, September 2005.
****Cataglyphis albicans*** var. ***auratus*** Menozzi, 1932
Amol, August 2005; Babol (Amirkola), July 2006.
****Cataglyphis lividus*** Andre, 1881
Savadkooh (Zirab), June 2003.
****Cataglyphis nodus*** var. ***drusa*** Santschi, 1929
Amol, April 2005; Fereydonkenar, November 2005.
****Cataglyphis semitonsus*** Santschi, 1929
Savadkooh (Polsephid), July 2000.
****Formica glauca*** Ruzsky, 1896
Amol, Aug. 2005; Babol (Bandpey), May 2006.

**Lasius alienus* Foerster, 1850
Galoogah, August 2002.
**Lasius neglectus* Van Loon, Boomsma & Andrasfaldvy, 1990
Amol, November 2005.
Lasius turcicus Santschi, 1921
Savadkooh, July 2003; Ghaemshahr, June 2005.
Lepisiota frauenfeldi* subsp. ***Karavievi* Ugamsky, 1929
Amol, April 2006.
**Lepisiota karavievi* Pisarski, 1967
Amol, June 2005.
**Plagiolepis maura* Santschi, 1920
Amol, November 2004; Ghaemshahr, October 2005.
**Polyrhachis lacteipennis* Smith, 1858
Amol, September 2005.

Subfamily Myrmicinae

**Aphaenogaster obsidiana* Mayr, 1861
Babol, June 2002.
**Cardiocondyla stambouloffi* Forel, 1892
Amol and Sari; September 2003.
**Crematogaster antaris* Forel, 1849
Joibar, July 2000.
**Crematogaster subdentata* Mayr, 1877
Neka, August 2004; Sari, August 2005.
**Crematogaster warburgi* Menozzi, 1933
Behshahr, June 2001; Sari, April 2003.
**Messor alexandri* Thome & Thome, 1981
Amol, September 2006.
**Messor darianus* Pisarski, 1967
Amol and Ghaemshahr, October 2005.
**Messor denticulatus* Santschi, 1927
Savadkooh, July 2003.
**Messor medioruber* Santschi, 1910
Amol, June 2006.
Messor caducus Victor, 1839
Sari and Neka, June 2002.
**Messor sultanus* Santschi, 1917
Babol, August 2003.
**Monomorium areniphilum* Santschi, 1911
Ghaemshahr and Joibar, September 2004.
**Monomorium pharaonis* Linnaeus, 1758
Savadkooh, July 2003.
**Monomorium venustum* Smith, 1858
Babol, Aug. 2003.
**Pheidole megacephala* Fabricius, 1793
Amol, August 2005.
Pheidole pallidula Nylander, 1849
Savadkooh (Shirgah), October 2000.
**Solenopsis wolfi* Emery, 1915
Ramsar, July 2003.
**Tetramorium caespitum* Linnaeus, 1758
Savadkooh (Shirgah), October 2000.
Tetramorium punctatum Santschi, 1927
Noor, July 2005.
**Tetramorium taurocaucasicum* Arnoldi, 1977
Amol, June 2005, Ghaemshahr, April 2006.

Subfamily Dolichoderinae

*****Linepithema humile*** Meyr, 1868
Nooshahr and Noor, September 2005.
****Tapinoma festae*** Emery, 1925
Fereydonkenar and Chalus, November 2001.
****Tapinoma karavievi*** Emery, 1925
Chalus and Tonekabon, June 2004.
Tapinoma simrothi subsp. ***Karavievi*** Emery, 1925
Behshahr and Neka, August 2001.

DISCUSSION

The results of this survey indicated that the subfamily Myrmicinae is more diverse than the two other subfamilies with 20 species. Majer (1986) classified ants into status categories of dominant; subdominant, which can attain dominant status in the absence of dominant ants; and nondominant, which live within or between the territories of dominant ants. Dominant ants include species that are most conspicuously useful for biological control.

Good evidence shows that ants prey on the egg of pest species in many different countries and habitats. For example, in Sri Lanka virtually 100% of eggs of *Opisina arenosella* were removed within 24 h by *Monomorium floricola*. *Solenopsis invicta* was part of a complex killing of over 70% of eggs of *Heliothis virescens* in 24 h on cotton where ratios of predators to prey ranging from 2: 1 to 200: 1 seem able to prevent significant pest damage. On sugar cane, over 90% of eggs and small larvae of *Castnia licus* and 92% of eggs of *Eldana saccharina* were killed by ants. *Pheidole* spp. are major predators in complexes that can kill over 95% of eggs of *Alabama argillacea* and some 80% of *Diabrotica* spp. eggs in the soil (Way & Khoo, 1992). Therefore, ants alone or as an important part of predator complex can cause very large mortalities of eggs and so can contribute importantly to natural control (Jaffe et al., 1990). More specific case studies are needed to assess the importance of such mortality, especially because increased egg mortality can sometimes be compensated for by decreased larval mortality (van Hamburg & Hassell, 1984).

The stability, social organization, and foraging behavior of some predatory ants enable them to react quickly to increasing prey density, and also make them uniquely able to protect crops from low-density pests. Such qualities require dependence on honeydew-producing Homoptera that may sometimes be made harmful by ant attendance. Cost-benefit judgments are therefore needed when such ants are to be used.

Predacious ants also affect other natural enemies, but less than might be expected, and may indeed benefit some. Ants tend to overlap the food niches of other predators and may force them into one competitive system. Whether overall biological control is benefited by such interactions is unknown. Work on the role of ants as part of overall natural-enemy complexes is needed. In addition, inadequate attention has been given to understanding ant-prey interactions. Research such as that carried out in some natural habitats needs to be undertaken in agroecosystems.

Behavioral attributes that enable one species, for example, a very small and apparently inoffensive species, to dominate over larger more aggressive species are not understood and need detailed investigation. Studies of this type should provide valuable clues to manipulating systems in favor of some beneficial species.

Biological-control attributes of many relatively inconspicuous nondominant ants have been inadequately studied. Some species may he valuable in their own right, but many also make a significant contribution to overall natural mortality, which needs to be understood much better than it is at present.

The results are promising from some ecological approaches to manipulating beneficial ants by cultural practices and habitat modification. More emphasis is needed on practical application, especially since some ants have sharply contrasting pest and beneficial attributes. Since eradication is impossible, the emphasis should be on enhancing their role in habitats where they are beneficial while controlling them elsewhere. Such approaches need not be incompatible.

Although the introduction of exotic predatory ants for biological control is potentially hazardous, it should not be discounted. In this context, work is needed on some accidentally introduced species that have important biological-control attributes.

Finally, in some circumstances, ants are uniquely useful, as when they are the only alternative to intensive insecticide treatment, or where alternative practices are uneconomic or impracticable.

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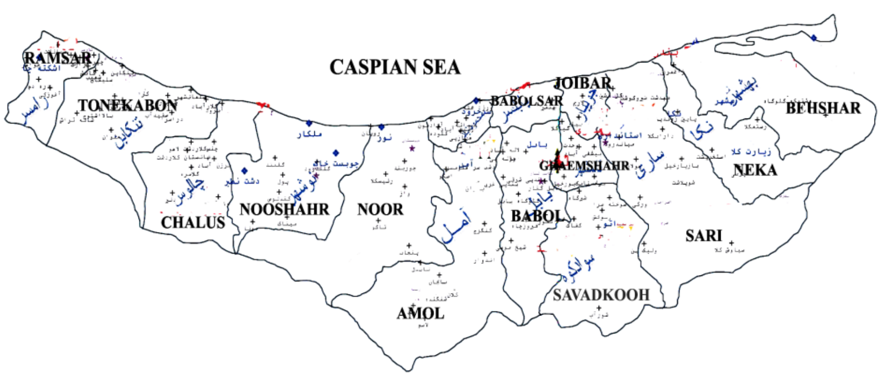

Fig. 1. The map of Mazandaran province, Northern Iran.

NEW FAMILY AND GENUS NAMES, FAHRIYEIDAE NOM. NOV. AND *FAHRIYEA* NOM. NOV., FOR SPICIDAE AND THE TYPE GENUS *SPICA* TERMIER & TERMIER, 1977 (PORIFERA: DEMOSPONGIAE: AGELASIDA)

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[Özdikmen, H. 2009. New family and genus names, Fahriyeidae nom. nov. and *Fahriyea* nom. nov., for Spicidae and the type genus *Spica* Termier & Termier, 1977 (Demospongiae: Agelasida). Munis Entomology & Zoology, 4 (1): 190-192**]**

ABSTRACT: A junior homonym was detected among the sponge genus group names and the following replacement name is proposed: *Fahriyea* nom. nov. for *Spica* Termier & Termier, 1977. Accordingly, new combinations are herein proposed for the species currently included in this genus. *Fahriyea spica* (Termier & Termier, 1977) comb. nov. and *Fahriyea texana* (Rigby & Bell, 2006) comb. nov.. In addition, I propose the replacement name Fahriyeidae new name for the family name Spicidae.

KEY WORDS: nomenclatural change, homonymy, replacement name, Spicidae, *Spica,* sponges.

Remarks on nomenclatural change

Firstly, the moth genus name *Spica* was erected by Swinhoe (1889) with the type species *Spica luteola* Swinhoe, 1889 by monotypy from Sikkim (India) in Lepidoptera (Drepanoidea: Drepanidae: Thyatrinae). It is still used as a valid genus name (e. g. Smetacek, 2002).

Subsequently, the fossil genus *Spica* was described by Termier & Termier (1977) with the type species *Spica spica* Termier & Termier, 1977 by original designation in Agelasida (Demospongiae). The name is currently used as a valid generic name among sponges as the type genus of the family Spicidae Termier & Termier, 1977. It was synonymized subjectively with *Fistulosponginina* by Finks et al. (2004). Then, it was revalidated by Rigby & Bell (2006). So it is still used as a valid genus (Senowbari-Daryan & Rigby, 1988; Weidlich & Senowbari-Daryan, 1996; Rigby & Bell, 2006).

However, the name *Spica* Termier & Termier, 1977 is invalid under the rule of homonymy, being a junior homonym of *Spica* Swinhoe, 1889. Under the International Code of Zoological Nomenclature (ICZN 1999) it must be rejected and replaced. In accordance with article 60 of the International Code of Zoological Nomenclature, fourth edition (1999), I propose to substitute the junior homonym *Spica* Termier & Termier, 1977 for the nomen novum *Fahriyea*. As a result of this, *Spica* Termier & Termier, 1977 is replaced with *Fahriyea* new name. The following new combination is established: *Fahriyea spica* (Termier & Termier, 1977) new combination, along with two another new combination for all two valid species currently included in *Spica* Termier & Termier, 1977.

In addition to this, I herein propose the replacement name Fahriyeidae new name for the family name Spicidae Termier & Termier, 1977 because its type genus *Spica* Termier & Termier, 1977 is invalid and the type genus of a family-group name must be valid.

SYSTEMATICS

Order Agelasida
Family **Fahriyeidae** new name

Spicidae Termier & Termier, 1977
Type genus.— *Fahriyea* **new name**.
Remarks.—The name *Spica* has been used in Agelasida as a stem for a family-group name, and should be automatically replaced with the new name.

Genus ***Fahriyea*** new name

Spica Termier & Termier, 1977, junior homonym of *Spica* Swinhoe, 1889.

Spica Termier & Termier, 1977. In Termier, Termier & Vachard, Palaeontographica (A) 156: 41. (Demospongiae: Ceractinomorpha: Agelasida: Fahriyeidae nom. nov.). Preoccupied by *Spica* Swinhoe, 1889. Proc. zool. Soc. London, 1889, 424. (Insecta: Lepidoptera: Drepanoidea: Drepanidae: Thyatrinae).

Type species.— *Spica spica* Termier & Termier, 1977 by original designation.

Etymology.— The new genus name is dedicated to my elder sister Fahriye Özdikmen (Demirer) from Turkey. It is feminine in gender.

Species account. — Two species.

The following new combinations are proposed and the species is removed from *Spica*:

Fahriyea spica (Termier & Termier, 1977) **new combination**
from *Spica spica* Termier & Termier, 1977

Fahriyea texana (Rigby & Bell, 2006) **new combination**
from *Spica texana* Rigby & Bell, 2006

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SOME BIOLOGICAL PARAMETERS OF *LYSIPHLEBUS FABARUM* (HYMENOPTERA: APHIDIIDAE) A PARASITOID OF *APHIS FABAE* (HOMOPTERA: APHIDIIDAE) UNDER LABORATORY CONDITIONS

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[**Matin, S. B., Sahragard, A. & Rasoolian, G.** 2009. Some biological parameters of *Lysiphlebus fabarum* (Hymenoptera: Aphidiidae) a parasitoid of *Aphis fabae* (Homoptera: Aphidiidae) under labaratory conditions. Munis Entomology & Zoology, 4 (1): 193-200]

ABSTRACT: Some biological traits of *Lysiphlebus fabarum* (Marshal) an important parasitoid of *Aphis fabae* were studied under laboratory conditions (21 ±1° C, a relative humidity of 70± 5 % and 14:10 L:D h. of photoperiod). Different stages of *Aphis fabae* and its host plant were used. Average preadult period of male and female adult parasitoids were 13.18 ± 0.28 and 13.68 ± 0.27 days, respectively. There were no significant differences between male and female wasps longevity ($P>0.05$). There was a significant difference between preadult period of female and male parasitoids on different life stages of *Aphis fabae* ($P < 0.05$). Diet affected significantly the female parasitoid longevity ($P<0.05$). Longevity was longer when the females were fed on 30% honey solution and the shortest when they had no access to host plant, host, water and honey solution. Sex ratio changed towards males as temperature increased. Data analysis revealed that female parasitoids prefer *Aphis fabae* over *Aphis craccivora* Koch and *Aphis nerri* for oviposition ($P< 0.05$). The lowest oviposition preference was shown for *Aphis nerri*. Mean lifetime fertility of *Lysiphlebus fabarum* was 122 ± 27.28 offsprings/ female on *Aphis fabae*. The intrinsic rate of increase(r_m), mean generation time, doubling time and rate of increase per week (R_W) were 0.28, 16.31 days, 2.47 days, and 7.11, respectively.

KEY WORDS: Diet, Host preference, Population growth, Preadult period, Sex ratio

Aphidiids as endoparasitoids of aphids oviposit in the host body in a way that is specific in these wasps. The larvae hatch into their hosts bodies after incubation. They develop as solitary endoparasitoids. After aphid mummification, they spin cocoons beneath the emptied bodies of their hosts. Prepupal, pupal and adult stages are completed inside the cocoon and the mummified body of the aphid. Mature adults emerge from their mummified aphid host by cutting a circular hole in the host tegument (Stary, 1970).

The lifespan of adult aphidiids is influenced by many factors, such as temperature, humidity, food, presence or absence of hosts, etc. (Stary, 1988). This period generally takes 13-16 days from oviposition to adult emergence in *Lysiphlebus testaceipes* (Weeden & Haffman, 1995) and 10 ± 0.26 days in *L. fabarum* (Baghery-Matin et al., 2005). Development time in *L. testaceipes* ranges between 53.53 ± 0.48 at 10° C to 8.86 ± 0.06 days at 26° C (Welling et al., 1986). This period has been reported as 33.7 days at 15 °C, 21.1 days at 21.6 °C and 19.9 days at 24 °C for *Ephedrus cerasicola* (Hofsvang & Hagvar, 1977). Adult females of *Aphidius sonchi* Marshal, a parasitoid of the sowthistle aphid, *Hyperomyzus lactucae* (L.) lived longer in the absence of hosts than in their presence and also longer than males. Those supplied with water and honey lived longer than those without honey (Liu & Carver, 1985).

The aphidiid wasps vary in their preference for different stages of their aphid hosts. Although the female wasps prefer the second and the third instar nymphs for oviposition, they all attack four instar nymphs (Stary, 1988). The females of *Aphidius sonchi* Marshal, oviposited in all nymphal instars and both apterous and alate adults of the host, *Hyperomyzus lactucae* (L.) (Liu & Carver, 1985). The females of *Ephedrus cerasicola* oviposited in four nymphal stages and newly emerged adults of *Myzus persicae*, but they preferred the third instar nymphs to others (Tremblay, 1964). It has been found that female *Lysiphlebus fabarum* prefers the second and the third instar nymphs of *Aphis fabae* to other ones and the rate of parasitism is related to the movement of the aphid host and the parasitoid itself (Tremblay, 1964). According to Rakhshani et al. (2004), *Trioxys pallidus* also showed a greater preference for the third and forth instar nymphs of the walnut aphid, *Chromaphis juglandicola* (Kalt.) than the others. Studies on the biology of *Aphidius sonchi* revealed that it was a specific parasitoid of species of *Hyperomyzus* (Mackauer & Stary, 1967). However, observations showed that the parasitoid also laid eggs in *Macrosiphum euphorbiae* (Thomas), an aphid occurring commonly on *Sonchus* with *H. lactucae* (L.) but the development of parasitoid larvae were never found in *M. euphorbia*, indicating that development of the parasitoid in *Macrosiphum euphorbiae* ceased during the egg stage (Liu & Carver, 1985).

The sex ratio in aphidiids is in favor of females in the field conditions , but it is variably influenced by environmental and genetical factors (Stary, 1988). Host size as an environmental factor affects parasitoid sex ratio, as smaller aphid hosts result in male parasitoids and the larger ones in females. Wellings et al. (1986) also found that smaller hosts produced male parasitoids in *Aphidius ervi*. Age in adult females is another important factor that influences sex allocation and progeny production in *Lysiphlebus delhiensis* (Kouame & Mackauer, 1991; Serivastava & Singh, 1995). The sex ratio (male/female) in *Ephedrus cerasicola* and *L. fabarum* has been reported 1: 1 and 1 :1.8, respectively (Stary, 1988).

The intrinsic rate of increase (r_m) for *Trioxys pallidus* reared on *Chromaphis juglandicola* has been studied by Rakhshani (2001) and for *Ephedrus cerasicola* by Hagvar and Hofsvang (1990).

In this research some biological parameters of *L. fabarum* reared on *A. fabae* were studied.

MATERIALS AND METHODS

Preadult period of the parasitoid

In order to determine preadult period of the wasp, colonies of different stages of *A. fabae* were separately established in clip cages (60 x10 mm). Each colony was then transferred to broad bean*, Vicia faba*e, which were inserted into a glass vial (90 x 50 mm) filled with water. The plant was fixed with nonabsorbent cotton into test tube. This tube then was placed in a transparent plastic dish (300 x 180 mm) on sides of which four circle holes (each 2 cm in diameter) were made for aeration and adult parasitoid releases. Three of them were covered with muslin and the fourth one was pluged with a cork. On the top of the dish cover, a hole (80 mm in diameter) was also made to feed wasps. Dishes were kept in growth chambers (21±1°C, a relative humidity of 70 ± 5 % and 14: 10 L: D). Five pairs of female and male parasitoids were introduced to each dish for 24 hrs. The different stages of aphid in dishes were observed daily. After mummification, mummified aphids from each dish with a plant part were placed in a Petri-dish (80 x 15 mm) and they were kept until adult parasitoid emergence. The number of adult parasitoid emerged each day was recorded and the observation was continued until all adults that emerged.

Effect of different diets on parasitoid longevity

Mated females were fed on (i) 30% of honey solution (sprayed as tiny droplets on the cover of the plastic dish), (ii) 30 % of honey solution with aphids and host plants, (iii) aphids and host plants without honey solution, and (iv) without food in the absence of aphids and host plants. Thirty five mated females (as replications) were released into a plastic dish (80x120 mm) for each treatment and by daily observation, number of dead female was recorded till the last wasp died.

Effect of temperature on sex ratio

Twenty mummified aphids at the same age (third instar nymphs of *A.fabae*) were placed in a Petri-dish (15 x 80 mm) and were reared to adult stage at four levels of temperatures (15, 20, 25, and 35° C and a relative humidity of 70 ± 5%). Each experiment was replicated five times at each temperature level. Petri-dishes were observed daily and the number of adult parasitoids emerged was recorded and they were sexed under a stereomicroscope (the abdomen tip in female is sharper than male).

Host species preference

In order to determine host species preference of the parasitoid, 20 third instar nymphs of *Aphis fabae*, *A. craccivora* and *A. nerri* were established on a part of *Vicia fabae*, *Robinia pseudoacacia*, and *Nerium oleander* plants. These were then transferred to a transparant plastic box as above. A pair of 1 day-old male and female parasitoid already fed on 30 % of honey solution, was introduced into each box. This experiment was replicated 6 times. After 24 hrs. wasps were removed from the cages using a pooter, and the infested host plant parts were transferred to transparent plastic dishes (120 x 80 mm). They were then kept in a growth chamber (25 ± 1° C, 65 ± 5% RH.) for 72 hrs. Aphids were then transferred in a deep freezer and were then dissected to determine the number of parasitoid eggs laid.

Analysis of variance was used for data analysis and means were compared with Duncan's multiple range test using SAS (1995) software. All experiment were performed in a completely randomized design.

Population growth parameters

In order to determine fertility lifetable of the parasitoid, adults emerging from mummified aphids were used. For this, 15 pairs of 1 day-old female and male parasitoids were introduced into transparent plastic boxes (70 x 110 x 200 mm) containing 50 third instar nymphs of *A. fabae* established already on apical parts of host plant (*Vicia fabae*). After 24 hrs, plant parts bearing parasitized hosts inserted in a glass vial (as above) filled with water were removed and transferred to transparent plastic dishes (80 x 120 mm) and were kept in a growth chamber (21±1°C and 70 ± 5 of RH, 10D: 14L) until adult parasitoids emerged. Fifty third instar nymphs were presented separately to each female parasitoid until they died. At the end of each experiment, the sex ratio of offsprings was determined and used to obtain female percentage at each age class. Population growth rates were calculated according to Andrewartha and Birch (1954) and Carey (1993):

Intrinsic rate of increase ($1 = \Sigma e^{-rx} l_x m_x$),
where, x= age in days, r = intrinsic rate of increase, l_x =age-specific survival, m_x = age-specific number of female offspring.

RESULTS

Preadult period

Average preadult period of male and female adult parasitoids reared on third instar nymphs of the aphid hosts were 13.18 ± 0.28 and 13.68 ± 0.27 days, respectively. There was no significant differences between this period for male and female wasps ($P>0.05$). Preadult periods of adult parasitoids on different life stages of *A. fabae* are presented in Table 1. There was a significant difference between preadult period of female parasitoids on different life stages of the host ($P<0.05$). The same results were found for male parasitoids ($P<0.05$). This period was shorter than female parasitoids.

Effect of different diets on parasitoid longevity

Data analysis showed that diet had a significant effect on female adult parasitoid longevity ($P<0.05$). The longevity was longer when the females were fed on 30% honey solution (12.83 ± 0.77 days) and the shortest (1.57 ± 0.15 days) when they had no access to host plant, host, water and honey solution. The female longevity on host plant, aphid, honey solution and on host plant & aphid was 8.86 ± 0.38 and 4.28 ± 0.256 day, respectively.

Effect of temperature on sex ratio

The sex ratio of *L. fabarum* at different levels of temperatures are shown in Table 2. The percentage of females decreased as the temperature increased.

Host species preference

Data analysis on the mean percentages of parasitism revealed that female parasitoids prefer *A. fabae* (52.33 ± 3.53%), over *A. craccivora* (34.63 ± 2.61 %) and *A. nerri* (10.56 ± 3.33 %) for oviposition ($P< 0.05$). As it is clear the lowest oviposition preference was shown for *A. nerri*.

Population growth parameters

Fertility life table parameters are shown in Table 3. Mean lifetime fertility of *L. fabarum* was 122 ± 27.28 offsprings/female (with a range of 62-141) on *A. fabae*. Age-specific survival (l_x) and age-specific fecundity of the parasitoid population (m_x) are illustrated in Fig.1.

DISCUSSIONS

Average preadult period of *L. fabarum* decreased as the host stages grew older. Similar results were found by Stary (1986). According to Hofsvang and Hagvar (1986) preadult period of *Ephedrus cerasicola* was influenced by species and age of the host and the temperature. Similar results were also found on *Aphidius matricarie* Hal. parasitizing *Myzus persicae* Sulz. (Rabasse & Shalaby, 1980).

Successful biological control is partly dependent on the longevity and reproductive success of beneficial insects. Availability of carbohydrates can improve the nutrition of parasitic insects, and thereby increase their longevity and realized fecundity. Evidence suggests that individual fitness benefits afforded by food sources are important for a time-limited parasitoid (Williams & Roane, 2007). In this study, food provision of female parasitoids affected their longevity significantly. Providing parasitoids with food will result in increased longevity and subsequent parasitism rates (Wäckers, 2001; Azzouz et al., 2004; Irvin et al., 2007). Similar results were found by Hofsvang and Hagvar (1986) on *Ephedrus cerasicola*. Longevity is generally influenced by searching activity, body size, mating, oviposition, temperature, humidity, photoperiod and diet (Jervis & Copland, 1996). The adult parasitoid of *Trioxys palidius* lived shorter when fed only on water and honey solution compared to those kept with hosts and fed upon honeydew and first instar nymphs of *Chromaphis juglandicola*. It was even shorter when they were kept without hosts and food (Rakhshani, 2001). In this research, the longevity of adult females of *Lysiphlebus fabarum* with hosts was shorter than *E. cerasicola* with *M. persicae* and *E. californicus* with *Acyrthosiphon pisum* (Hofsvang & Hagvar, 1975a).

The sex ratio changed towards males as temperature increased. According to Tremblay (1964) at higher temperatures, most activities of the parasitoid including mating, oviposition, flight and searching declined and that in turn resulted in the reduction of offspring number and an increase in the number of males in the population. This result is similar to those found by Tremblay (1964). As females grow older, daily oviposition rate decreases leading to an increase in male offsprings (Hofsvang & Hagvar, 1975b, Hagvar & Hofsvang, 1990). Parasitized nymphs of *Aphis fabae* start to mummifiy prior to maturity and reproduction. Therefore, by eliminating reproduction in younger instars and parasitization of fourth instar nymphs and adult stages by the parasitoid will eventually decrease aphid reproduction and its population considerably (Tremblay, 1964; Hofsvang & Hagvar, 1986; Hagvar & Hofsvang, 1991).

Data analysis on host species selection showed that *A. fabae* was the most preferred host for the parasitoid. This has been shown to be related to the colour of the aphid host, as this parasitoid prefers aphids with darker colours to others (Tregubenko, 1980). Carver (1984) in a study on the host ranges of *L. fabarum* and *L. testacipes* found that the percentage of adult parasitoids emergence on *A. nerii* was very low as compared with those on *A. craccivora* and *A. citricidus*. The toxic substances in *Nerium oleander* leaf tissues affect the growth of parasitoid inside the body of the aphid host (P. Stary, unpubl. data, 2002).

The intrinsic rate of increase (r_m) obtained for *L. fabarum* was similar to those obtained for *Ephedrus cerasicola* (Hagvar & Hofsvang, 1990) and *Trioxys pallidus* (Rakhshani, 2001). The r_m values in these insects were 0.38 and 0.28, respectively. Hagvar and Hofsvang (1990) state the intrinsic rate of increase in Aphidiid wasps generally ranges between 0.29 and 0.38. Net reproductive rate obtained here was less than the reproductive rate for *Ephedrus cerasicola* on *M. persicae* and more than that calculated for *T. pallidus* on *Chromaphis juglandicola*. The generation time of *L. fabarum* was greater than those obtained for two above mentioned was species, but the doubling time was lower than *T. pallidus* and higher than *Ephedrus cerasicola*.

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Table 1. Average (± Se) preadult periods (in days) of *L.fabarum* reared on different life stages of *A. fabae* at 21±1°C

Host stages:	*1st instar*	*2nd instar*	*3rd instar*	4th instar nymph	*adults*
Females:	17.38± 0.33 a (n 17)	15.76± 0.19b (n 20)	14.21± 0.27bc (n 32)	11.3± 0.4 cd (n 25)	9.73± 0.14d (n 9)
Males :	17.06± 0.17 a (n 35)	14.37± 0.04b (n 35)	13.92±0.17bc (n 48)	11.25 ± 0.82cd (n 34)	9.3± 0.19d (n 12)

Data with the same letter are not significantly different at 0.05

Table 2. Sex ratio of *L.fabarum* reared on *A. fabae* at different temperatures.

Temperature (oC)	No. of males	No. of females	Female
15	53	147	73.5
20	57	160	73.7
25	56	123	68.7
30	38	58	60.4

Table 3. Population growth parameters of *L. fabarum* reared on *A. fabae* under laboratory condition

Parameters	Values
Net reproductive rate ($R_o = \sum l_x m_x$)	94.34
Intrinsic rate of increase (r_m)	0.28
Mean generation time ($T = \ln R_o / r_m$)	16.31
Doubling time ($Dt = \ln 2/r_m$)	2.47
Rate of increase per week ($R_W = e^{rm})^7$	7.11

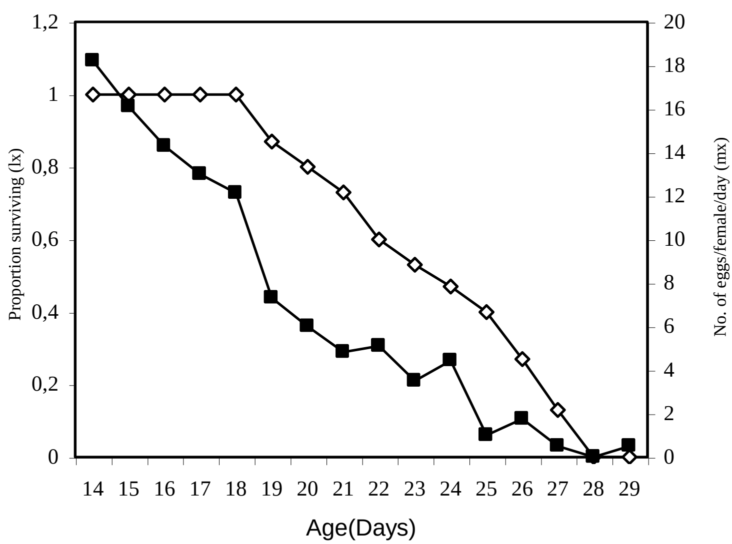

Fig. 1. Age-specific survival rate (l_x) and age-specific fecundity (m_x) of *L. fabarum* reared on *A.fabae*.

NEW NAMES FOR TWO GALL MIDGES GENERA (DIPTERA: CECIDOMYIIDAE)

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[Özdikmen, H. 2009. New names for two gall midges genera (Diptera: Cecidomyiidae). Munis Entomology & Zoology, 4 (1): 201-203**]**

ABSTRACT: Two genus group names in Cecidomyiidae were detected as nomenclaturally invalid and the following replacement names are proposed: *Novocalmonia* nom. nov. for *Calmonia* Tavares, 1917 and *Pritchardaea* nom. nov. for *Pararete* Pritchard, 1951. Accordingly, new combinations are herein proposed for the species currently included in these genus group names.*Novocalmonia fici* (Gagne, 1994); *Novocalmonia urostigmata* (Tavares, 1917) and *Pritchardaea elongata* (Felt, 1908).

KEY WORDS: nomenclatural changes, Diptera, Cecidomyiidae, gall midges.

Two proposed genus names in Cecidomyiidae are nomenclaturally invalid, as the genus group names have already been used by different authors in Trilobita and Porifera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus names.

TAXONOMY

Order DIPTERA
Family CECIDOMYIIDAE

Genus *NOVOCALMONIA* nom. nov.

Calmonia Tavares, 1917. Brotéria, Sér. Zool., 15, 173. (Insecta: Diptera: Nematocera: Cecidomyiidae: Cecidomyiinae: Oligotrophini). Preoccupied by *Calmonia* Clarke, 1913. Monogr. Serv. geol. Brasil, 1, 119. (Trilobita: Phacopida: Phacopina: Acastoidea: Calmoniidae).

Remarks on nomenclatural change: Firstly, the neotropical trilobite genus *Calmonia* was described by Clarke (1913) with the type species *Calmonia signifer* Clarke, 1913 from Ponta Grossa Sh, Paraná Basin, Brazil. It is still used as a valid genus name in Trilobita (e. g. Jell & Adrain, 2003). It is the type genus of the trilobite family Calmoniidae Delo, 1935.

Subsequently, the neotropical gall midge genus *Calmonia* was erected by Tavares (1917) with the type species *Calmonia urostigmata* Tavares, 1917 by original designation from Nova Friburgo, Rio de Jenairo, Brasil. Also, it is still used as a valid genus name (e. g. Maia, 2005 and 2007).

Thus the gall midge genus *Calmonia* Tavares, 1917 is a junior homonym of the valid genus name *Calmonia* Clarke, 1913. So I propose here that *Calmonia* Tavares, 1917 should be replaced with the new name *Novocalmonia*, as a replacement name.

Etymology: from the latin word “nova” (meaning “new” in English) + the preexisting genus name *Calmonia*.

Summary of nomenclatural changes:

Novocalmonia **nom. nov.**
pro *Calmonia* Tavares, 1917 (non Clarke, 1913)

Novocalmonia fici (Gagne, 1994) **comb. nov.**
from *Calmonia fici* Gagne, 1994

Novocalmonia urostigmata (Tavares, 1917) **comb. nov.**
from *Calmonia urostigmata* Tavares, 1917

Genus *PRITCHARDAEA* nom. nov.

Pararete Pritchard, 1951. Univ. Calif. Publ. Ent., 8, 253. (Insecta: Diptera: Nematocera: Cecidomyiidae: Lestremiinae: Lestremiini). Preoccupied by *Pararete* Ijima, 1927. Siboga Exped., 6, 165. (Porifera: Hexactinellida: Hexasterophora: Hexactinosida: Euretidae: Euretinae).

The name *Pararete* was initially introduced by Ijima, 1927 for a sponge genus (with the type species *Eurete farreopsis* Carter, 1877 from Philippines. It is still used as a valid genus name (e. g. Hooper & Van Soest, 2002).

Later Pritchard, 1951 described a new nearctic gall midge genus under the same generic name (with the type species *Lestremia elongata* Felt, 1908 by monotypy from Argus Mountains, California, USA). Also, it is still used as a valid genus name (Thompson & Evenhuis, 1998).

Thus, the genus group name *Pararete* Pritchard, 1951 is nomenclaturally invalid as a junior homonym of the genus *Pararete* Ijima, 1927. So I propose a new replacement name *Pritchardaea* nom. nov. for the genus name *Pararete* Pritchard, 1951.

Etymology: This genus name is dedicated to A. E. Pritchard who is the current author of the preexisting genus *Pararete*.

Summary of nomenclatural changes:

Pritchardaea **nom. nov.**
pro *Pararete* Pritchard, 1951 (non Ijima, 1927)

Pritchardaea elongata (Felt, 1908) **comb. nov.**
from *Pararete elongata* (Felt, 1908)
Lestremia elongata Felt, 1908

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LIFE HISTORY TRAITS OF *TETRANYCHUS URTICAE* KOCH ON THREE LEGUMES (ACARI: TETRANYCHIDAE)

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[Razmjou, J., Tavakkoli, H. & Nemati, M. 2009. Life history traits of *Tetranychus urticae* Koch on three legumes (Acari: Tetranychidae). Munis Entomology & Zoology, 4 (1): 204-211**]**

ABSTRACT: The two-spotted spider mite, *Tetranychus urticae* Koch, is very polyphagous and considered a serious pest world-wide. The divers host plant species may have been the different effects of this pest; we therefore compared population growth parameters of *T. urticae* reared on three commonly grown and important legumes in Iran (soybean, cowpea and bean). The life table parameters were estimated at 25 ± 1°C, 60 ± 10% RH, and a photoperiod of 18:6 h (L: D). Egg hatchability, development time and survival to adult stage were similar among cultivars, but we detected significant variation in fecundity and longevity, resulting in large differences for population growth parameters such as the intrinsic rate of natural increase (r_m), net reproductive rate (R_o), finite rate of increase (λ) and doubling time (DT). Soybean was the most favorable host for two-spotted spider mites with r_m = 0.296 (offsprings/female/day), followed by cowpea (0.242) and bean (0.230). The slowest population growth was observed on the bean species with r_m = 0.214. These findings indicate that the choice of host plant species will affect how fast spider mite populations reach damaging levels in a culture.

KEY WORDS: host plant, legumes, life table, *Tetranychus urticae*

The two-spotted spider mite, *Tetranychus urticae* Koch (Acari, Tetranychidae) is one of the most serious agricultural pests in the world. This mite is polyphagous and attacks the broad range of crops, including soybean, cowpea, and common bean and etc. (van de Vrie et al., 1972; Khanjani, 2005). These latter three plants are economic important crops, commercially produced in some regions of Iran. Based on reports by the Iranian Ministry of Agriculture in 2005, overall, these crops are grown on more than 180000 ha annually in Iran. Therefore, outbreaks of several pests especially *T. urticae* limits yield of these high cash leguminous plants. The importance of this mite pest is not only due to direct damage to plants including defoliation, leaf burning, and even in excessive outbreaks plant death but also indirect damage to plants which decreases in photosynthesis and transpiration (Brandenburg and Kennedy, 1987).

Host plants of spider mites differ in the degree of food quality, which either depend on the level of primary plant metabolites, or on the quantity and nature of secondary metabolites (Rosenthal and Berenbaum, 1991). Many secondary metabolites found in plants have a responsibility in defense against herbivores, pests and pathogens. These compounds can perform as toxins, deterrents, digestibility reducers or act as precursors to physical defense systems (Bennett and Wallsgrove, 1994; Balkema-Boomstra, 2003).

The rapid developmental rate and high reproductive potential of *T. urticae* allows them to achieve damaging population levels very quickly when growth conditions are good, resulting in an equally rapid decline of host plant quality. The population growth parameters of *T. urticae* such as developmental rate, survival, reproduction and longevity may vary in response to changes in temperature, host plant species, host plant nutrition, cultivar kind, phenological stage, exposure to pesticides, relative humidity, etc. (Sabelis, 1981; Brandenburg and Kennedy, 1987; Wermelinger et al., 1991; Wilson, 1994; Dicke, 2000; James, 2002; Marcic, 2003; Skorupska, 2004).

Biological knowledge, in particular life table attributes is a significant step to an improved reorganization of the population dynamics of pests. This information may be used as an important means in planning pest management program. On the other hand, host plants have main effects on development, mortality and fecundity rates in spider mite population dynamics; therefore, in order to expand a successful integrated pest management (IPM) program for this spider mite, it is vital to comprehend its life-history parameters on diverse host plans. However, despite its economic importance and word-wide distribution, relatively little is known about its population growth parameters especially on some host plants and the relevance of these results in different conditions of Iran is unknown. Hence, the goal of this study was to evaluate the population growth characteristics of two-spotted spider mite and the suitability of three economically important legumes: common bean, *Phaseolus vulgaris* L., cowpea, *vigna unguiculata*, and soybean, *Glycine max* Merrill, as host plants of *T. urticae*.

MATERIALS AND METHODS

This study was conducted in a laboratory of the plant protection department at the faculty of agriculture, Mohaghegh Ardabili University, Iran in 2007. All experiments were carried out at 25 ± 1 °C, 60 ± 10 humidity and a photoperiod of 16:8 (L: D) in a growth chamber.

Mite colony

Samples of two-spotted spider mites were collected from soybean fields of the Moghan region, Iran in June 2007. These mites were then cultured on potted related plants in a growth chamber for at least three months before conducting the experiments.

Plant material

The development and fecundity of *T. urticae* was estimated on three leguminous host plant including common bean, *Phaseolus vulgaris* L., cowpea, *Vigna unguiculata*, and soybean. Seeds of these bean plants were supplied by the seeds institute of Karaj, and agricultural and resources research center of Moghan, Iran. Plants were grown from seeds in plastic pots of 12 cm in diameter filled with suitable field soil and maintained in a greenhouse. Two or four weeks after planting, clean leaves were collected and used to cut the leaf discs used in the experiments.

Experiment 1. To evaluate the hatchability of eggs, the sex ratio of the offspring and survivorship of immature mites, one female and one adult male from the stock culture were transferred to a fresh leaf disc (30 mm in diameter) placed on a water-saturated cotton in a Petri dish (90 mm in diameter). The females were allowed to deposit eggs for five days after the preoviposition period. All eggs laid by each female were reared through all stages to adulthood. From these data we calculated the hatchability of mite eggs, the immature mite's survivorship and the sex ratio of the appearing mites (Gotoh and Nagata, 2001). Non-mated females, i.e. producing only males, were not taken into account.

Experiment 2. To assess development and life table parameters of *T. urticae* on each host plant, one female and one male (for mating) were randomly selected from the stock culture and transferred to a fresh leaf disc. Female mites were allowed to lay eggs for 24 hours, after which the mites and all but two eggs were removed from the Petri dish. Development times and survivorship of these eggs and other immature stages (larva and nymphs) were monitored and recorded daily until reaching adulthood. These assays were replicated twenty times for each host plant.

To evaluate mite fecundity, one newly emerged female from the development experiment and one male collected from the stock culture (for mating) were introduced to a 90 mm Petri dish with a fresh leaf disc on water-saturated cotton. Eggs were counted and removed daily until all experimental females died. In this way, we evaluated the fecundity of 20 two-spotted mite females per host plant (see Table 2 and 3) (Gotoh and Gomi, 2003).

Data analysis. Developmental time, the proportion of immature mites surviving, longevity and fecundity of *T. urticae* were analysed with analyses of variance (ANOVA) using the MINITAB-13.1 statistical software (Minitab lnc. 1994 Philadelphia, PA). When the overall variation among cultivars was significant, post-hoc comparisons among means were carried out using Tukey tests at $\alpha <$ 0.05.

Life table parameters including intrinsic rate of natural increase (r_m), net reproductive rate (R_0), doubling time (DT), finite rate of increase (λ) and the generation time (T) as well as their standard errors were estimated by the jackknife method (Southwood, 1978; Meyer et al., 1986; Carey, 1993) using the SAS System Software V6.12 (SAS Institute, 1989). Significance of differences between mean values of life table parameters was determined using Student's t test (Maia et al 2000). The r_m for two-spotted spider mites on different cultivars was estimated using the following equation (Birch, 1948):

$$\sum e^{-rx} l_x m_x = 1 \quad [1]$$

Where x is the age in days, r is the intrinsic rate of natural increase, l_x is the age-specific survival, and m_x is the age-specific number of female offspring. After r was computed for the original data (r_{all}), the jackknife technique was applied to appraise the differences in r_m values by estimating the variances (Meyer et al., 1986). The jackknife pseudo-value r_j was calculated for the n samples by using the following formula:

$$r_j = n \times r_{all} - (n-1) \times r_i \quad [2]$$

The jackknife pseudo-values for each treatment were subjected to an analysis of variance (ANOVA). Also, Jackknife techniques were used to calculate the other parameters of life tables (Maia et al., 2000).

RESULTS

Hatchability, Sex ratio and survivorship. Percentage of egg hatchability ranged from 89 to 92.5 and sex ratio (proportion of females) from 77.7 to 86 percent on different host plants. The survivorship of immature stages (from egg to adult) was from 72.5 to 87.5 percent as well (see Table 1).

Developmental time of immature stages. No significant variation among three host plant was observed for the development period of two-spotted spider mite eggs (F =2.77; df= 2, 68; P = 0.070), of mite nymphs (F = 0.26; df = 2, 68; P = 0.769). While the development period of mite larvae showed significantly differences among host species (F = 8.21; df = 2, 68; P = 0.001). Also, when the total development time, i.e. the sum of the three periods above, is compared among host plants, the variation is not significant (F = 1.93; df = 2, 68; P = 0.153). The means of these periods are listed in Table 2.

Female longevity and lifespan. The adult longevity of two-spotted spider mite as well as the total lifespan (from egg to death) varied significantly among three host plants (adult longevity: F = 10.08; df = 2, 53; P = 0.000; total lifespan: F = 10.68; df = 2, 53; P = 0.000). The mites survived and oviposited clearly longer on the soybean plants than on all other host plants (Table 2).

Fecundity. The number of eggs laid by each female mite (F = 7.77; df = 2, 53; P = 0.001) exhibited significant differences among three host plants. While no significant variation among host plants was observed for the number of eggs laid by each female per day (F = 2.75; df = 2, 53; P = 0.073). Due to much longer adult survival, mites laid about more than twice as many eggs on soybean compared to the bean plants (Table 1).

Life table parameters. The analysis of the net reproductive rate (R_o) of the two spotted spider mite indicated significant differences among three host plants (P < 0.05). The cohorts reared on Soybean had the largest R_o value, followed by cowpea, those on bean had the smallest R_o value (Table 3).

The intrinsic rate of natural increase (r_m) of *T. urticae* was also found to be significantly different among the three host plant species (P < 0.05), ranging from 0.296 on Soybean to 0.230 on bean (Table 3). The finite rate of increase (λ) and the doubling time (DT) varied in a similar fashion and exhibited the same hierarchy of performance: best on soybean, followed by cowpea, worst on bean. Only the generation time (T) followed a different pattern, being shortest on bean and highest on cowpea (Table 3).

DISCUSSION

Plant species vary seriously on the basis of their suitability as hosts for specific insects and mites when measured in terms of insect survival, reproductive rates and acceptance by the pest population (van den Boom et al., 2003; Musa and Ren, 2005; Greco et al., 2006). Host plant species often differ in chemical profiles, thereby affecting host (i.e., herbivore) quality (Ode, 2006). So, host plant quality is a key determinant of the fecundity of herbivorous insects (Awmack and Leather, 2002). Our results showed that there are seriously differences in the spider mite performance among on three leguminous plants tested in this study. Therefore, obtained results from these experiments showed a better performance of *T. urticae* on soybean leaf discs than on any other two plants. This was shown not only in the fecundity (mean number of eggs laid on leaf discs), adult longevity but in the lifetime of the two-spotted spider mite, as well (Table 2). So, the mean number of eggs laid by *T. urticae* on soybean plant (83.16, eggs/female) was more than two times higher than those on bean (34.50 eggs/female). In addition, the means for the lifetime of *T. urticae* were 21.63 days on soybean whereas this value was 21.53 and 14.10 days on cowpea and bean plants, respectively (Table 2). Therefore, the better r_m of mite female found on soybean and by followed cowpea compared with mites on bean was mainly the result of the greater overall fecundity and longer adult oviposition period and lifetime of this pest. The poor performance of mites on bean was the result of poor fecundity, lower survivorship immature stages and shorter life time and adult oviposition period (Tables 1, 2 and 3). The r_m value of *T. urticae* estimated in the current study ranged from 0.230 to 0.296 individuals per female per day (Table 2). These values are close to those estimated for the spider mites reared on other host plants (Sabelis, 1985; Gotoh and Gomi, 2003; Kasap, 2003; Kafil et al., 2007).

Musa and Ren (2005) demonstrated that life history traits of *Bemisia tabaci* differ greatly between three leguminous species including soybean, garden bean (*P. vulgaris*) and cowpea. Based on their results, the r_m value of *B. tabaci* was 0.1097 (d^{-1}) on garden bean and 0.1857 (d^{-1}) on soybean. In particular, some studies have documented that amount of performance and acceptance of the spider mite differs between plant species. For instance, van den Boom et al (2003) found that the plant species vary in their degree of acceptance by the *T. urticae* population. Their results indicated that the plants including soybean, hop, golden chain and tobacco are highly acceptable to the spider mite, because almost 100% of the spider mites stayed on the plant while eggplant, cowpea and thorn apple had a lower percentage of spider mite acceptance where this value was 65% for cowpea. Besides the findings of Greco et al (2006) showed a high preference and a better performance of *T. urticae* on strawberry leaves than on onion, leek and parsley leaves. This was shown not only in the fecundity but in the maximum number of offspring settled, as well. Several potential mechanisms could be responsible for this phenomenon including plant nutritional quality of the host plant and morphological or allelochemical features (Sabelis, 1985; Krips et al., 1998; Dike et al., 1999; Agrawal, 2000; Pietrosiuk et al., 2003; Balkema-Boomstra et al., 2003). Our findings show that soybean plant is a more suitable host plant than cowpea and bean plants for two-spotted spider mite. Therefore, this pest may be able to create quickly a large and damaging population on soybean plants, and this feature must be considered by growers in order to implement IPM programs for this spider mite.

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Table 1. Number of eggs per female, egg hatchability, immature survivorship and sex ratio of *T. urticae* reared on three legumes at 25°C.

	Parameter (mean ± SE)				
Host	Number of Eggs/female[a]	Number of Eggs/ female/day	Egg hatchability (%)	Immature survivorship (%)	**Sex ratio (% female)**
Soybean	83.16 ± 10.71a (19)	6.59 ± 0.43a (19)	92.5 (153)	87.5 (153)	**81.2 (125)**
Cowpea	65.53 ± 10.26ab(17)	5.05 ± 0.38a (17)	90.0 (129)	72.5 (129)	**86.0 (68)**
Bean	**34.50 ± 5.60bc (20)**	**6.17 ± 0.54a (20)**	**89.0 (54)**	**72.5 (54)**	**81.0 (24)**

[a]For this parameter, differences among species host plant were determined by Tukey tests. Within columns, means followed by different letters are significantly different (P<0.05). Sample size of all parameters is in the parenthesis.

Table 2. Development period of immature stages and adult female of *T. urticae* reared on three legumes at 25°C.

	Development period in days (Mean ± SE)					
Host	Eggs	Larva	Nymphs	Total (Immature stage)	Oviposition	Female lifespan
Soybean	4.50 ± 0.14a (22)	1.05 ± 0.05a (22)	3.68 ± 0.14a (22)	9.23 ± 0.11a (22)	12.47 ± 1.51a (19)	21.63 ± 1.53a (19)
Cowpea	4.17 ± 0.99a (24)	1.50 ± 0.12b (24)	3.71± 0.14a (24)	9.38 ± 0.10a (24)	12.06 ± 1.82a (17)	21.53 ± 1.78a (17)
Bean	*4.20 ± 0.08a (25)*	*1.12 ± 0.07a (25)*	*3.80± 0.08a (25)*	*9.12 ± 0.07a (25)*	*5.00 ± 0.53b (20)*	*14.10 ± 0.56b (20)*

For each parameter, differences among bean cultivars were determined by Tukey tests. Within columns, means followed by different letters are significantly different ($P<0.05$). The *n* value in the parentheses shows the number of the tested individuals.

Table 3. Life table parameters of *T. urticae* reared on three legumes at 25°C.

	Parameter (Mean ± SD)				
Host	R_o	r_m	DT (d)	λ (d)	**T (d)**
Soybean	53.84 ± 6.64a	0.296 ± 0.012a	2.34 ± 0.09a	1.345 ± 0.016a	**13.45 ± 0.67a**
Cowpea	29.13 ± 4.66b	0.242 ± 0.013b	2.86 ± 0.15b	1.274 ± 0.016b	**13.96 ± 0.89a**
Bean	**11.25 ± 1.85c**	**0.230 ± 0.013b**	**3.00 ± 0.15b**	**1.259 ± 0.016b**	**10.59 ± 0.31a**

[a] Differences among bean cultivars were determined by t-test pairwise comparison, based on jackknife estimates of variance for each parameter (Maia et al 2000). Within columns, means followed by different letters are significantly different ($P<0.05$).
[b] Each parameter value is mean of 20 replications.

SUBSTITUTE NAMES FOR EIGHT SPONGE GENUS GROUP NAMES (PORIFERA)

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ABSTRACT: Eight junior homonyms were detected among the sponges genera and the following replacement names are proposed: Class Demospongiae: *Spongonewellia* nom. nov. pro *Newellia* Wood, Reitner & West, 1989 and *Exsuperantia* nom. nov. pro *Rimella* Schmidt, 1879; Class Hexactinellida: *Novocarbonella* nom. nov. pro *Carbonella* Hurcewicz and Czarniecki, 1986; *Maestitia* nom. nov. pro *Napaea* Schrammen, 1912; *Hyalonema* (*Ijimaonema*) nom. nov. pro *Hyalonema* (*Pteronema*) Ijima, 1927 and *Rigbykia* nom. nov. pro *Rigbyella* Mostler & Mosleh-Yazdi, 1976; Class Regulares: *Yukonensis* nom. nov. pro *Acanthopyrgus* Handfield, 1967; Class Uncertain: *Mostlerhella* nom. nov. pro *Bengtsonella* Mostler, 1996. Accordingly, new combinations are herein proposed for the type species currently included in these genera respectively: *Spongonewellia mira* (Wood, Reitner & West, 1989) comb. nov.; *Exsuperantia clava* (Schmidt, 1879) comb. nov.; *Novocarbonella rotunda* Hurcewicz and Czarniecki, 1986) comb. nov. ; *Maestitia striata* (Schrammen, 1912) comb. nov.; *Hyalonema (Ijimaonema) aculeatum* Schulze, 1894 comb. nov.; *Hyalonema (Ijimaonema) cebuense* Higgin, 1875 comb. nov.; *Hyalonema (Ijimaonema) clavigerum* Schulze, 1886 comb. nov.; *Hyalonema (Ijimaonema) globus* (Schulze, 1886) comb. nov.; *Hyalonema (Ijimaonema) heideri* Schulze, 1894 comb. nov.; *Hyalonema (Ijimaonema) topsenti* Ijima, 1927 comb. nov.; *Rigbykia ruttneri* (Mostler & Mosleh-Yazdi, 1976) comb. nov.; *Yukonensis yukonensis* Handfield, 1967) comb. nov. and *Mostlerhella australiensis* (Mostler, 1996) comb. nov.

KEY WORDS: nomenclatural changes, homonymy, replacement names, sponges, Porifera.

In an effort to reduce the number of homonyms in Porifera, I systematically checked the generic names published. I found eight sponges genera whose names had been previously published for other taxa, making them junior homonyms. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose replacement names for these genus group names.

TAXONOMY

Phylum PORIFERA

Class DEMOSPONGIAE

Genus *SPONGONEWELLIA* nom. nov.

Newellia Wood, Reitner & West, 1989. Lethaia 22 (1): 86. (Porifera: Demospongiae: Haplosclerida). Preoccupied by *Newellia* André, 1962. Publ. cult. Comp. Diam. Angola No. 60: 69. (Arachnida: Acari: Acariformes: Actinedida: Parasitengona: Trombidioidea: Johnstonianidae).

Remarks: The genus *Newellia* was erected by André, 1962 with the type species *Newellia glandulosa* André, 1962 in Acari. It is still used as a valid genus name in the family Johnstonianidae. Later, the sponge genus *Newellia* was described by Wood, Reitner & West, 1989 with the type species *Newellia mira* Wood, Reitner & West, 1989 by original designation. It is still used as a valid genus name (e. g. Boury-Esnault, 2006). However, the name *Newellia* Wood, Reitner & West, 1989 is invalid under the law of homonymy, being a junior homonym of *Newellia* André, 1962. I propose to substitute the junior homonym name *Newellia* Wood, Reitner & West, 1989 for the nomen novum *Spongonewellia*. The name is from the word "sponge" + preexisting genus name *Newellia*.

Summary of nomenclatural changes:

Spongonewellia **nom. nov.**
pro *Newellia* Wood, Reitner & West, 1989 (non André, 1962)

Spongonewellia mira (Wood, Reitner & West, 1989) **comb. nov.**
from *Newellia mira* Wood, Reitner & West, 1989

Genus *EXSUPERANTIA* nom. nov.

Rimella Schmidt, 1879. Spong. Mex., 21. (Porifera: Demispongiae: Lithistida: Phymaraphiniidae). Preoccupied by *Rimella* Agassiz, 1840. Conch. Min., 137. (Mollusca: Gastropoda: Stromboidea: Strombidae).

Remarks: Firstly, the genus *Rimella* was established by Agassiz, 1840 for a gastropod genus with the type species *Rostellaria fissurella* Lamarck, 1799 by subsequent designation. It is still used as a valid genus name. Subsequently, the name *Rimella* was proposed by Schmidt, 1879 for a sponge genus with the type species *Rimella clava* Schmidt, 1879 from gulf of Mexico. Also, it is still used as a valid genus name (Pisera & Lévi, 2002). However, the name *Rimella* Schmidt, 1879 is invalid under the law of homonymy, being a junior homonym of *Rimella* Agassiz, 1840. I propose to substitute the junior homonym name *Rimella* Schmidt, 1879 for the nomen novum *Exsuperantia*. The name is from the Latin word "exsuperantia" (meaning "superiority" in English).

Summary of nomenclatural changes:

Exsuperantia **nom. nov.**
pro *Rimella* Schmidt, 1879 (non Agassiz, 1840)

Exsuperantia clava (Schmidt, 1879) **comb. nov.**
from *Rimella clava* Schmidt, 1879

Class HEXACTINELLIDA

Genus *NOVOCARBONELLA* nom. nov.

Carbonella Hurcewicz & Czarniecki, 1986. Annales Soc. geol. Pol. 55 (3-4): 341. (Porifera: Hexactinellida). Preoccupied by *Carbonella* Dain, 1953. Trudy vses. neft. nauchno-issled. geol.-razv. Inst. 74: 36. (Protozoa: Rhizopoda: Foraminifera: Fusulinidia: Fusulinida: Tournayellidae).

Remarks: The protozoon genus *Carbonella* was erected by Dain, 1953 with the type species *Carbonella spectabilis* Dain, 1953. It is not extant. It was assigned to Foraminiferida by Sepkoski (2002). It is still used as a valid genus name. Later, the genus *Carbonella* was described by Hurcewicz & Czarniecki, 1986 with the type species *Carbonella rotunda* Hurcewicz and Czarniecki, 1986 from the Carboniferous of Poland. It is still used as a valid genus name (e. g. Rigby & Bell, 2006). However, the name *Carbonella* Hurcewicz and Czarniecki, 1986 is invalid under the law of homonymy, being a junior homonym of *Carbonella* Dain, 1953. I propose to substitute the junior homonym name *Carbonella* Hurcewicz and Czarniecki, 1986 for the nomen novum *Novocarbonella*. The name is from the Latin word "nova" (meaning "new" in English) + the preexisting genus *Carbonella*.

Summary of nomenclatural changes:

Novocarbonella **nom. nov.**
pro *Carbonella* Hurcewicz and Czarniecki, 1986 (non Dain, 1953)

Novocarbonella rotunda Hurcewicz and Czarniecki, 1986) **comb. nov.**
from *Carbonella rotunda* Hurcewicz and Czarniecki, 1986

Genus *MAESTITIA* nom. nov.

Napaea Schrammen, 1912. Palaeontogr., Suppl. 5, no. 3, 273. (Porifera: Hexactinellida: Lychniscosida: Ventriculitidae: Ventriculitinae). Preoccupied by *Napaea* Hübner, [1819]. Samml. Exot. Schmett., 1 pl. (34). (Insecta: Lepidoptera: Papilionoidea: Riodinidae: Riodininae: Mesosemiini: Napaeina).

Remarks: The name *Napaea* was initially introduced by Hübner, [1819] for a butterfly genus (with the type species *Cremna eucharila* Bates , 1867 by subsequent designation) in Lepidoptera. *Cremna eucharila* Bates, 1967 was designated as the type-species of *Napaea* Hübner, [1819] under the plenary powers of the Commission and was placed on the Official List of Specific Names in Zoology, (Opinion 820), The Bulletin of Zoological Nomenclature, 24: 212. *Napaea* was placed on the Official List of Generic Names in Zoology after the designation of *Cremna eucharila*, (Opinion 820). It is still used as a valid genus name. The genus is the type genus of the family group name Napaeina. Subsequently, Schrammen, 1912 described a new sponge genus (with the type species *Napaea striata* Schrammen, 1912) under the same generic name. It is a valid genus name (e. g. Jahnke & Gasse, 1993). Thus, the genus *Napaea* Schrammen, 1912 is a junior homonym of the genus *Napaea* Hübner, [1819]. So I propose a new replacement name *Maestitia* **nom. nov.** for *Napaea* Schrammen, 1912. The name is from the Latin word "maestitia" (meaning "melancholy, sorrow" in English).

Summary of nomenclatural changes:

Maestitia **nom. nov.**
pro *Napaea* Schrammen, 1912 (non Hübner, [1819])

Maestitia striata (Schrammen, 1912) **comb. nov.**
from *Napaea striata* Schrammen, 1912

Genus *HYALONEMA* Gray, 1832
Subgenus *IJIMAONEMA* nom. nov.

Pteronema Ijima, 1927. Siboga Exped. Rep., 6, 61. (Porifera: Hexactinellida: Amphidiscophora: Amphidiscosida: Hyalonematidae: *Hyalonema*). Preoccupied by *Pteronema* Haeckel, 1879. Syst. der Medusen, 1, 101. (Cnidaria: Hydrozoa: Hydroidomedusa: Anthomedusae: Capitata).

Remarks: Firstly, the generic name *Pteronema* was established by Haeckel, 1879 as an hydrozoon genus with the type species *Pteronema darwini* Haeckel, 1879 from Australia. It is still used as a valid genus name. Later, the generic name *Pteronema* was described by Ijima, 1927 for a new sponge genus group with the type species *Hyalonema* (*Pteronema*) *topsenti* Ijima, 1927. It is stil used as a valid genus name (e. g. Hooper & Van Soest, 2002). However, the generic name *Pteronema* Ijima, 1927 is invalid under the law of homonymy, being a junior homonym of *Pteronema* Haeckel, 1879. So I propose a new replacement name *Ijimaonema* **nom. nov.** for *Pteronema* Ijima, 1927. The name is dedicated to Ijima who is current author of the preexisting subgenus *Pteronema*.

Summary of nomenclatural changes:

Genus *Hyalonema* Gray, 1832

Subgenus *Ijimaonema* **nom. nov.**
pro *Pteronema* Ijima, 1927 (non Haeckel, 1879)

Hyalonema (Ijimaonema) aculeatum Schulze, 1894 **comb. nov.**
from *Hyalonema (Pteronema) aculeatum* Schulze, 1894

Hyalonema (Ijimaonema) cebuense Higgin, 1875 **comb. nov.**
from *Hyalonema (Pteronema) cebuense* Higgin, 1875

Hyalonema (Ijimaonema) clavigerum Schulze, 1886 **comb. nov.**
from *Hyalonema (Pteronema) clavigerum* Schulze, 1886

Hyalonema (Ijimaonema) globus (Schulze, 1886) **comb. nov.**
from *Hyalonema (Pteronema) globus* (Schulze, 1886)

Hyalonema (Ijimaonema) heideri Schulze, 1894 **comb. nov.**
from *Hyalonema (Pteronema) heideri* Schulze, 1894

Hyalonema (Ijimaonema) topsenti Ijima, 1927 **comb. nov.**
from *Hyalonema (Pteronema) topsenti* Ijima, 1927

Genus *RIGBYKIA* nom. nov.

Rigbyella Mostler & Mosleh-Yazdi, 1976. Geol.-Palaont. Mitt. 5 (1): 19. (Porifera: Hexactinellida). Preoccupied by *Rigbyella* Stehli, 1956. J. Paleont. 30: 310. (Brachiopoda: Strophomenata: Productida: Lyttoniidina: Lyttonioidea: Rigbyellidae).

Remarks: Mostler & Mosleh-Yazdi (1976) established a cambrian spiculate sponge genus *Rigbyella* with the type species *Rigbyella ruttneri* Mostler & Mosleh-Yazdi, 1976 from Iran. It is still used as a valid genus name (e. g. Carrera & Botting, 2008). Unfortunately, the generic name was already preoccupied by Stehli (1956), who had described the genus *Rigbyella* with the type species *Paralyttonia girtyi* Wanner & Sieverts, 1935 in Brachiopoda. It is still used as a valid genus name. It is the type genus of the family Rigbyellidae Williams et al., 2000. Thus, the genus *Rigbyella* Mostler & Mosleh-Yazdi, 1976 is a junior homonym of the generic name *Rigbyella* Stehli, 1956. So I propose a new replacement name *Rigbykia* **nom. nov.** for *Rigbyella* Mostler & Mosleh-Yazdi, 1976. The name is dedicated to J. K. Rigby.

Summary of nomenclatural changes:

Rigbykia **nom. nov.**
pro *Rigbyella* Mostler & Mosleh-Yazdi, 1976 (non Stehli, 1956)

Rigbykia ruttneri (Mostler & Mosleh-Yazdi, 1976) **comb. nov.**
from *Rigbyella ruttneri* Mostler & Mosleh-Yazdi, 1976

Class REGULARES

Genus *YUKONENSIS* nom. nov.

Acanthoppyrgus Handfield, 1967. J. Paleont. 41: 209. (Porifera: Regulares: Capsulocyathida). Preoccupied by *Acanthopyrgus* Descamps & Wintrebert, 1966. Bull.Soc.ent.Fr. 71: 28. (Insecta: Orthoptera: Caelifera: Acrididea: Pyrgomorphoidea: Pyrgomorphidae: Orthacridinae: Sagittacridini).

Remarks: Handfield (1967) proposed the generic name *Acanthopyrgus* as a fossil genus of sponges with the type species *Acanthopyrgus yukonensis* Handfield, 1967 from Mackenzie Mountains, Yukon territory (Yukon, Canada, North America). It is a valid genus name. It is not extant. It was assigned to Capsulocyathida by Sepkoski (2002). Unfortunately, the generic name was already preoccupied by Descamps & Wintrebert (1966), who had proposed the genus name *Acanthopyrgus* as a orthopteran genus with the type species *Geloius finoti* Bolivar, 1905 in Caelifera. Thus, the genus group name *Acanthopyrgus* Handfield, 1967 is a junior homonym of the generic name *Acanthopyrgus* Descamps & Wintrebert, 1966. I propose a new replacement name *Yukonensis* **nom. nov.** for *Acanthopyrgus* Handfield, 1967. The name is from the type locality Yukon for tautonymy.

Summary of nomenclatural changes:

Yukonensis **nom. nov.**
pro *Acanthopyrgus* Handfield, 1967 (non Descamps & Wintrebert, 1966)

Yukonensis yukonensis Handfield, 1967) **comb. nov.**
from *Acanthopyrgus yukonensis* Handfield, 1967

Class UNCERTAIN

Genus *MOSTLERHELLA* nom. nov.

Bengtsonella Mostler, 1996. Geol.-Palaeontol. Mitt. 21: 228. (Porifera: Uncertain). Preoccupied by *Bengtsonella* Müller & Hinz, 1991. Fossils Strata No. 28: 15. (Chordata: Vertebrata: Conodonta).

Remarks: The name *Bengtsonella* was initially introduced by Müller & Hinz, 1991 for a fossil conodont genus (with the type species *Bengtsonella triangularis* Müller & Hinz, 1991 from Sweden) in Conoconta. It is still used as a valid genus name. Subsequently, Mostler, 1996 described a new Cambrian spiculate sponge genus with the type species *Bengtsonella australiensis* Mostler, 1996 from Australia under the same generic name. It is a valid genus name and it is endemic to Australia (e. g. Carrera & Botting, 2008). Thus, the genus *Bengtsonella* Mostler, 1996 is a junior homonym of the genus *Bengtsonella* Müller & Hinz, 1991. I propose a new replacement name *Mostlerhella* **nom. nov.** for *Bengtsonella* Mostler, 1996. The name is dedicated to H. Mostler who is the current author of the preexisting genus *Bengtsonella*.

Summary of nomenclatural changes:

Mostlerhella **nom. nov.**
pro *Bengtsonella* Mostler, 1996 (non Müller & Hinz, 1991)

Mostlerhella australiensis (Mostler, 1996) **comb. nov.**
from *Bengtsonella australiensis* Mostler, 1996

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EXPRESSING OF DIGESTIVE AMYLASE IN VARIOUS DEVELOPMENTAL STAGES OF *EURYGASTER MAURA*, AN ENZYMATIC APPROACH

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[**Mehrabadi, M. & Bandani, A. R.** 2009. Expressing of digestive amylase in various developmental stages of *Eurygaster maura,* an enzymatic approach. Munis Entomology & Zoology, 4 (1): 219-226**]**

ABSTRACT: In order to identify and determine of α-amylase expressing in various developmental stages of *Eurygaster maura,* a series of biochemical and enzymatic experiments was carried out. For this goal midgut α-amylase was isolated and characterized. Enzyme samples from midguts of adults were prepared by the method of Cohen with slight modifications. The α-amylase activity was assayed by the dinitrosalicylic acid (DNS) procedure, using 1% soluble starch as substrate. Then absorbance was read at 540 nm by spectrophotometer. Amylase activity was detected in the midgut of the insects which were collected from wheat fields during spring. Amylase activity in the midgut of feeding insects was 0.083 U/insect. α-amylase activity was detected in the various nymphal stage. The results show that α-amylase activity in the immature stages increase constantly up to the third-instar. There were no significant differences of enzyme activity between third, fourth, fifth nymphal stages and adults (0.0071 - 0.0083 (U/insect)). α-amylase activity in first-nymphal stage was 0.0046 U/insect. Optimum temperature for the enzyme activity was determined to be between 30 to 40 ˚C. Optimum pH value for amylase was 6.5-7.

KEY WORDS: *Eurygaster maura*, nymphal stages, amylase assay.

Wheat is one of the main crops planted over a wide area in Iran. Several biotic factors influence the yield of this economic crop; among mentioned biotic factors the most important factors are insects which in recent years decrease wheat yield dramatically. Wheat bugs have an important role in the decrease of wheat products. Among hemipteran insects in wheat farms, genera of *Eurygaster* sp. is more important than others and have several species such as E. *integriceps, E. maura* etc. As wheat bugs are piercing- sucking insects, they must introduce theirs salivary enzymes into the seed and after partial digestion, sucking digested material (e.g. flush-feeding insects). The entrance of mentioned bugs salivary enzymes into the feeding seeds, in addition of its direct injury to wheat seeds, it causes the decrease of feeding seeds quality, and has harmful medical effects on consumers including humans. *Eurygaster maura* is the dominant wheat bug in north Iran particularly in the Gorgan area, Golestan province. The insect is mainly found in wheat farm which causes severe damage to the vegetative growth stage of wheat in the early season. It also feeds on wheat grains in the late growth stage, thus damaged grains lose their bakery properties. In addition to the direct damage to wheat grain it also injects salivary enzymes into the feeding seeds causing damage to seed quality, too. Injection of salivary enzymes into the wheat also produces hygienic problem for consumers. The most important periods in the life cycle of *E. maura* are the period of late nymphal development and the intense feeding of the newly emerged adults. Nymphs in the early instars do not feed intensively. After the third instar, feeding is intensified and the damage to crops becomes obvious. The emerged adults start intense feeding on wheat grains. During feeding, this pest with its piercing-sucking mouthparts injects saliva from the salivary gland complexes into the grains to liquefy food. Then the liquefied food is ingested and further digestion is made inside the gut. Because of injecting enzymes into the grain during feeding, the enzymes degrade gluten proteins and cause rapid relaxation of dough which results in the production of bread with poor volume and texture (Kazzazi et al., 2005).

α-Amylases (α-1,4-glucan-4-glucanohydrolases; EC 3.2.1.1) are hydrolytic enzymes that are widespread in nature, being found in microorganisms, plants, and animals. These enzymes catalyze the hydrolysis of α-D-(1,4)-glucan linkage in starch components, glycogen and various other related carbohydrates (Franco et al., 2000; Strobl et al., 1998).

E. maura like other insect pests of wheat lives on a polysaccharide-rich diet and depends to a large extent on the effectiveness of its α-amylases for survival (Mendiola-Olaya et al., 2000). It converts starch to maltose, which is then hydrolyzed to glucose by an α-glucosidase. In insects only α-amylases has been found to hydrolyze long α-1,4-glucan chains such as starch or glycogen. Amylase activity has been described from several insect orders including Coleoptera, Hymenoptera, Diptra, Lepidoptera and Hemiptera (Terra et al., 1988; Mendiola-Olaya et al., 2000; Zeng, and Cohen 2000; Oliveira-Neto et al., 2003).

An understanding of how digestive enzymes function is essential when developing methods of insect control, such as the use of enzyme inhibitors and transgenic plants to control phytophagous insects (Bandani et al., 2001; Maqbool et al., 2001). For nearly all these strategies, having a strong understanding of the target pest's feeding is important. Also, an understanding of the biochemistry and physiology of feeding adaptation is important.

Nothing is currently known about the properties of α-amylase of *E. maura*. The purpose of the present study is to identify and characterize the α-amylase activity of *E. maura* in order to gain a better understanding of the digestive physiology of wheat bug. This understanding will hopefully lead to new management strategies for this pest.

MATERIALS AND METHODS

Insects

The insects were collected from the Gorgan wheat farm of Golestan Province, Iran and maintained on wheat plants in the laboratory at 27 ± 2°C with 14 h light : 10 h dark cycle. Voucher specimens are kept in the Entomological Laboratory, Plant Protection Department, Tehran University.

Sample Preparation

Enzyme samples from midguts and salivary glands of adults were prepared by the method of Cohen (1993) with slight modifications. Briefly, adults were randomly selected and midgut from these individuals were removed by dissection under a light microscope in ice-cold saline buffer (0.006 M NaCl).

The midgut was separated from the insect body, rinsed in ice-cold saline buffer, placed in a pre-cooled homogenizer and ground in one ml of universal buffer. The homogenates from both preparations were separately transferred to 1.5 ml centrifuge tubes and centrifuged at 15000 ×g for 20 min at 4˚C. The supernatants were pooled and stored at -20˚C for subsequent analyses.

Nymphs' α-amylase was prepared by the method of Mendiola-Olaya (2000) with slight modifications. The nymphs' weight was determined. Whole *E. maura* nymphs were homogenized in the above mentioned universal buffer and centrifugation carried out as before. The supernatants were pooled and stored at -20˚C for later use.

Amylase Activity Assay

The α- amylase activity was assayed by the dinitrosalicylic acid (DNS) procedure (Bernfeld 1995), using 1% soluble starch (Merck, product number 1257, Darmstadt, Germany) as substrate. Ten microliters of the enzyme was incubated for 30 min at 35˚C with 500 µl universal buffer and 40µl soluble starch. The reaction was stopped by addition of 100 µl DNS and heated in boiling water for 10 min. 3,5-Dinitrosalicylic acid is a color reagent that the reducing groups released from starch by α- amylase action are measured by the reduction of 3,5-dinitrosalicylic acid. The boiling water is for stopping the α-amylase activity and catalyzing the reaction between DNS and reducing groups of starch.

Then absorbance was read at 540 nm after cooling in ice for 5 min. One unit of α-amylase activity was defined as the amount of enzyme required to produce 1 mg maltose in 30 min at 35˚C. A standard curve of absorbance against the amount of maltose released was constructed to enable calculation of the amount of maltose released during α-amylase assays. Serial dilutions of maltose (Merck, Product Number 105911, Mr 360.32 mg mol-1) in the universal buffer at pH 6.5 were made to give following range of concentrations of 2, 1, 0.5, 0.25, 0.125 mg ml-1 (Fig. 1).

A blank without substrate but with α-amylase extract and a control containing no α-amylase extract but with substrate were run simultaneously with the reaction mixture. All assays were performed in duplicate and each assay repeated at least three times.

Effect of Temperature on Enzyme Activity

The effect of temperature on α-amylase activity was determined by incubating the reaction mixture at different temperatures including 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, and 70 ˚C for 30 min. Also thermo-stability of enzyme over 10 days at specified temperature was determined. Samples were maintained at 4, 24, 34, and 44˚C for 10 days followed by determination of residual activity by enzyme assay as described before.

Effect of pH on Enzyme Activity

The pH optima of amylase was determined using universal buffer (Hosseinkhani and Nemat-Gorgani, 2003). The pH was tested were 2, 3, 4, 5, 5.5, 6, 6.5, 7, 7.5, 8, 9, and 10.

Protein Determination

Protein concentration was measured according to the method of Bradford (1976), using bovine serum albumin (Bio-Rad, Munchen, Germany) as a standard (Fig. 1).

Statistical Analysis

Data were compared by one-way analysis of variance (ANOVA) followed by Duncan multiple range test when significant differences were found at P = 0.05.

RESULTS

α- amylase Activity

Studies showed that α- amylase activity is present in midgut of adult *E. maura* and in whole body of nymphs (Table 1). the activity of midgut enzyme was 0.0507 U/insect.

Only trace amounts of enzyme activity were detected in the first-nymphal stage (0.0046 U/insect), whereas α- amylase activity reached its highest value (0.083 U/insect) in the fifth-nymphal stage (Table 1).

These results show that α-amylase expression and activity in the immature stages increase constantly up to third-instar nymph. There was significant differences in amylase activity between first, second and third instars (d.f. =4, F

=57.41, P =0.0001). The amounts of α-amylase activity did not change significantly in the last nymphal stages (third, fourth and fifth instars) (Table 1). Enzyme activities in these stages were 0.071, 0.078 and 0.083 U/insect, respectively (Fig.2)

Effect of Temperature on Amylase Activity

Optimum temperature for the enzyme activity was determined to be between 30 to 40 ˚C (Fig. 3). The rapid decrease in amylase activity observed above 40˚C and amylase activity reached zero at 70˚C. α-amylase thermal stability was monitored by measuring residual activity after incubation of enzyme at 4, 24, 34, and 44˚C over 10 days. The amylolytic activity decreased at high temperature. For instance at 4 and 44˚C loss of enzyme activity over 10 days were 2 and 50%, respectively (Fig 3).

Effect of pH on Amylase Activity

Optimum pH value for amylase was 6.5-7 (Fig. 4). Activity dropped rapidly below pH 4.0 and mildly above pH 7.0. However, there was considerable activity over a broad range of pH.

DISCUSSIONS

The results from this study demonstrate that midget of adults and nymphal hole body of *E. maura* have α- amylase activity, then expressing of amylase was demonstrated. The presence of the amylase activity in the gut of other phytophagous heteropterans has been reported. The insects can digest polysaccharides partially by salivary secretions, which would be ingested along with partially digested starches to be used in the midgut (Boyd 2003). The complete breakdown of starch should take place in the midgut where large amounts of amylase exist.

Amylases in insects are generally most active in neutral to slightly acid pH conditions. Optimal pH values for amylases in larvae of several coleopterans were 4-5.8 and in Lygus spp. (Heteroptera) was 6.5 (Zheng and Cohen 2000). Optimum pH generally corresponds to the pH prevailing in the midguts from which the amylases are isolated.

The first nymphal stage of the wheat bug does not feed, which may be one reason why they have very low expression of amylase and activity (0.0046 U/insect). In the field, feeding is usually intensified at the third instar where damage to crops is obvious. The present study found the maximum α-amylase activity present in the third to fifth nymphal stages.

The Wheat bug α-amylase has an optimum temperature activity of 30-40oC, which is consistent with the other reports (Ishaaya et al. 1971; Mendiola-Olaya et al. 2000).

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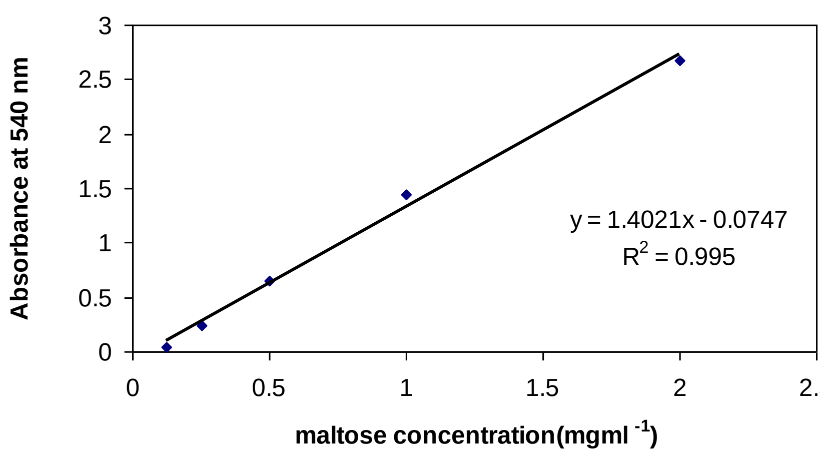

Fig. 1. Standart calibration curve for the determination of maltose released in the α-amylase assay.

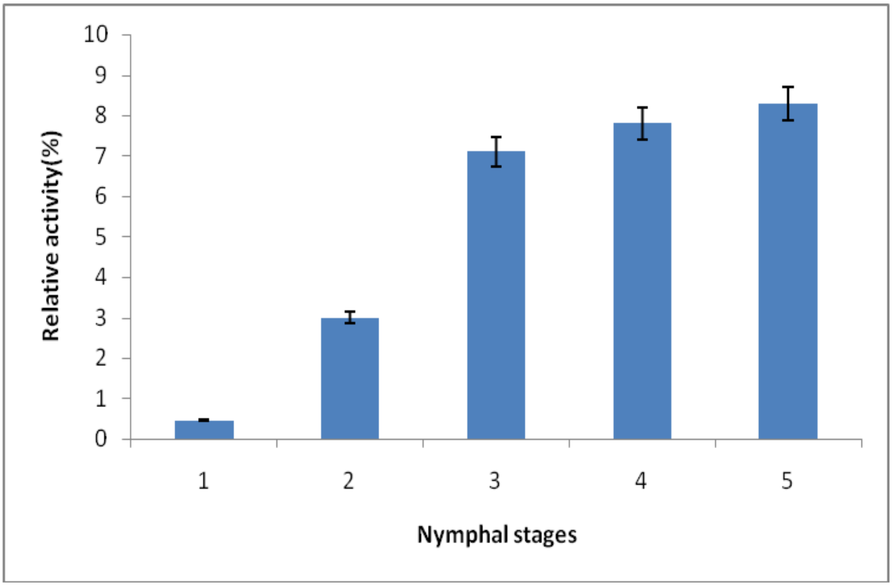

Fig. 2. Histogram of the activity of α-amylase in different nymphal stages of *E.maura*.

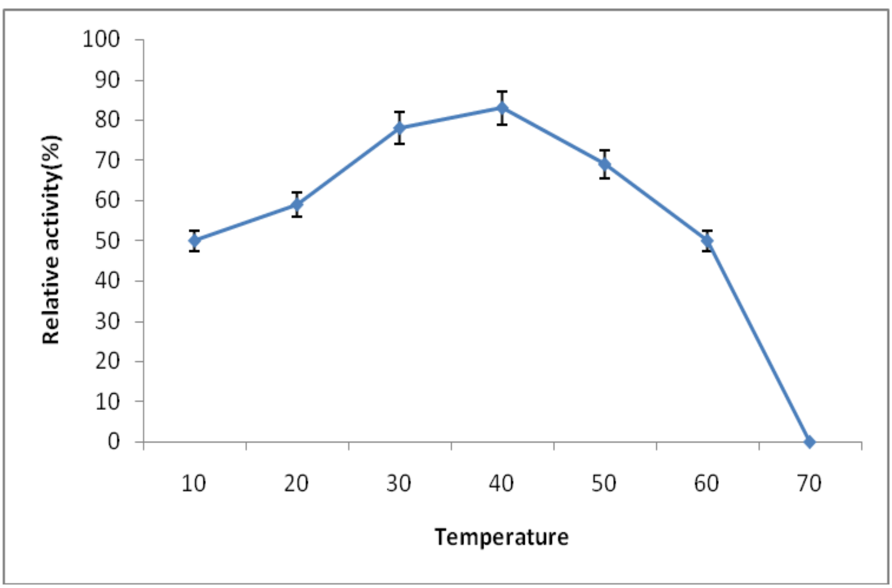

Fig 3. Effect of temperature on α-amylase activity of *E. maura*.

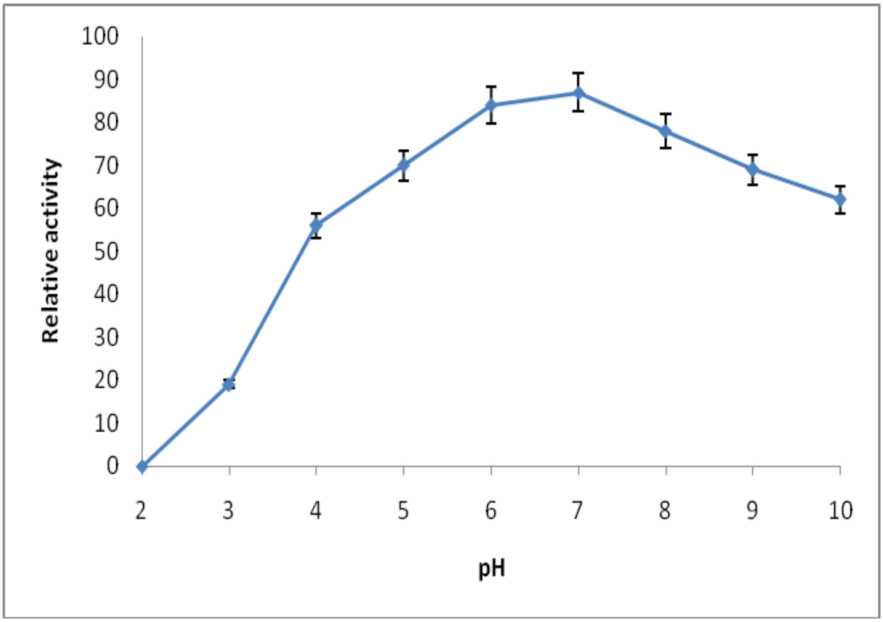

Fig 4. Effect of pH on α-amylase activity of *E. maura*.

Table 1. Comparison of the activity of α-amylase in different nymphal stages of *E. maura*.

Nymphal stage	Activity per ml enzyme (μmol/min/ml; Mean ± SE)	Unit Activity (μmol/min/u, Mean± SE)
1	0.00046 ± 0.020b	0.0046 ± 0.023b
2	0.0030 ± 0.025c	0.030 ± 0.034c
3	0.0071 ± 0.020a	0.071±0.05a
4	0.0078 ± 0.030a	0.078 ± 0.042a
5	0.0083 ± 0.026a	0. 083 ± 0.011a

Sample size for each nymphal stage, n = 3. Values with the same letter did not significantly differ.

NEW NAMES FOR TWO PREOCCUPIED CENTIPEDE GENERA (CHILOPODA)

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[Özdikmen, H. 2009. New names for two preoccupied centipede genera (Chilopoda). Munis Entomology & Zoology, 4 (1): 227-229**]**

ABSTRACT: Two junior homonyms were detected among the centipede genera and the following replacement names are proposed: *Chileana* nom. nov. pro *Araucania* Chamberlin, 1956 (non Pate, 1947) and *Paralamyctes* (*Edgecombegdus*) nom. nov. pro *Paralamyctes* (*Nothofagobius*) Edgecombe, 2001 (non Kuschel, 1952). Accordingly, new combinations are herein proposed for the species currently included in these genera respectively: *Chileana araucanensis* (Sylvestri, 1899) comb. nov.; *Paralamyctes* (*Edgecombegdus*) *cassisi* Edgecombe, 2001 comb. nov. and *Paralamyctes* (*Edgecombegdus*) *mesibovi* Edgecombe, 2001 comb. nov..

KEY WORDS: nomenclatural changes, homonymy, replacement names, sponges, Porifera.

Two proposed genus group names in Chilopoda are nomenclaturally invalid, as the genus group names have already been used by different authors in Hymenoptera and Coleoptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus group names.

Order GEOPHILIDA
Family LINOTAENIIDAE
Genus *CHILEANA* nom. nov.

Araucania Chamberlin, 1956. Acta Univ. lund., Avd. 2 (N.S.) 51 (5): 32. (Chilopoda: Geophilida: Linotaeniidae). Preoccupied by *Araucania* Pate, 1947. Ent. News, 57, 219. (Insecta: Hymenoptera: Sapygidae: Sapyginae).

Remarks on nomenclatural change:

Firstly, the neotropical hymenopteran genus name *Araucania* was proposed by Pate (1947) as an objective replacement name for the preoccupied genus *Laura* Reed, 1930 (non *Laura* Lacaze-Duthiers, 1883 as the type genus of Lauridae in Crustacea) in Hymenoptera. It is still used as a valid genus name.

Subsequently, the neotropical centipede genus *Araucania* was described by Chamberlin (1956) with the type species *Linotaenia araucanensis* Sylvestri, 1899 by original designation from Chile in Chilopoda. Also, it is still used as a valid genus name.

Thus, the centipede genus *Araucania* Chamberlin, 1956 is a junior homonym of the valid genus name *Araucania* Pate, 1947. So I propose here that *Araucania* Chamberlin, 1956 should be replaced with the new name *Chileana*, as a replacement name.

Etymology: from the type locality Chile.

Summary of nomenclatural changes:

Chileana **nom. nov.**
pro *Araucania* Chamberlin, 1956 (non Pate, 1947)

Chileana araucanensis (Sylvestri, 1899) **comb. nov.**
from *Araucania araucanensis* (Sylvestri, 1899)
Linotaenia araucanensis Sylvestri, 1899

Order LITHOBIOMORPHA
Family HENICOPIDAE
Genus *PARALAMYCTES* Pocock, 1901
Subgenus *EDGECOMBEGDUS* nom. nov.

Nothofagobius Edgecombe, 2001. Rec. Aust. Mus. 53 (2), 228. (Chilopoda: Lithobiomorpha: Henicopidae: Henicopinae). Preoccupied by *Nothofagobius* Kuschel, 1952. Rev. chil. Ent., 2, 254. (Insecta: Coleoptera: Curculionoidea: Curculionidae: Curculioninae).

Remarks on nomenclatural change:

Edgecombe (2001) proposed the generic name *Nothofagobius* as a subgenus of the genus *Paralamyctes* Pocock, 1901 of centipedes with the type species *Paralamyctes* (*Nothofagobius*) *cassisi* Edgecombe, 2001 from Australia. It is still used as a valid genus group name.

Unfortunately, the generic name was already preoccupied by Kuschel (1952), who had proposed the genus name *Nothofagobius* as a beetle genus with the type species *Nothofagobius brevirostris* Kuschel, 1952 from Chile in the family Curculionidae. It is still used as a valid genus name.

Thus, the genus group name *Nothofagobius* Edgecombe, 2001 is a junior homonym of the generic name *Nothofagobius* Kuschel, 1952. So I propose a new replacement name *Edgecombegdus* **nom. nov.** for *Nothofagobius* Edgecombe, 2001. The name is dedicated to G. D. Edgecombe who is the current author of the preexisting genus group name *Nothofagobius*. It is masculine in gender.

Summary of nomenclatural changes:

Genus *Paralamyctes* Pocock, 1901

Subgenus *Edgecombegdus* **nom. nov.**
pro *Nothofagobius* Edgecombe, 2001 (non Kuschel, 1952)

Paralamyctes (*Edgecombegdus*) *cassisi* Edgecombe, 2001 **comb. nov.**
from *Paralamyctes* (*Nothofagobius*) *cassisi* Edgecombe, 2001

Paralamyctes (*Edgecombegdus*) *mesibovi* Edgecombe, 2001 **comb. nov.**
from *Paralamyctes* (*Nothofagobius*) *mesibovi* Edgecombe, 2001

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A NEW SPECIES FOR THE ARANEOFAUNA OF TURKEY, *EVARCHA MICHAILOVI* LOGUNOV, 1992 (ARANEAE: SALTICIDAE)

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[**Yağmur, E. A., Kunt, K. B. & Ulupınar, E.** 2009. A new species for the areneofauna of Turkey, *Evarcha michailovi* Logunov, 1992 (Araneae: Salticidae). Munis Entomology & Zoology, 4 (1): 230-232]

ABSTRACT: *Evarcha michailovi* Logunov, 1992 is recorded for the first time for areneofauna of Turkey.

KEY WORDS: *Evarcha michailovi* Logunov, 1992, Araneae, Salticidae, Turkey.

Family Salticidae, is one of the important groups of the order Araneae. To date, members of this family represents 13 % of the world's araneofauna with a total of 5188 described species in 560 genus (Platnick, 2008). According to the latest checklist by Bayram et al. (2008), the family Salticidae is represented by a total of 74 species of 31 genus in Turkey.

The aim of this study is to investigate the morphological and genital characteristics of *Evarcha michailovi*, a new record for Turkish araneofauna. Specimens were collected using a sweeping net from the study area. They were preserved in 70 % ethanol. The identification and drawings were made by means of a SMZ10A Nikon stereomicroscope attached a camera lucida. Species identification was based on genital characters defined by Logunov (1992). The specimens were deposited in the Arachnology Museum of Turkish Arachnological Society (MTAS). All measurements are in millimeters (mm) in the present text.

Family Salticidae Blackwall, 1841

Evarcha michailovi Logunov, 1992 (fig. 1)

Material Examined:
1 male, 2 females (MTAS/Sal: 0745-47), Kavalcık village, (36°13'48.13"N, 36°36'36.83"E, Hatay province, Reyhanlı district), 26.IV.2007, collected over annual plants by using sweeping net; 1 male (MTAS/Sal: 0751), İslahiye district, (37° 1'6.19"N, 36°38'44"E, Gaziantep province), 15.XII.2007, collected over annual plants by using sweeping net.

Description of Male:

Total length, 5.32 (n=1). Prosoma is blackish brown. On both sides of the prosoma, there is a grayish-white band that becomes narrower towards the pedicel. It is dark brown, black around the eyes. There is grayish white hair above the anterior eyes. Dorsal of the prosoma has shorter hair when compared to other parts. Chelicers are yellowish-brown. Opistosoma is grayish-brown. There are whitish-grey and blackish-brown random and vague spots on the surface of the dorsal. Legs are blackish brown. There is also, yellowish, grayish and whitish hair seldom seen. Leg measurements are given in Table 1.

Description of Female:

Total length, 6.01 (n=3). Body coloration is almost same with the males, only legs are a little lighter in color. Leg measurements are given in Table 2.

Conclusion:

E. michailovi which, according to Logunov (1992) showed "Siberian subboreal" distribution when it was defined, with a notice by the same researcher that this distribution can expand, currently is known from France, Russia, Mongolia, Kazakhstan and China (Platnick, 2008). Our records are the first locality records from the wide geographical area without any previous record, between the populations of Europe and Asia.

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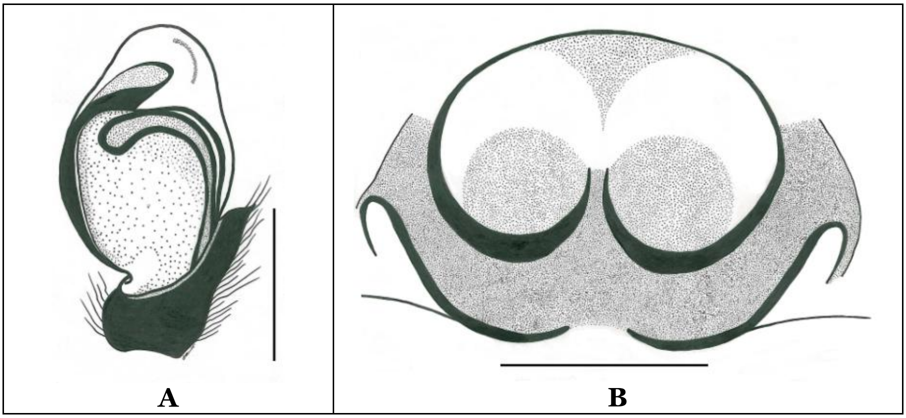

Fig. 1. *Evarcha michailovi* Logunov, 1992 (A) Male palp, ventral view (B) Epigynum, ventral view. Scale lines=0.25 mm.

Table 1. Leg measurements of the male.

Leg (n=1)	Femur	Patella + Tibia	Metatarsus	Tarsus	Total
I	1.78	2.37	0.85	0.93	5.93
II	1.50	1.83	0.71	0.50	4.54
III	1.78	2.37	0.85	0.93	5.93
IV	1.64	1.22	1.18	0.55	4.59

Table 2. Leg measurements of the female.

Leg (n=3)	Femur	Patella + Tibia	Metatarsus	Tarsus	Total
I	1.58	2.09	0.79	0.56	5.02
II	1.41	1.73	0.71	0.54	4.39
III	1.83	1.86	1.02	0.61	5.32
IV	1.78	1.92	1.30	0.61	5.61

SUBSTITUTE NAMES FOR SOME UNICELLULAR ANIMAL TAXA (PROTOZOA)

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[Özdikmen, H. 2009. Substitute names for some unicellular animal taxa (Protozoa). Munis Entomology & Zoology, 4 (1): 233-256**]**

ABSTRACT: Fourty-eight junior homonyms were detected among the protozoon genus group names and the following replacement names are proposed: *Baileyella* nom. nov. pro *Durotrigia* Bailey, 1987; *Novedwardsiella* nom. nov. pro *Edwardsiella* Versteegh & Zevenboom, 1995; *Neofentonia* nom. nov. pro *Fentonia* Bailey & Hogg, 1995; *Neogippslandia* nom. nov. pro *Gippslandia* Stover & Williams, 1987; *Yesevius* nom. nov. pro *Goniodoma* Stein, 1883; *Akbuluta* nom. nov. pro *Hannaites* Mandra, 1969; *Phia* nom. nov. pro *Hanusia* Deane, Hill, Brett & McFadden, 1998; *Dodgeia* nom. nov. pro *Herdmania* Dodge, 1981; *Yildizia* nom. nov. pro *Lundiella* Sarma & Shyam, 1974; *Zugelia* nom. nov. pro *Normandia* Zügel, 1994; *Baserus* nom. nov. pro *Suessia* Morbey, 1975; *Belowius* nom. nov. pro *Wanneria* Below, 1987; *Volkanus* nom. nov. pro *Diplotheca* Valkanov, 1970; *Hollandeia* nom. nov. pro *Perkinsiella* Hollande, 1981; *Thomsenella* nom. nov. pro *Platypleura* Thomsen, 1983; *Elifa* nom. nov. pro *Dinema* Perty, 1852; *Semihia* nom. nov. pro *Metanema* Klebs, 1892; *Aneza* nom. nov. pro *Tejeraia* Anez, 1982; *Neopileolus* nom. nov. pro *Pileolus* Couteaux & Chardez, 1981; *Altineria* nom. nov. pro *Angelina* Altıner, 1988; *Neocatena* nom. nov. pro *Catena* Schröder, Medioli & Scott, 1989; *Turgutia* nom. nov. pro *Chenia* Sheng, 1963; *Neogallitellia* nom. nov. pro *Gallitellia* Loeblich & Tapan, 1986; *Mccullochia* nom. nov. pro *Krebsia* McCulloch, 1977; *Mccullochella* nom. nov. pro *Milesia* McCulloch, 1977; *Ugurus* nom. nov. pro *Mirifica* Shlykova, 1969; *Novonanlingella* nom. nov. pro *Nanlingella* Rui & Sheng, 1981; *Doyrana* nom. nov. pro *Natlandia* McCulloch, 1977; *Akcaya* nom. nov. pro *Sabaudia* Charollais & Brönnimann, 1966; *Novosetia* nom. nov. pro *Setia* Ferrandez & Canadell, 2002; *Novosigmella* nom. nov. pro *Sigmella* Azbel & Mikhalevich, 1983; *Kuremsia* nom. nov. pro *Sphaeridia* Heron-Allen & Earland, 1928; *Palmierina* nom. nov. pro *Teichertina* Palmieri, 1994; *Novamuria* nom. nov. pro *Amuria* Whalen & Carter, 1998; *Enjumetia* nom. nov. pro *Bathysphaera* Hollande & Enjumet, 1960; *Haeckelocyphanta* nom. nov. pro *Cyphanta* Haeckel, 1887; *Blomeus* nom. nov. pro *Milax* Blome, 1984; *Novormistonia* nom. nov. pro *Ormistonia* Li Hong-sheng, 1994; *Deweverus* nom. nov. pro *Riedelius* De Wever, 1982; *Wonia* nom. nov. pro *Scharfenbergia* Won Moon-Zoo, 1983; *Neosophia* nom. nov. pro *Sophia* Whalen & Carter, 1998; *Neozanola* nom. nov. pro *Zanola* Pessagno & Yang, 1989; *Ozdikmenella* nom. nov. pro *Clathrella* Penard, 1903; *Obvallatus* nom. nov. pro *Adelina* Hesse, 1911; *Neogarnia* nom. nov. pro *Garnia* Lainson, Landau & Shaw, 1971; *Hoshidella* nom. nov. pro *Loxomorpha* Hoshide, 1988; *Manastirlia* nom. nov. pro *Rayella* Dasgupta, 1967 and *Aliona* nom. nov. pro *Schizocystis* Léger, 1900. Accordingly, new combinations are herein proposed for the type species currently included in these genus groups. As a result of these nomenclatural changes, four new family group names Yeseviidae nom. nov., Baseridae nom. nov., Akcayinae nom. nov. and Ozdikmenellidae nom.nov. are also proposed for Goniodomidae, Suessiidae, Sabaudiinae and Clathrellidae.

KEY WORDS: nomenclatural changes, homonymy, replacement names, Protozoa.

Fourty-eight proposed genus group names in Protozoa are nomenclaturally invalid, as the genus group names have already been used by different authors in various animal groups. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus group names.

TAXONOMY

PHYTOMASTIGOPHOREA

Genus *Baileyella* nom. nov.

Durotrigia Bailey, 1987. J. Micropalaeontol. 6 (2): 89. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Diniferina: Gonyaulacidae). Type species: *Durotrigia daveyi* Bailey, 1987.

Preoccupied by *Durotrigia* Hoffstetter, 1967. In Lehman (Ed.). Problemes actuels de paleontologie. (Evolution des vertebres). Colloques int.Cent.natn.Rech.scient., Paris No.163: 362. (Reptilia: Diapsida: Lepidosauria: Squamata: Sauria). Type species: *Durotrigia triconidens* Hoffstetter, 1967

Etymology: The name is dedicated to D. A. Bailey who is the author of the preexisting genus *Durotrigia*.

Summary of nomenclatural changes:
Genus *Baileyella* **nom. nov.**
pro *Durotrigia* Bailey, 1987 (non Hoffstetter, 1967)
Type species *Baileyella daveyi* (Bailey, 1987) **comb. nov.**
from *Durotrigia daveyi* Bailey, 1987

Genus *Novedwardsiella* nom. nov.

Edwardsiella Versteegh & Zevenboom, 1995. Rev. Palaeobot. Palynol. 85 (3-4), 217 (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Gonyaulacidae). Type species: *Edwardsiella sexispinosum* Versteegh & Zevenboom, 1995.

Preoccupied by *Edwardsiella* Andres, 1883. Atti Accad. Lincei, Mem., (3) 14, 301, 305. (Cnidaria: Anthozoa: Hexacorallia: Actiniaria). Type species: *Edwardsia carnea* Gosse, 1856.

Etymology: from the Latin world "nova" (meaning "new" in English) + the preexisting genus name *Edwardsiella*.

Summary of nomenclatural changes:
Genus *Novedwardsiella* **nom. nov.**
pro *Edwardsiella* Versteegh & Zevenboom, 1995 (non Andres, 1883; nec Rukhkin, 1937)
Type species *Novedwardsiella sexispinosum* (Versteegh & Zevenboom, 1995) **comb. nov.**
from *Edwardsiella sexispinosum* Versteegh & Zevenboom, 1995

Genus *Noefentonia* nom. nov.

Fentonia Bailey & Hogg, 1995. J. Micropalaeontol. 14 (1), April: 58. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida). Type species: *Parvocysta bjaerkei* Smelror, 1987.

Preoccupied by *Fentonia* Butler, 1881. Trans. ent. Soc. London, 1881, 20. (Insecta: Lepidoptera: Noctuoidea: Notodontidae). Type species: *Fentonia laevis* Butler, 1881.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Fentonia*.

Summary of nomenclatural changes:
Genus *Neofentonia* **nom. nov.**
pro *Fentonia* Bailey & Hogg, 1995 (non Butler, 1881)

Type species *Neofentonia bjaerkei* (Smelror, 1987) **comb. nov.**
from *Fentonia bjaerkei* (Smelror, 1987)
Parvocysta bjaerkei Smelror, 1987

Genus *Neogippslandia* nom. nov.

Gippslandia Stover & Williams, 1987. AASP (Am. Assoc. Stratigr. Palynol.) Contrib. Ser. No. 18: 107. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Peridiniidae). Type species: *Gippslandia extensa* Stover & Williams, 1987.

Preoccupied by *Gippslandia* Bayly & Arnott, 1969. Aust. J. mar. Freshwat. Res. 20: 191. (Crustacea: Copepoda: Calanoida: Centropagidae). Type species: *Gippslandia estuarina* Bayly & Arnott, 1969.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Gippslandia*.

Summary of nomenclatural changes:
Genus *Neogippslandia* **nom. nov.**
pro *Gippslandia* Stover & Williams, 1987 (non Bayly & Arnott, 1969)
Type species *Neogippslandia extensa* (Stover & Williams, 1987) **comb. nov.**
from *Gippslandia extensa* Stover & Williams, 1987

Family Yeseviidae nom. nov.
Genus *Yesevius* nom. nov.

Goniodoma Stein, 1883. Org. Infus., 3 (2) 12. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Goniodomataceae=Goniodomidae). Type species: *Peridinium acuminatum* Ehrenberg, 1838.

Preoccupied by *Goniodoma* Zeller, 1849. Linnaea Entom., 4, 195. (Insecta: Lepidoptera: Gelechioidea: Coleophoridae). Type species: *Goniodoma auroguttella* Zeller, 1849.

Etymology: The name is dedicated to the famous Turkish philosopher Hoca Ahmet Yesevi.

In addition to this, I herein propose the replacement name Gomezellidae new name for the family name Goniodomidae because its type genus *Goniodoma* Stein, 1883 is invalid and the type genus of a family-group name must be valid.

Summary of nomenclatural changes:
Family Yeseviidae **nom. nov.**
pro Goniodomidae
Genus *Yesevius* **nom. nov.**
pro *Goniodoma* Stein, 1883 (non Zeller, 1849)
syn. *Triadinium* Dodge, 1981 (preoccupied by ciliate genus *Triadinium* Fiorentini, 1890)
Type species *Yesevius acuminatus* (Ehrenberg, 1838) **comb. nov.**
from *Goniodoma acuminatum* (Ehrenberg, 1838)
Peridinium acuminatum Ehrenberg, 1838

Genus *Akbuluta* nom. nov.

Hannaites Mandra, 1969. Occ. Pap. Calif. Acad. Sci. 77: 2. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Silicoflagellida: Silicoflagellidae). Type species: *Hannaites quadria* Mandra, 1969.

Preoccupied by *Hannaites* Imlay, 1957. J. Wash. Acad. Sci. 47: 275. (Mollusca: Cephalopoda: Ammonidea). Type species: *Hannaites riddlensis* Imlay, 1957.

Etymology: The name is dedicated to Associate Prof. Dr. Aydın Akbulut (Turkey).

Summary of nomenclatural changes:
Genus *Akbuluta* **nom. nov.**
pro *Hannaites* Mandra, 1969 (non Imlay, 1957)
Type species *Akbuluta quadria* (Mandra, 1969) **comb. nov.**
from *Hannaites quadria* Mandra, 1969

Genus *Phia* nom. nov.

Hanusia Deane, Hill, Brett & McFadden, 1998. Eur. J. Phycol. 33 (2), May: 153. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Cryptomonadida). Type species: *Hanusia phi* Deane, Hill, Brett & McFadden, 1998.

Preoccupied by *Hanusia* Cripps, 1989. Geobios (Lyon) 22 (2): 219. (Echinodermata: Homalozoa: Stylophora: Cornuta). Type species: *Hanusia prilepensis* Cripps, 1989.

Etymology: from the species epiteth "*phi*".

Summary of nomenclatural changes:
Genus *Phia* **nom. nov.**
pro *Hanusia* Deane, Hill, Brett & McFadden, 1998 (non Cripps, 1989)
Type species *Phia phi* (Deane, Hill, Brett & McFadden, 1998) **comb. nov.**
from *Hanusia phi* Deane, Hill, Brett & McFadden, 1998

Genus *Dodgeia* nom. nov.

Herdmania Dodge, 1981. British phycol. J. 16 (3): 274. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Lophodiniidae). Type species: *Herdmania litoralis* Dodge, 1981.

Preoccupied by *Herdmania* Lahille, 1888. C. R. Ass. Franç., 16, 1887, 677. (Chordata: Tunicata: Ascidiacea: Stolidobranchia: Pyuridae). Type species: *Cynthia momus* Savigny, 1816.

Etymology: The name is dedicated to J. D. Dodge who is the author name of the preexisting genus *Herdmannia*.

Summary of nomenclatural changes:
Genus *Dodgeia* **nom. nov.**
pro *Herdmania* Dodge, 1981 (non Lahille, 1888; non Thompson, 1893; non Hartmeyer, 1900; non Metcalf, 1900; nec Ritter, 1903)
Type species *Dodgeia litoralis* (Dodge, 1981) **comb. nov.**
from *Herdmania litoralis* Dodge, 1981

Genus *Yildizia* nom. nov.

Lundiella Sarma & Shyam, 1974. Br. phycol. J. 9: 307. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Volvocida: Volvocina: Volvocidae). Type species: *Lundiella indica* Sarma & Shyam, 1974.

Preoccupied by *Lundiella* Carvalho, 1951. Ent. Medd., 26, 132. (Insecta: Hemiptera: Heteroptera: Miridae). Type species: *Cimatlan pertingens* Distant, 1893.

Etymology: The name is dedicated to Prof. Dr. Kazım Yıldız (Turkey).

Summary of nomenclatural changes:
Genus *Yildizia* **nom. nov.**
pro *Lundiella* Sarma & Shyam, 1974 (non Carvalho, 1951)

Type species *Yildizia indica* (Sarma & Shyam, 1974) **comb. nov.**
from *Lundiella indica* Sarma & Shyam, 1974

Genus *Zugelia* nom. nov.

Normandia Zügel, 1994. Cour. Forschungsinst. Senckenb. 176, 5 Dezember: 30. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Pithonelloidea). Type species: *Normandia circumperforata* Zügel, 1994

Preoccupied by *Normandia* Pic, 1900. Bull. Soc. ent. France, 1900, 267. (Insecta: Coleoptera: Dryopoidea: Elmidae). Type species: *Normandia nitens* (Müller, 1817).

Etymology: The name is dedicated to P. Zügel who is the author name of the preexisting genus *Normandia*.

Summary of nomenclatural changes:
Genus *Zugelia* **nom. nov.**
pro *Normandia* Zügel, 1994 (non Pic, 1900)
Type species *Zugelia circumperforata* (Zügel, 1994) **comb. nov.**
from *Normandia circumperforata* Zügel, 1994

Family Baseridae nom. nov.
Genus *Baserus* nom. nov.

Suessia Morbey, 1975. Palaeontographica 152B: 39. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Suessiales: Suessiidae=Suessiaceae). Type species: *Suessia swabiana* Morbey, 1975.

Preoccupied by *Suessia* Deslongchamps, 1855. Annuaire Inst. Prov., 1855, 535. (Brachiopoda: Rhynchonelliformea: Rhynchonellata: Spiriferinida: Cyrtinidina: Suessioidea: Suessiidae). Type species: *Suessia costata* Deslongchamps, 1855.

Etymology: The name is dedicated to Dr. Birol Başer (Turkey).

In addition to this, I herein propose the replacement name Baseridae new name for the family name Suessiidae because its type genus *Suessia* Morbey, 1975 is invalid and the type genus of a family group name must be valid.

Summary of nomenclatural changes:
Family Baseridae **nom. nov.**
pro Suessiidae=Suessiaceae
Genus *Baserus* **nom. nov.**
pro *Suessia* Morbey, 1975 (non Deslongchamps, 1855)
Type species *Baserus swabiana* (Morbey, 1975) **comb. nov.**
from *Suessia swabiana* Morbey, 1975

Genus *Belowius* nom. nov.

Wanneria Below, 1987. Palaeontogr. Abt. B. Palaeophytol. 205 (1-6): 72. (Protozoa: Sarcomastigophora: Mastigophora: Phytomastigophorea: Dinoflagellida: Suessiidae). Type species: *Wanneria misolensis* Below, 1987.

Preoccupied by *Wanneria* Walcott, 1908. Smithson. misc. Coll., 53, 296. (Trilobita: Redlichiida: Olenellina: Olenelloidea: Olenellidae). Type species: *Olenellus* (*Holmia*) *walcottanus* Wanner, 1901.

Etymology: The name is dedicated to R. Below who is the author name of the preexisting genus *Wanneria*.

Summary of nomenclatural changes:
Genus *Belowius* **nom. nov.**
pro *Wanneria* Below, 1987 (non Walcott, 1908)
Type species *Belowius misolensis* (Below, 1987) **comb. nov.**
from *Wanneria misolensis* Below, 1987

ZOOMASTIGOPHOREA

Genus *Volkanus* nom. nov.

Diplotheca Valkanov, 1970. Zool. Anz. 184: 272. (Protozoa: Sarcomastigophora: Mastigophora: Zoomastigophorea: Choanoflagellida: Acanthoecida: Acanthoecidae). Type species: *Diplotheca costata* Valkanov, 1970.

Preoccupied by *Diplotheca* Matthew, 1885. Canad. Record. Sci., 1, no. 3, 149; 1885, Amer. J. Sci., (3) 30, 293. (Mollusca: Hyolitha: Hyolithida). Type species: *Diplotheca acadica* Matthew, 1885.

Etymology: The name is dedicated to Volkan Yanmaz (Turkey).

Summary of nomenclatural changes:
Genus *Volkanus* **nom. nov.**
pro *Diplotheca* Valkanov, 1970 (non Matthew, 1885)
Type species *Volkanus costatus* (Valkanov, 1970) **comb. nov.**
from *Diplotheca costata* Valkanov, 1970

Genus *Hollandeia* nom. nov.

Perkinsiella Hollande, 1981. Protistologica 26 (4): 622. (Protozoa: Sarcomastigophora: Mastigophora: Zoomastigophorea: Kinetoplastida). Type species: *Perkinsiella amoebae* Hollande, 1981.

Preoccupied by *Perkinsiella* Kirkaldy, 1903. Entomologist, 36, 179. (Insecta: Hemiptera: Fulgoromorpha: Delphacidae: Delphacinae: Delphacini). Type species: *Perkinsiella saccharicida* Kirkaldy, 1903.

Etymology: The name is dedicated to A. Hollande who is the author of the preexisting genus *Perkinsiella*.

Summary of nomenclatural changes:
Genus *Hollandeia* **nom. nov.**
pro *Perkinsiella* Hollande, 1981 (non Kirkaldy, 1903)
Type species *Hollandeia amoebae* (Hollande, 1981) **comb. nov.**
from *Perkinsiella amoebae* Hollande, 1981

Genus *Thomsenella* nom. nov.

Platypleura Thomsen, 1983. In Thomsen & Boonruang, 1983. Protistologica, 19 (2): 204. (Protozoa: Sarcomastigophora: Mastigophora: Zoomastigophorea: Choanoflagellida: Acanthoecidae). Type species: *Parvicorbicula infundibuliformis* Leadbeater, 1974.

Preoccupied by *Platypleura* Amyot & Serville, 1843. (Roret's Suite à Buffon) Hémiptères, 465. (Insecta: Hemiptera: Cicadidae: Cicadinae: Platypleurini). Type species: *Platypleura clara* Amyot & Serville, 1843.

Etymology: The name is dedicated to H. A. Thomsen who is the author of the preexisting genus *Platypleura*.

Summary of nomenclatural changes:
Genus *Thomsenella* **nom. nov.**
pro *Platypleura* Thomsen, 1983 (non Amyot & Serville, 1843; nec Pomel, 1887)
Type species *Thomsenella infundibuliformis* (Leadbeater, 1974) **comb. nov.**
from *Platypleura infundibuliformis* (Leadbeater, 1974)
Parvicorbicula infundibuliformis Leadbeater, 1974

EUGLENOZOA

Genus *Elifa* nom. nov.

Dinema Perty, 1852. Kennt. Lebensform., 169. (Protozoa: Euglenozoa: Plicostoma: Euglenoidea). Type species: *Dinema griseola* Perty, 1852.

Preoccupied by *Dinema* Fairmaire, 1849. Rev. Mag. Zool., (2) 1, 457. (Insecta: Coleoptera: Curculionoidea: Anthribidae: Anthribinae: Jordanthribini). Type species: *Dinema filicorne* Fairmaire, 1849.

Etymology: The new name is dedicated to my daughter Elif Gül Özdikmen (Turkey). It is feminine in gender.

Summary of nomenclatural changes:
Genus *Elifa* **nom. nov.**
pro *Dinema* Perty, 1852 (non Fairmaire, 1849; nec Beneden, 1867)
Type species *Elifa griseola* (Perty, 1852) **comb. nov.**
from *Dinema griseola* Perty, 1852

Genus *Semihia* nom. nov.

Metanema Klebs, 1892. Z. wiss. Zool., 55, 385. (Protozoa: Euglenozoa: Euglenida: Sphenomonadina: Sphenomonadidae). Type species: *Metanema variabile* Klebs, 1892.

Preoccupied by *Metanema* Guenée, 1857. In Boisduval & Guenée, Hist. nat. Ins., Spec. gén. Lép., 9, 171. (Insecta: Lepidoptera: Geonetroidea: Geometridae: Ennominae). Type species: *Metanema inatomaria* Guenée, 1857.

Etymology: The name is dedicated to Semih Çalamak (Turkey).

Summary of nomenclatural changes:
Genus *Semihia* **nom. nov.**
pro *Metanema* Klebs, 1892 (non Guenée, 1857)
Type species *Semihia variabile* (Klebs, 1892) **comb. nov.**
from *Metanema variabile* Klebs, 1892

Genus *Tripanosoma* Stiles & Hassall, 1925
Subgenus *Aneza* nom. nov.

Tejeraia Anez, 1982. Memorias Inst. Oswaldo Cruz 77 (4): 411. (Protozoa: Euglenozoa: Kinetoplastea: Tripanosomatida: Tripanosomatidae: *Tripanosoma*). Type species: *Tripanosoma rangeli* Tejera, 1920.

Preoccupied by *Tejeraia* Diaz-Ungria, 1964. Annls. Parasit. hum. comp. 38: 904. (Nematoda: Spirurida: Spiruroidea). Type species: *Tejeraia mediospirallis* Diaz-Ungria, 1964.

Etymology: The name is dedicated to N. Anez who is the author of the preexisting subgenus *Tejeraia*.

Summary of nomenclatural changes:
Genus *Tripanosoma* Stiles & Hassall, 1925
Subgenus *Aneza* **nom. nov.**
pro *Tejeraia* Anez, 1982 (non Diaz-Ungria, 1964)
Type species *Tripanosoma* (*Aneza*) *rangeli* Tejera, 1920 **comb. nov.**
from *Tripanosoma* (Tejeraia) *rangeli* Tejera, 1920

ACTINOPODA

TESTACEA

Genus *Neopileolus* nom. nov.

Pileolus Couteaux & Chardez, 1981. Revue Ecol. Biol. Sol 18 (2): 202. (Protozoa: Rhizopoda: Testacea: Euglyphida: Trinematidae). Type species: *Pileolus tuberosus* Couteaux & Chardez, 1981.

Preoccupied by *Pileolus* Sowerby, 1823. Gen. Shells, pt. 19, pl. 187. (Mollusca: Gastropoda: Orthogastropoda: Neritopsina: Neritoidea: Pileolidae). Type species: *Pileolus plicatus* Sowerby, 1823.

Etymology: from the Latin prefix “neo-” (meaning “new” in English) + the preexisting genus name *Pileolus*.

Summary of nomenclatural changes:
Genus *Neopileolus* **nom. nov.**
pro *Pileolus* Couteaux & Chardez, 1981 (non Sowerby, 1823; non Lesson, 1831; non Ehrenberg, 1843; nec Spriestersbach, 1919)
Type species *Neopileolus tuberosus* (Couteaux & Chardez, 1981) **comb. nov.**
from *Pileolus tuberosus* Couteaux & Chardez, 1981

FORAMINIFERA

Genus *Altineria* nom. nov.

Angelina Altıner, 1988. Rev. Paleobiol. Volume special No. 2 (1): 28. (Protozoa: Foraminifera).

Preoccupied by *Angelina* Salter, 1859. In Murchison, Siluria, ed. 3, 53. (Trilobita: Ptychopariida: Olenina: Olenidae). Type species: *Angelina sedwickii* Salter, 1859.

Etymology: The name is dedicated to D. Altıner who is the author of the preexisting genus *Angelina*.

Summary of nomenclatural changes:
Genus *Altineria* **nom. nov.**
pro *Angelina* Altıner, 1988 (non Salter, 1859)

Genus *Neocatena* nom. nov.

Catena Schröder, Medioli & Scott, 1989. Micropaleontology (N Y) 35 (1): 40. (Protozoa: Foraminifera: Baculellidae). Type species: *Catena piriformis* Schröder, Medioli & Scott, 1989.

Preoccupied by *Catena* Richter, 1975. Nasekom. Mongol. 3: 635. (Insecta: Diptera: Tachinidae) (see O’Hara, 2007). Type species: *Catena serena* Richter, 1975.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Catena*.

Summary of nomenclatural changes:
Genus *Neocatena* **nom. nov.**
pro *Catena* Schröder, Medioli & Scott, 1989 (non Richter, 1975)
Type species *Neocatena piriformis* (Schröder, Medioli & Scott, 1989) **comb. nov.**
from *Catena piriformis* Schröder, Medioli & Scott, 1989

Genus *Turgutia* nom. nov.

Chenia Sheng, 1963. Palaeont. sin. 149 (N.S.) (B) No. 10: 213. (Protozoa: Foraminifera: Fusulinina: Fusulinacea: Staffellidae). Type species: *Chenia kwangsiensis* Sheng, 1963.

Preoccupied by *Chenia* Hsu, 1954. Acta Zool. Sinica 6, 33, 36. (Trematoda: Derogenidae). Type species: *Chenia cheni* Hsu, 1954.

Etymology: The name is dedicated to Semra Turgut (Haliloğlu) (Turkey).

Summary of nomenclatural changes:
Genus *Turgutia* **nom. nov.**
pro *Chenia* Sheng, 1963 (non Hsu, 1954)
Type species *Turgutia kwangsiensis* (Sheng, 1963) **comb. nov.**
from *Chenia kwangsiensis* Sheng, 1963

Genus *Neogallitellia* nom. nov.

Gallitellia Loeblich & Tapan, 1986. Transactions Am. microsc. Soc. 105 (3): 249. (Protozoa: Foraminifera: Heterohelicacea: Guembelitriidae). Type species: *Guembelitria vivans* Cushman, 1934.

Preoccupied by *Gallitellia* Cuif, 1977. Memoires Bur. Rech. geol. minier. No. 89: 260. (Cnidaria: Anthozoa: Scleractinia). Type species: *Gallitellia seelandalpi* Cuif, 1977.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Gallitellia*.

Summary of nomenclatural changes:
Genus *Neogallitellia* **nom. nov.**
pro *Gallitellia* Loeblich & Tapan, 1986 (non Cuif, 1977)
Type species *Neogallitellia vivans* (Cushman, 1934) **comb. nov.**
from *Gallitellia vivans* (Cushman, 1934)
Guembelitria vivans Cushman, 1934

Genus *Mccullochia* nom. nov.

Krebsia McCulloch, 1977. Qualitative observations on recent foraminiferal tests with emphasis on the eastern Pacific. University of Southern California, Los Angeles, California: 19. (Protozoa: Foraminifera: Lagenida: Glandulinidae).

Preoccupied by *Krebsia* Mörch, 1877. Malak. Bl., 24, 97. (Mollusca: Gastropoda: Hypsogastropoda: Littorinimorpha: Capuloidea: Capulidae). Type species: *Capulus* (*Krebsia*) *intornus* Lamarc, 1822.

Etymology: The name is dedicated to I. McCulloch who is the author of the preexisting genus *Krebsia*.

Summary of nomenclatural changes:
Genus *Mccullochia* **nom. nov.**

pro *Krebsia* McCulloch, 1977 (non Moerch, 1877; nec Guppy, 1895)

Genus *Mccullochella* nom. nov.

Milesia McCulloch, 1977. Qualitative observations on recent foraminiferal tests with emphasis on the eastern Pacific. University of Southern California, Los Angeles, California: 307. (Protozoa: Foraminifera: Rotaliida: Rotaliacea: Discorbidae)

Preoccupied by *Milesia* Latreille, 1804. Nouv. Dict. H. N., 24 (Tab.), 194. (Insecta: Diptera: Syrphidae: Eristalinae: Milesiini). Type species: *Syrphus crabroniformis* Fabricius, 1775.

Etymology: The name is dedicated to I. McCulloch who is the author of the preexisting genus *Milesia*.

Summary of nomenclatural changes:
Genus *Mccullochella* **nom. nov.**
pro *Milesia* McCulloch, 1977 (non Latreille, 1804; nec Chapman, 1929)

Genus *Ugurus* nom. nov.

Mirifica Shlykova, 1969. Vop. Mikropaleont. 12: 49. (Protozoa: Foraminifera: Fusulinidia: Fusulinida: Endothyridae: Endothyrinae). Type species: *Endothyra mirifica* Rauzer-Chernousova, 1948.

Preoccupied by *Mirifica* Fletcher, 1956. Proc. R. ent. Soc. Lond. (B) 25: 33. (Insecta: Lepidoptera: Geometroidea: Geometridae: Geometrinae). Type species: *Mirifica variata* Fletcher, 1956.

Etymology: The name is dedicated to Uğur Akçay (Turkey).

Summary of nomenclatural changes:
Genus *Ugurus* **nom. nov.**
pro *Mirifica* Shlykova, 1969 (non Fletcher, 1956)
Type species *Ugurus mirificus* (Rauzer-Chernousova, 1948) **comb. nov.**
from *Mirifica mirifica* (Rauzer-Chernousova, 1948)
Endothyra mirifica Rauzer-Chernousova, 1948

Genus *Novonanlingella* nom. nov.

Nanlingella Rui & Sheng, 1981. Special Pap. geol. Soc. Am. No. 187: 35. (Protozoa: Foraminifera: Fusulinidia: Fusulinida: Fusulinina: Fusinacea: Schubertellidae: Boultoniinae). Type species: *Nanlingella meridionalis* Rui & Sheng, 1981.

Preoccupied by *Nanlingella* Xiong & Wang, 1980. In Meitan, Kexue, Yanjiuyuan, Dizhi, Kantan, Yanjiusuo 1980. [Mesozoic fossils of coal-bearing strata in Hunan Hubei & Jiangxi Provinces.] Di 2 fence. Shuangqiao gang huashi. (Mollusca: Bivalvia: Autolamellibranchiata: Pteriomorphia: Pterioida).

Etymology: from the Latin world "nova" (meaning "new" in English) + the preexisting genus name *Nanlingella*.

Summary of nomenclatural changes:
Genus *Novonanlingella* **nom. nov.**
pro *Nanlingella* Rui & Sheng, 1981 (non Xiong & Wang, 1980)
Type species *Novonanlingella meridionalis* (Rui & Sheng, 1981) **comb. nov.**
from *Nanlingella meridionalis* Rui & Sheng, 1981

Genus *Doyrana* nom. nov.

Natlandia McCulloch, 1977. Qualitative observations on recent foraminiferal tests with emphasis on the eastern Pacific. University of Southern California, Los Angeles, California: 346. (Protozoa: Foraminifera: Rotaliina: Discorbacea: Bagginidae: Baggininae). Type species: *Natlandia secasensis* McCulloch, 1977.

Preoccupied by *Natlandia* David, 1946. Contrib. Paleont., Carnegie Inst. Wash., 551, 97. (Chordata: Osteichthyes: Actinopterygii: Neopterygii: Teleostei: Salmoniformes). Type species: *Natlandia ornata* David, 1946.

Etymology: The name is dedicated to Associate Prof. Dr. Emine Yıldız Doyran (Turkey).

Summary of nomenclatural changes:
Genus *Doyrana* **nom. nov.**
pro *Natlandia* McCulloch, 1977 (non David, 1946)
Type species *Doyrana secasensis* (McCulloch, 1977) **comb. nov.**
from *Natlandia secasensis* McCulloch, 1977

Subfamily Akcayinae nom. nov.
Genus *Akcaya* nom. nov.

Sabaudia Charollais & Brönnimann, 1966. Archs. Sci. Geneve 18: 616. (Protozoa: Foraminifera: Textularidia: Textulariida: Cuneolinidae: Sabaudiinae). Type species: *Textulariella minuta* Hofker, 1965.

Preoccupied by *Sabaudia* Ghigi, 1909. Racc. plancton., 2, no. 1, 19. (Ctenophora: Tentaculata: Typhlocoela: Cydippida: Pleurobrachiidae). Type species: *Sabaudia liguriae* Ghigi, 1909.

Etymology: The name is dedicated to the family Akçay (Turgut, Günay, Meltem and Uğur Akçay)(Turkey).

In addition to this, I herein propose the replacement name Akcayinae new name for the subfamily name Sabaudiinae because its type genus *Sabaudia* Charollais & Brönnimann, 1966 is invalid and the type genus of a family-group name must be valid.

Summary of nomenclatural changes:
Subfamily Akcayinae **nom. nov.**
pro Sabaudiinae
Genus *Akcaya* **nom. nov.**
pro *Sabaudia* Charollais & Brönnimann, 1966 (non Ghigi, 1909)
Type species *Akcaya minuta* (Hofker, 1965) **comb. nov.**
from *Sabaudia minuta* (Hofker, 1965)
Textulariella minuta Hofker, 1965

Genus *Novosetia* nom. nov.

Setia Ferrandez & Canadell, 2002. J. Foraminiferal Res. 32 (1), January: 7. (Protozoa: Foraminifera: Orbitoidae). Type species: *Lepidorbitoides tibetica* Douvillé, 1916.

Preoccupied by *Setia* Adams & Adams, 1852. Ann. Mag. nat. Hist., (2) 10, 359. (Mollusca: Gastropoda: Orthogastropoda: Caenogastropoda: Hypsogastropoda: Littorinimorpha: Rissoidea: Rissoidae: Rissoinae). Type species: *Setia pulcherrima* (Jeffreys, 1848).

Etymology: from the Latin world “nova” (meaning “new” in English) + the preexisting genus name *Setia*.

Summary of nomenclatural changes:
Genus *Novosetia* **nom. nov.**
pro *Setia* Ferrandez & Canadell, 2002 (non Adams & Adams, 1852)
Type species *Novosetia tibetica* (Douvillé, 1916) **comb. nov.**
from *Setia tibetica* (Douvillé, 1916)
Lepidorbitoides tibetica Douvillé, 1916

Genus *Novosigmella* nom. nov.

Sigmella Azbel & Mikhalevich, 1983. In Mikhalevich, 1983. The bottom Foraminifera from the shelves of the tropical Atlantik. Akademiya Nauk SSSR, Leningrad: 121. (Protozoa: Foraminifera: Miliolina: Miliolacea: Hauerinidae: Sigmoilinitinae). Type species: *Planispirina edwarsi* Schlumberger, 1887.

Preoccupied by *Sigmella* Hebard, 1940. Ent. News, 51, 236. (Insecta: Dictyoptera: Blattodea: Blaberoidea: Blattellidae: Blattellinae). Type species: Type species information not available.

Etymology: from the Latin world "nova" (meaning "new" in English) + the preexisting genus name *Sigmella*.

Summary of nomenclatural changes:
Genus *Novosigmella* **nom. nov.**
pro *Sigmella* Azbel & Mikhalevich, 1983 (non Hebard, 1940)
Type species *Novosigmella edwarsi* (Schlumberger, 1887) **comb. nov.**
from *Sigmella edwarsi* (Schlumberger, 1887)
Planispirina edwarsi Schlumberger, 1887

Genus *Kuremsia* nom. nov.

Sphaeridia Heron-Allen & Earland, 1928. J. R. micr. Soc., (3) 48, 286, 294. (Protozoa: Foraminifera: Rotaliina: Discorbacea: Pegidiidae). Type species: *Sphaeridia papillata* Heron-Allen & Earland, 1928.

Preoccupied by *Sphaeridia* Linnaniemi, 1912. Acta Soc. Sci. Fenn., 40, 248. (Insecta: Collembola: Symphypleona: Sminthurididae). Type species: *Sminthurus pumilis* Krausbauer, 1898.

Etymology: from the Turkish "küremsi" (meaning "like sphere" in English).

Summary of nomenclatural changes:
Genus *Kuremsia* **nom. nov.**
pro *Sphaeridia* Heron-Allen & Earland, 1928 (non Linnaniemi, 1912)
Type species *Kuremsia papillata* (Heron-Allen & Earland, 1928) **comb. nov.**
from *Sphaeridia papillata* Heron-Allen & Earland, 1928

Genus *Palmierina* nom. nov.

Teichertina Palmieri, 1994. Qld Geol. 6: 8. (Protozoa: Foraminifera: Textulariina: Astrorhizoidea: Psammosphaeridae: Psammosphaerinae). Type species: *Crithionina teicherti* Parr, 1942.

Preoccupied by *Teichertina* Veevers, 1959. Bull. Bur. Miner. Resour. Geol. Geophys. Aust. 45: 37. (Brachiopoda: Enteletacea: Dalmanellidae). Type species: *Teichertina fitzroyensis* Veevers, 1959.

Etymology: The name is dedicated to V. Palmieri who is the author of the preexisting genus *Teichertina*.

Summary of nomenclatural changes:
Genus *Palmierina* **nom. nov.**
pro *Teichertina* Palmieri, 1994 (non Veevers, 1959)
Type species *Palmierina teicherti* (Parr, 1942) **comb. nov.**
from *Teichertina teicherti* (Parr, 1942)
Crithionina teicherti Parr, 1942

RADIOLARIA

Genus *Novamuria* nom. nov.

Amuria Whalen & Carter, 1998. Geol. Surv. Can. Bull. 496: 56. (Protozoa: Actinopoda: Radiolaria: Polycystina: Spumellaria: Xiphostylidae). Type species: *Amuria impensa* Whalen & Carter, 1998.

Preoccupied by *Amuria* Staudinger, 1887. In Romanoff, Mém. Lép., 3, 172. (Insecta: Lepidoptera: Zygaenoidea: Zygaenidae: Procridinae). Type species: *Amuria cyclops* Staudinger, 1887.

Etymology: from the Latin world "nova" (meaning "new" in English) + the preexisting genus name *Amuria*.

Summary of nomenclatural changes:
Genus *Novamuria* **nom. nov.**
pro *Amuria* Whalen & Carter, 1998 (non Staudinger, 1887; non Brunner, 1893; nec Aurivillius, 1894)
Type species *Novamuria impensa* (Whalen & Carter, 1998) **comb. nov.**
from *Amuria impensa* Whalen & Carter, 1998

Genus *Enjumetia* nom. nov.

Bathysphaera Hollande & Enjumet, 1960. Archs. Mus. natn. Hist. nat. Paris (7) 7: 127. (Protozoa: Actinopoda: Radiaolaria: Polycystina: Spumellaria). Type species: *Bathysphaera pelagica* Hollande & Enjumet, 1960.

Preoccupied by *Bathysphaera* Beebe, 1932. Bull. New York zool. Soc., 35, 175. (Actinopterygii: Stomiiformes: Stomiidae: Melanostomiinae). Type species: *Bathysphaera intacta* Beebe, 1932.

Etymology: The name is dedicated to M. Enjumet who is the second author of the preexisting genus name *Bathysphaera*.

Summary of nomenclatural changes:
Genus *Enjumetia* **nom. nov.**
pro *Bathysphaera* Hollande & Enjumet, 1960 (non Beebe, 1932)
Type species *Enjumetia pelagica* (Hollande & Enjumet, 1960) **comb. nov.**
from *Bathysphaera pelagica* Hollande & Enjumet, 1960

Genus *Haeckelocyphanta* nom. nov.

Cyphanta Haeckel, 1887. Rep. Voy. Challenger, Zool., 18 (1), 360. (Protozoa: Actinopoda: Radiolaria: Polycystina: Spumellaria). Type species: *Cyphanta leavis* Haeckel, 1887.

Preoccupied by *Cyphanta* Walker, 1865. List Specimens Lep. Ins. Brit. Mus., 33, 855. (Insecta: Lepidoptera: Noctuoidea: Notodontidae: Platychasmatinae). Type species: *Cyphanta xanthochlora* Walker, 1865.

Etymology: The name is dedicated to E. Haeckel who is the author of the preexisting genus *Cyphanta*.

Summary of nomenclatural changes:
Genus *Haeckelocyphanta* **nom. nov.**
pro *Cyphanta* Haeckel, 1887 (non Walker, 1865)
Type species *Haeckelocyphanta leavis* (Haeckel, 1887) **comb. nov.**
from *Cyphanta leavis* Haeckel, 1887

Genus *Blomeus* nom. nov.

Milax Blome, 1984. Micropaleontology, 30 (4): 372. (Protozoa: Actinopoda: Radiolaria: Polycystina: Nassellaria: Eucyrtidiacea: Eucyrtidiidae). Type species: *Milax alienus* Blome, 1984.

Preoccupied by *Milax* Gray, 1855. Cat. Pulmonata Brit. Mus., 1, 174. (Mollusca: Gastropoda: Pulmonata: Milacidae). Type species: *Limax gagates* Dreparnaud, 1801.

Etymology: The name is dedicated to C. D. Blome who is the author of the preexisting genus *Milax*.

Summary of nomenclatural changes:
Genus *Blomeus* **nom. nov.**
pro *Milax* Blome, 1984 (non Gray, 1855)
Type species *Blomeus alienus* (Blome, 1984) **comb. nov.**
from *Milax alienus* Blome, 1984

Genus *Novormistonia* nom. nov.

Ormistonia Li Hong-sheng, 1994. Acta Micropalaeontol. Sin. 11 (2), Jun: 265. (Protozoa: Actinopoda: Radiolaria). Type species: *Ormistonia pteracaena* Li Hong-sheng, 1994.

Preoccupied by *Ormistonia* Maksimova, 1978. Ezhegodnik Vses. paleont. Obshch. 21: 98. (Trilobita: Proetida: Proetoidea: Proetidae). Type species: *Dechenella* (*Dechenella*) *teska* Ormiston, 1967.

Etymology: from the Latin world “nova” (meaning “new” in English) + the preexisting genus name *Ormistonia*.

Summary of nomenclatural changes:
Genus *Novormistonia* **nom. nov.**
pro *Ormistonia* Li Hong-sheng, 1994 (non Maksimova, 1978)
Type species *Novormistonia pteracaena* (Li Hong-sheng, 1994) **comb. nov.**
from *Ormistonia pteracaena* Li Hong-sheng, 1994

Genus *Deweverus* nom. nov.

Riedelius De Wever, 1982. Revue Micropaleont. 24 (4): 200. (Protozoa: Actinopoda: Radiolaria: Polycystina: Nassellaria: Foremanellinidae). Type species: *Riedelius williami* De Weyer, 1982.

Preoccupied by *Riedelius* Hudec, 1961. Sb. nar. mus. Praze (B) 17: 110. (Mollusca: Gastropoda: Pulmonata: Oxychilidae: *Oxychilus*). Type species: *Oxychilus inopinatus* (Uličný, 1887).

Etymology: The name is dedicated to P. De Wever who is the author of the preexisting genus *Riedelius*.

Summary of nomenclatural changes:
Genus *Deweverus* **nom. nov.**
pro *Riedelius* De Wever, 1982 (non Hudec, 1961)

Type species *Deweverus williami* (De Wever, 1982) **comb. nov.**
from *Riedelius williami* De Wever, 1982

Genus *Wonia* nom. nov.

Scharfenbergia Won Moon-Zoo, 1983. Palaeontographica (A) 182 (4-6): 158. (Protozoa: Actinopoda: Radiolaria: Polycystina: Latentifistularia: Latentifistulidae). Type species: *Spongotripus concentricus* Rust, 1892.

Preoccupied by *Scharfenbergia* Oudemans, 1936. Arch. Naturgesch., (N.F.) 5, 412. (Arachnida: Acari: Prostigmata: Anystina: Anystoidea: Anystidae: Anystinae). Type species: *Actineda hilaris* Koch, 1836.

Etymology: The name is dedicated to M.-Z. Won who is the author of the preexisting genus *Scharfenbergia*.

Summary of nomenclatural changes:
Genus *Wonia* **nom. nov.**
pro *Scharfenbergia* Won Moon-Zoo, 1983 (non Oudemans, 1936)
Type species *Wonia concentricus* (Rust, 1892) **comb. nov.**
from *Scharfenbergia concentrica* (Rust, 1892)
Spongotripus concentricus Rust, 1892

Genus *Neosophia* nom. nov.

Sophia Whalen & Carter, 1998. In Carter, Whalen and Guex, 1998. Geol. Surv. Can. Bull. 496: 41. (Protozoa: Actinopoda: Radiolaria: Polycystina: Spumellaria: Hagiastridae). Type species: *Sophia tuberis* Whalen & Carter, 1998.

Preoccupied by *Sophia* Robineau-Desvoidy, 1830. Mém. présentés Acad. Roy. Sci. Inst. France, 2, 317. (Insecta: Diptera: Tachinidae). Type species: *Sophia filipes* Robineau-Desvoidy, 1830.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Sophia*.

Summary of nomenclatural changes:
Genus *Neosophia* **nom. nov.**
pro *Sophia* Whalen & Carter, 1998 (non Robineau-Desvoidy, 1830; nec Lamarck, 1816)
Type species *Neosophia tuberis* (Whalen & Carter, 1998) **comb. nov.**
from *Sophia tuberis* Whalen & Carter, 1998

Genus *Neozanola* nom. nov.

Zanola Pessagno & Yang, 1989. In Pessagno, Six & Yang, 1989. Micropaleontology (N Y) 35 (3): 241. (Protozoa: Actinopoda: Radiolaria: Polycystina: Spumellaria: Xiphostylidae). Type species: *Triactoma cornuta* Baumgartner, 1980.

Preoccupied by *Zanola* Walker, 1855. List Specimens Lep. Ins. Brit. Mus., 5, 1173. (Insecta: Lepildoptera: Bombycoidea: Bombycidae: Apatelodinae). Type species: *Zanola difficilis* Walker, 1855.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting genus name *Zanola*.

Summary of nomenclatural changes:
Genus *Neozanola* **nom. nov.**
pro *Zanola* Pessagno & Yang, 1989 (non Walker, 1855)

Type species *Neozanola cornuta* (Baumgartner, 1980) **comb. nov.**
from *Zanola cornuta* (Baumgartner, 1980)
Triactoma cornuta Baumgartner, 1980

HELIOZOA

Family Ozdikmenellidae nom. nov.
Genus *Ozdikmenella* nom. nov.

Clathrella Penard, 1903. Arch. Protistenk., 2, 293. (Protozoa: Heliozoa: Desmothoracida: Clathrellidae). Type species: *Clathrella foreli* Penard, 1903.

Preoccupied by *Clathrella* Récluz, 1864. J. Conchyliol., 12, 251. (Mollusca: Gastropoda: Heterobranchia: Heterostropha: Pyramidelloidea: Amathinidae). Type species: *Fossarus clathrata* Philippi, 1844.

Etymology: The name is dedicated to the my family Özdikmen (Nurettin, Redife, Fahriye, Fehmi, Tülay, Zehra Gülşen, Çağrı, Hüseyin, Meltem, Elif Gül) (Turkey) .

In addition to this, I herein propose the replacement name Ozdikmenella new name for the family name Clathrellidae because its type genus *Clathrella* Penard, 1903 is invalid and the type genus of a family-group name must be valid.

Summary of nomenclatural changes:
Family Ozdikmenellidae **nom. nov.**
pro Clathrellidae
Genus *Ozdikmenella* **nom. nov.**
pro *Clathrella* Penard, 1903 (non Récluz, 1864)
Type species *Ozdikmenella foreli* Penard, 1903) **comb. nov.**
from *Clathrella foreli* Penard, 1903

APICOMPLEXA

Genus *Obvallatus* nom. nov.

Adelina Hesse, 1911. Arch. Zool. exp. gén. Paris, (5) 7 (Notes et Revue, xv-xix). (Protozoa: Myzozoa: Apicomplexa: Conoidasida: Coccidiasina: Eucoccidiorida: Adeleorina: Adeleidae). Type species: *Adelina octospora* Hesse, 1911.

Preoccupied by *Adelina* Dejean, 1835. Catal. Coléopt., 3, 315. (Insecta: Coleoptera: Tenebrionoidea: Tenebrionidae: Diaperinae: Diaperini: Adelinina). Type species: *Cucujus planus* Fabricius, 1801.

Etymology: from the Latin word “obvallatus” (meaning “irrefutable, consolidated or strengthen” in English).

Summary of nomenclatural changes:
Genus *Obvallatus* **nom. nov.**
pro *Adelina* Hesse, 1911 (non Dejean, 1835; nec Catraine, 1841)
Type species *Obvallatus octosporus* (Hesse, 1911) **comb. nov.**
from *Adelina octospora* Hesse, 1911

Genus *Plasmodium* Marchiafava & Celli, 1885
Subgenus *Neogarnia* nom. nov.

Garnia Lainson, Landau & Shaw, 1971. Int. J. Parasit. 1: 247. (Protozoa: Apicomplexa: Eucoccidiida: Haemosporina: Plasmodiidae: *Plasmodium*). Type species: *Garnia gonadoti* Lainson, Landau & Shaw, 1971.

Preoccupied by *Garnia* Casey, 1922. Mem. Col., 10, 151. (Insecta: Coleoptera: Curculionoidea: Curculionidae). Type species: *Garnia militaris* Casey, 1922.

Etymology: from the Latin prefix "neo-" (meaning "new" in English) + the preexisting subgenus name *Garnia*.

Summary of nomenclatural changes:
Genus *Plasmodium* Marchiafava & Celli, 1885
Subgenus *Neogarnia* **nom. nov.**
pro *Garnia* Lainson, Landau & Shaw, 1971 (non Casey, 1922)
Type species *Plasmodium* (*Neogarnia*) *gonadoti* (Lainson, Landau & Shaw, 1971) **comb. nov.**
from *Plasmodium* (*Garnia*) *gonadoti* (Lainson, Landau & Shaw, 1971)
Garnia gonadoti Lainson, Landau & Shaw, 1971

Genus *Hoshidella* nom. nov.

Loxomorpha Hoshide, 1988. Proc. Jpn. Soc. Syst. Zool. No. 37: 48. (Protozoa: Apicomplexa: Eugregarinida: Lecudinidae). Type species: *Loxomorpha harmothoe* Hoshide, 1988.

Preoccupied by *Loxomorpha* Amsel, 1956. Boln. Ent. venez. 10: 254. (Insecta: Lepidoptera: Pyraloidea: Crambidae: Spilomelinae). Type species: *Loxomorpha citrinalis* Amsel, 1956.

Etymology: The name is dedicated to K. Hoshide who is the author of the preexisting genus *Loxomorpha*.

Summary of nomenclatural changes:
Genus *Hoshidella* **nom. nov.**
pro *Loxomorpha* Hoshide, 1988 (non Amsel, 1956; nec Nielsen, 1964)
Type species *Hoshidella harmothoe* (Hoshide, 1988) **comb. nov.**
from *Loxomorpha harmothoe* Hoshide, 1988

Genus *Manastirlia* nom. nov.

Rayella Dasgupta, 1967. Parasitology 57: 471. (Protozoa: Apicomplexa: Coccidia: Eucoccida: Haemosporina: Haemoproteidae). Type species: *Rayella rayi* Dasgupta, 1967.

Preoccupied by *Rayella* Teichert, 1939. J. Paleont., 13, 622. (Crustacea: Ostracoda). Type species: *Basslerites hanseni* Teichert, 1937.

Etymology: The name is dedicated to my student Sergey Manastırlı (Moldova, Gagauziya) .

Summary of nomenclatural changes:
Genus *Manastirlia* **nom. nov.**
pro *Rayella rayi* Dasgupta, 1967 (non Teichert, 1939)
Type species *Manastirlia rayi* (Dasgupta, 1967) **comb. nov.**
from *Rayella rayi* Dasgupta, 1967

Genus *Aliona* nom. nov.

Schizocystis Léger, 1900. C. R. Acad. Sci. Paris, 131, 722. (Protozoa: Apicomplexa: Conoidasida: Gregarinasina: Neogregarinorida: Schizocystidae). Type species: *Schizocystis gregarinoides* Léger, 1900.

Preoccupied by *Schizocystis* Jaekel, 1895. Verh. dtsch. zool. Ges., 1895, 113. (Echinodermata: Cystoidea: Rhombifera: Callocystitidae: Scoliocystinae). Type species: *Schizocystis armata* (Forbes, 1848).

Etymology: The name is dedicated to Aliona Orlioglo (Moldova, Gagauziya) .

Summary of nomenclatural changes:
Genus *Aliona* **nom. nov.**
pro *Schizocystis* Léger, 1900 (non Jaekel, 1895)
Type species *Aliona gregarinoides* (Léger, 1900) **comb. nov.**
from *Schizocystis gregarinoides* Léger, 1900

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APPENDIX

Summary of the nomenclatural changes in the present paper.

Junior Homonym	Senior Homonym	New Names
Durotrigia Bailey, 1987	*Durotrigia* Hoffstetter, 1967	*Baileyella* nom. nov.
Edwardsiella Versteegh & Zevenboom, 1995	*Edwardsiella* Andres, 1883	*Novedwardsiella* nom. nov.
Fentonia Bailey & Hogg, 1995	*Fentonia* Butler, 1881	*Neofentonia* nom. nov.
Gippslandia Stover & Williams, 1987	*Gippslandia* Bayly & Arnott, 1969	*Neogippslandia* nom. nov.
Goniodoma Stein, 1883	*Goniodoma* Zeller, 1849	Family *Yeseviidae* nom. nov. Genus *Yesevius* nom. nov.
Hannaites Mandra, 1969	*Hannaites* Imlay, 1957	*Akbuluta* nom. nov.
Hanusia Deane, Hill, Brett & McFadden, 1998	*Hanusia* Cripps, 1989	*Phia* nom. nov.
Herdmania Dodge, 1981	*Herdmania* Lahille, 1888	*Dodgeia* nom. nov.
Lundiella Sarma & Shyam, 1974	*Lundiella* Carvalho, 1951	*Yildizia* nom. nov.
Normandia Zügel, 1994	*Normandia* Pic, 1900	*Zugelia* nom. nov.
Suessia Morbey, 1975	*Suessia* Deslongchamps, 1855	Family *Baseridae* nom. nov. Genus *Baserus* nom. nov.
Wanneria Below, 1987	*Wanneria* Walcott, 1908	*Belowius* nom. nov.
Diplotheca Valkanov, 1970	*Diplotheca* Matthew, 1885	*Volkanus* nom. nov.
Perkinsiella Hollande, 1981	*Perkinsiella* Kirkaldy, 1903	*Hollandeia* nom. nov.
Platypleura Thomsen, 1983	*Platypleura* Amyot & Serville, 1843	*Thomsenella* nom. nov.
Dinema Perty, 1852	*Dinema* Fairmaire, 1849	*Elifa* nom. nov.
Metanema Klebs, 1892	*Metanema* Guenée, 1857	*Semihia* nom. nov.
Tejeraia Anez, 1982	*Tejeraia* Diaz-Ungria, 1964	*Aneza* nom. nov.
Pileolus Couteaux & Chardez, 1981	*Pileolus* Sowerby, 1823	*Neopileolus* nom. nov.
Angelina Altıner, 1988	*Angelina* Salter, 1859	*Altineria* nom. nov.
Catena Schröder, Medioli & Scott, 1989	*Catena* Richter, 1975	*Neocatena* nom. nov.
Chenia Sheng, 1963	*Chenia* Hsu, 1954	*Turgutia* nom. nov.
Gallitellia Loeblich & Tapan, 1986	*Gallitellia* Cuif, 1977	*Neogallitellia* nom. nov.
Krebsia McCulloch, 1977	*Krebsia* Mörch, 1877	*Mccullochia* nom. nov.
Milesia McCulloch, 1977	*Milesia* Latreille, 1804	*Mccullochella* nom. nov.
Mirifica Shlykova, 1969	*Mirifica* Fletcher, 1956	*Ugurus* nom. nov.

Junior Homonym	Senior Homonym	New Names
Nanlingella Rui & Sheng, 1981	*Nanlingella* Xiong & Wang, 1980	*Novonanlingella* nom. nov.
Natlandia McCulloch, 1977	*Natlandia* David, 1946	*Doyrana* nom. nov.
Sabaudia Charollais & Brönnimann, 1966	*Sabaudia* Ghigi, 1909	Subfamily *Akcayinae* nom. nov. Genus *Akcaya* nom. nov.
Setia Ferrandez & Canadell, 2002	*Setia* Adams & Adams, 1852	*Novosetia* nom. nov.
Sigmella Azbel & Mikhalevich, 1983	*Sigmella* Hebard, 1940	*Novosigmella* nom. nov.
Sphaeridia Heron-Allen & Earland, 1928	*Sphaeridia* Linnaniemi, 1912	*Kuremsia* nom. nov.
Teichertina Palmieri, 1994	*Teichertina* Veevers, 1959	*Palmierina* nom. nov.
Amuria Whalen & Carter, 1998	*Amuria* Staudinger, 1887	*Novamuria* nom. nov.
Bathysphaera Hollande & Enjumet, 1960	*Bathysphaera* Beebe, 1932	*Enjumetia* nom. nov.
Cyphanta Haeckel, 1887	*Cyphanta* Walker, 1865	*Haeckelocyphanta* nom. nov.
Milax Blome, 1984	*Milax* Gray, 1855	*Blomeus* nom. nov.
Ormistonia Li Hong-sheng, 1994	*Ormistonia* Maksimova, 1978	*Novormistonia* nom. nov.
Riedelius De Wever, 1982	*Riedelius* Hudec, 1961	*Deweverus* nom. nov.
Scharfenbergia Won Moon-Zoo, 1983	*Scharfenbergia* Oudemans, 1936	*Wonia* nom. nov.
Sophia Whalen & Carter, 1998	*Sophia* Robineau-Desvoidy, 1830	*Neosophia* nom. nov.
Zanola Pessagno & Yang, 1989	*Zanola* Walker, 1855	*Neozanola* nom. nov.
Clathrella Penard, 1903	*Clathrella* Récluz, 1864	Family *Ozdikmenellidae* nom. nov. Genus *Ozdikmenella* nom. nov.
Adelina Hesse, 1911	*Adelina* Dejean, 1835	*Obvallatus* nom. nov.
Garnia Lainson, Landau & Shaw, 1971	*Garnia* Casey, 1922	*Neogarnia* nom. nov.
Loxomorpha Hoshide, 1988	*Loxomorpha* Amsel, 1956	*Hoshidella* nom. nov.
Rayella Dasgupta, 1967	*Rayella* Teichert, 1939	*Manastirlia* nom. nov.
Schizocystis Léger, 1900	*Schizocystis* Jaekel, 1895	*Aliona* nom. nov.

EVALUATION OF FLUBENDIAMIDE AS AN IPM COMPONENT FOR THE MANAGEMENT OF BRINJAL SHOOT AND FRUIT BORER, *LEUCINODES ORBONALIS* GUENEE

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ABSTRACT: A field experiment was conducted to evaluate the efficacy of flubendiamide as an IPM component for the management of brinjal shoot and fruit borer and eight IPM packages were evaluated. Among the different IPM packages, package 6 (mechanical control + potash @100 kg/ha + field sanitation in combination with flubendiamide 24WG applied at 5% level of shoot and fruit infestation) showed the better performance by reducing 80.63% fruit infestation over control and produced the highest number of healthy and total fruits/plant (25.0 and 27.20, respectively). The same package also increased 108.83% healthy fruit yield and decreased 74.13% infested fruit yield over control. The highest benefit cost ratio (5.53) was recorded in IPM package 2 (Potash @100 kg/ha + flubendiamide 24WG applied at 5% level of fruit infestation), where 9 sprays were required. The BCR of 4.12 and 4.00 was obtained in IPM package 6 and package 5 with 8 and 5 sprays, respectively. The results of this study suggested that application of flubendiamide at 5% level of fruit infestation in combination with mechanical control + potash @ 100 kg/ha + field sanitation may be used for the management of brinjal shoot and fruit borer.

KEY WORDS: Benefit cost ratio, Field sanitation, Infestation, Mechanical control, Potash.

Brinjal shoot and fruit borer is the most destructive pest of brinjal, which caused 31-86% fruit damage in Bangladesh (Alam et al., 2003) reaching up to 90% (Raman, 1997), 37-63% in India (Dhankar, 1988) and 50-70% in Pakistan (Saeed & Khan, 1997). Farmers of Bangladesh as well as of other Asian countries in most cases solely depend on insecticides for the management of the pest. Such reliance on insecticides has created many problems such as very frequent application of insecticides (up to 140 times in a season), excessive residues on market vegetables that concerns general consumer health and the environment, pesticide resistance, trade implications, poisoning, hazards to non-target organisms, increased production costs etc. (Alam et al., 2003; Pedigo, 2002; Debach & Rosen, 1991). In the context of damage for ensuring food safety and minimization of severity, environmental hazards, appropriate management practice for BSFB incorporating different methods as needed and ought to be devised consistent with modern pest management. The researchers have been trying combination of various components of the IPM package such as cultural, mechanical, pheromone, chemical etc. for the control of brinjal shoot and fruit borer (FAO, 2003; Sasikala et al., 1999; Islam et al., 1999; Maleque et al., 1998).

Mechanical control such as collection and destruction of infested shoots and fruits in combination with insecticide treatments reduced BSFB infestation, increased yield of fruit and ensured the highest benefit cost ratio (Alam et al., 2003; FAO, 2003; Rahman et al., 2002). Use of balanced fertilizer and application of insecticides decreased fruit damage both in quantity and quality (Patnaik et al. 1998). Combination of higher dose of potash along with insecticides treatment also reduced the percentage of fruit infestation (Sudhakar et al., 1998). Mechanical control in combination with insecticides spraying at 5% fruit infestation provided the best protection against brinjal shoot and fruit borer (Islam et al., 1999). Field sanitation, through the removal of plant debris and refuges and cleaning reduced the BSFB infestation significantly (Sasikala et al., 1999). However, none of the individual method alone provides satisfactory protection of the crop against this obnoxious pest. Nevertheless, their combination in a best compatible manner is expected to render desirable protection of the crop.

Flubendiamide, having a new biochemical mode of action, showed excellent effectiveness against a broad spectrum of lepidopterous insect pests including resistance strains (Tohnishi et al., 2005). Thus flubendiamide is expected to provide the necessary protection against brinjal shoot and fruit borer, if needed to supplement the actions of other control components such as cultural, mechanical and field sanitation. Accordingly, the present experiment was undertaken to evaluate the effectiveness of flubendiamide as an IPM component for the management of the brinjal shoot and fruit borer in the field.

MATERIALS AND METHODS

The experiment was conducted in the field at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) during October 2006 to May 2007 (winter season). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 3 m × 3 m having 2 m space between the blocks and 1.5 m between the plots. The distance between rows was 1 m and that between plants was 60 cm. The crop was grown following the recommended practices as described by Rashid (1993). Weeding, mulching and irrigation were done as and when necessary. The experiment comprised 8 combinations of IPM components each such combination termed as an IPM package and an untreated control.

Package 1: Mechanical control + application of flubendiamide 24WG at 5% level of fruit infestation: Twenty days after transplanting, clipping of infested shoots by scissors was carried out and destroyed them by burring at a 7 days interval. At fruiting stage, removal and destruction of both infested shoots and fruits were carried out at 7 days interval and continued till the last harvest. Field application of flubendiamide 24WG (0.012%) was made at 5% level of fruit infestation at 7 days interval and continued till the last harvest.

Package 2: Use of potash @ 100 kg/ha + application flubendiamide 24WG at 5% level of fruit infestation: Application of 100 kg potash per hectare as muriate of potash (MP) fertilizer. One third of the MP was applied in the pit one week before transplanting and the rest of MP was applied in two equal installments as top dressing at 20 days after transplanting and at the flower initiation stage and flubendiamide 24WG was applied as IPM package 1.

Package 3: Field sanitation and application of flubendiamide 24WG at 5% level of fruit infestation: Dead and fallen leaves were collected from the field and destroyed by burring in soil to remove the pupae from soil at 7 days interval and flubendiamide 24WG was applied as IPM package 1.

Package 4: Use of potash @ 100 kg/ha + mechanical control + application of flubendiamide 24WG at 5% level of fruit infestation: Potash was applied as IPM package 2. Mechanical control and application of flubendiamide were done as IPM package 1.

Package 5: Use of potash @ 100 kg/ha + mechanical control + field sanitation + application of flubendiamide 24WG at 5% level of fruit infestation: Potash was applied as IPM package 2 and field sanitation was done according to IPM package 3. Mechanical control and application of flubendiamide were done as IPM package 1.

Package 6: Use of potash @ 100 kg/ha + mechanical control + field sanitation + flubendiamide 24WG applied at 5% level of shoot and fruit infestation: Potash was applied as IPM package 2 and field sanitation was done as IPM package 3. Mechanical control was also made as IPM package 1 but flubendiamide 24WG (0.012%) was applied at 5% level of both shoots and fruits infestation.

Package 7: Use of potash @ 100 kg/ha + mechanical control + field sanitation: Potash was applied as IPM package 2 and field sanitation was done as IPM package 3. Mechanical control was also made as IPM package 1.

Package 8: Schedule spray of flubendiamide 24WG at 7 days interval: After 20 days of transplanting, field application of flubendiamide 24WG (0.012%) was made at 7 days interval and continued till the last harvest.

Untreated control: No pest control technique was applied in control plots. However, an equal volume of water, which was used for other plots, was sprayed at 7 days intervals.

Insecticide application: Brinjal fields were visited regularly and the number of total and infested shoots was counted to determine the level of shoot infestation. The level of fruit infestation was determined by random observation and selection of 50 fruits/ plot everyday. Flubendiamide 24WG was applied by mixing 2.5 g of insecticide with 5 liter of water (0.5 g of flubendiamide 24WG per liter of water i.e., 0.012% flubendiamide) and sprayed covering the whole plants. Five liters of spray material was required to spray three plots. The spraying was done in the afternoon to avoid bright sunlight and drift caused by strong wind and adverse effect on pollinating bees and other pollinators.

Data collection: The total number of shoots as well as the number of infested shoots was recorded from 10 plants of each plot at weekly intervals and the percent shoot infestation was calculated. Fruits were harvested at 7 days interval and the number of healthy and infested fruits was recorded for calculating the percent fruit infestation. The weight of healthy and infested fruits was noted separately per plot per treatment. The cumulative plot yield of healthy and infested fruits of 10 harvests were transformed into healthy, infested and total yield per hectare in tons respectively.

Benefit Cost Ratio (BCR): For benefit cost analysis, records of the costs incurred for labour, fertilizer, insecticide, application in each IPM package were maintained. It is to be noted here that expenses incurred referred to those only on pest control. The price of the harvested marketable healthy fruits of each treatment and that of control were calculated at market rate. The result of Benefit-Cost analysis was expressed in terms of Benefit Cost Ratio.

Data analysis: Data were analyzed by using MSTAT software for analysis of variance after square root transformation. ANOVA was made by F variance test and the pair comparisons were performed by Duncan's Multiple Range Test (DMRT) (Gomez & Gomez, 1984).

RESULTS

Effect of different IPM packages on shoot infestation

Shoot infestation of brinjal was significantly influenced by the different IPM packages. The lowest percent of shoot infestation was observed in schedule spray plot (package 8), which was significantly lower than that of all packages (Figure 1). However, the highest percent of shoot infestation was observed in untreated control, which was statistically identical with IPM package 3 (field sanitation + flubendiamide applied at 5% level of fruit infestation) and package 2 (potash @ 100k/ha + flubendiamide at 5% level of fruit infestation). Accordingly, Figure 2 illustrated that IPM package 8 (schedule spray plot) provided maximum reduction of shoot infestation over control, which was significantly higher than that of all other IPM packages. No significant difference was observed among the percent reduction of shoot infestation over control in IPM package 1 (mechanical control + flubendiamide 24WG applied at 5% level of fruit infestation), package 4 (mechanical control + potash @100 kg/ha + flubendiamide 24WG at 5% level of fruit infestation), package 5 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation), package 6 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation) and package 7 (mechanical control + potash @100 kg/ha +field sanitation).

Effect of different IPM packages on fruit infestation

IPM packages significantly reduced the borer infestation on brinjal, increased the number of healthy and total fruits/plant, and decreased the number infested fruits/plant of brinjal. Data (Table 1) revealed that IPM package 6 (mechanical control + potash @ 100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation) produced the highest number of healthy fruits/plant (25.00) and statistically similar results were obtained in package 8 (schedule spray of flubendiamide 24WG at 7 days interval) regarding this parameter. However, the number of healthy fruits/plant was statistically identical in IPM package 5 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation), package 4 (mechanical control + potash @100 kg /ha + flubendiamide 24WG applied at 5% level of fruit infestation) and package 1 (mechanical control + flubendiamide 24WG applied at 5% level of fruit infestation). In contrast, the lowest number of healthy fruits/plant (11.98) was obtained from the untreated control, which was significantly lower than all other IPM packages except package 7 (mechanical control + fertilizer +field sanitation). Moreover, the data regarding the number of infested fruits/plant (Table 1) showed that the highest value (8.53) was obtained from untreated control as against the lowest (2.20) in IPM package 6 (mechanical control + potash @100 kg /ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation). However, the number of total fruits/plant was statistically identical in IPM package 1, 2, 4, 5, 6 and 8 (Table 1).

Table 1 further revealed that the lowest level of fruit infestation (8.04%) was found in IPM package 6 and statistically no significant difference was observed between IPM package 8 (8.85%), package 5 (10.23%). IPM package 7 (mechanical control + potash @100 kg /ha + field sanitation) had comparatively higher level of fruit infestation (34.94%) than all other IPM packages. The rest of the packages (package 1, package 2 and package 3) had intermediate levels of fruit infestation having no significant difference among them. Significantly the highest percent fruit infestation (41.60%) was obtained in untreated control.

The data (Table 2) showed that IPM package 6 (mechanical control + potash @ 100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation) provided the highest reduction of fruit infestation (80.63%) over the control having no significant difference with package 8, package 5 and package 4. Therefore, the results indicated that none of the package was able to exceed the standard level of 80% reduction in fruit infestation over control except the package 6. Mechanical control in combination with potash @100 kg/ha and field sanitation (package 7) showed very low effectiveness and flubendiamide alone and in combination with mechanical control or potash fertilizer showed significantly higher level of effectiveness against the brinjal shoot and fruit borer.

Effect of different IPM packages on yield performance of brinjal

The effect of different IPM packages on yield of brinjal was evaluated in terms of healthy fruit yield, infested fruit yield and total fruit yield. IPM package 6 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation) produced the highest healthy fruit yield (17.71 t/ha). Although statistically no significant difference was observed in IPM package 8 (schedule spray of flubendiamide 24WG at 7 days interval) and package 5 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation) regarding healthy fruit yield (Table 3). In contrast, healthy fruit yield was the lowest (8.48 t/ha) in untreated control plots, which was identical with that of the IPM package 7 (mechanical control + potash @100 kg/ha + field sanitation). Accordingly, infested fruit yield was the highest in untreated control plots (4.33 t/ha) having no statistical significant with IPM package 7 (mechanical control + potash @100 kg/ha + field sanitation). Thus, the highest total fruit yield was obtained in IPM package 6 with no significant difference among the IPM packages 1, 2, 4, 5, 6 and 8 treated plots. A further analysis of the yield to assess the impact of each treatment on yield over control as shown in the same Table, suggested that IPM package 6 ensured maximum increase (108.84%) of healthy fruit yield over control. However, maximum reduction (74.13%) of infested fruit yield was found in that package and as a cumulative impact, maximum increase of total fruit yield (46.99%) was obtained in the same package (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation).

Economic analysis of different IPM packages
The benefit-cost ratio (BCR) as worked out based on the expenses incurred and value of crops obtained against the treatment used in the present study for the control of brinjal shoot and fruit borer has been presented in Table 4. It is revealed from Table that the highest BCR (5.53) was found in IPM package 2 (potash @100 kg/ha + flubendiamide 24WG applied at 5% level of fruit infestation) where 9 applications were required. Although almost equal BCR (5.48) was obtained in package 4 (mechanical control + potash @ 100 kg/ha + flubendiamide 24WG applied at 5% level of fruit infestation) with only 5 sprays of flubendiamide. In contrast, the lowest BCR (0.53) was obtained from IPM package 7 (mechanical control + potash @100 kg/ha + field sanitation) with no application of insecticide. In the schedule spray plots, the BCR was 4.03 but the number of spray was 16. Although the IPM package 6 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of infestation) had the higher BCR (4.12) than IPM package 5 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation) however, the number of spray was lower in package 5 (5) compared to package 6 (8). IPM package 3 (field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation) required 7 sprays but the BCR was only 1.70.

DISCUSSION

The results demonstrated that the scheduled spray of flubendiamide at weekly intervals was found to be the most effective in reducing shoot infestation of brinjal by shoot and fruit borer. There is no information on the efficacy of flubendiamide against the pest in the field or laboratory; however, findings of other researchers with different insecticides supported these results. Raman et al. (2002) stated that schedule spray of cypermethrin at weekly interval showed the best efficacy in reducing shoot infestation of brinjal. Moreover, Kabir et al. (2003) found the similar efficacy against this pest by spraying of carbosulfan at weekly intervals.

The performance of the different IPM packages against brinjal shoot and fruit borer in different aspects such as percent fruit infestation, reduction of infestation over control, healthy fruit yield and total yield as found in the present study was more or less in conformity with the findings of several other similar studies. Mannan & Begum (1999) found that hand picking damaged shoots and fruit and spraying of cypermethrin at 15 days interval caused 25.78% fruit infestation and 63.93% fruit infestation reduction over control. Gapud et al. (1999) reported that the removal of damaged shoots and fruit at every week produced higher yield than plants sprayed every three weeks. Moreover, mechanical control in combination with spraying of cypermethrin and monocrotophos alternatively at 5% fruit infestation provided effective control of the brinjal shoot and fruit borer (Islam & Karim, 1994). Combination of 4 cultural practices such as irrigation, pruning of older leaves and use of wide spacing, sanitation and proper disposal of BSFB-infested plant material and fertilizer use as per recommended rate controlled 70% of BSFB population in brinjal (FAO, 2003). These findings also agree with that of the Sudhakar et al. (1998), who reported that a higher dose of potash along with insecticide treatment reduced the percentage of fruit infestation.

The findings regarding BCR and number of spray agree with Alam et al. (2006), who obtained the benefit cost ratio (BCR) 3.4 in IPM treated field during winter trial. However, the findings also coincide with those of Maleque et al. (1998), who found a benefit cost ratio (BCR) of 3.4 and 3.3 by using mechanical control + application of cypermethrin at 5% level of fruit infestation and schedule spray of cypermethrin at 7 days intervals, respectively where the weekly spray involved applying 8 times more insecticides. These results contradict the findings of Islam et al. (1999), who observed the BCR of 37.77 in plots treated with shobicron (mixture of cypermethrin and profenofos) at 10% fruit with only 3 applications. The difference in results might be due to the cost of insecticides, the price of product and socio-economic conditions.

The overall results suggested that use of IPM package 5 (mechanical control + potash @100 kg/ha + field sanitation + flubendiamide 24WG applied at 5% level of fruit infestation) against the brinjal shoot and fruit borer reduced fruit infestation, increased marketable yield and benefits cost ratio. This had ultimately reduced the number of insecticide applications. This would have a positive impact on the environment, reduce toxic residue load on brinjal fruits and finally the cost of control measure would be minimized significantly.

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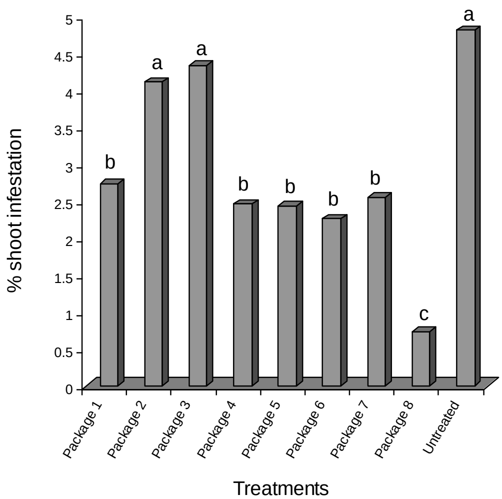

Fig. 1 Percent shoot infestation under different treatments caused by brinjal shoot and fruit borer. Bars having the same letter are not significantly different according to DMRT at $P \leq 0.05$

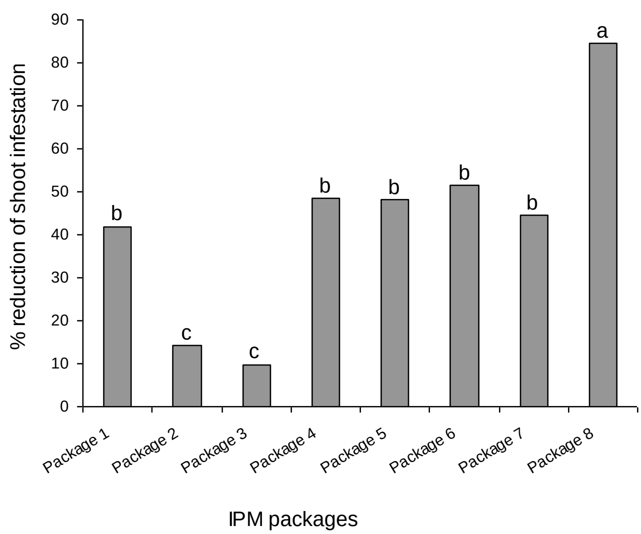

Fig. 2 Effect of different IPM packages on percent reduction of shoot infestation over control against brinjal shoot and fruit borer. Bars having the same letter are not significantly different according to DMRT at $P \leq 0.05$

Table 1. Effect of different IPM packages on number of fruits per plant and percent fruit infestation caused by brinjal shoot and fruit borer

IPM packages	Healthy fruits/ plant	Infested fruits/ plant	Total fruits/ plant	Percent fruit infestation by number	Percent reduction of fruit infestation over control
Package 1	20.09 bc	4.76b	24.85 abc	19.15 cd	53.86 bc
Package 2	19.42 cd	4.24 bc	23.66 abc	17.95 cd	56.85 bc
Package 3	16.38 de	4.80 b	21.18 bc	22.83 c	45.15 c
Package 4	21.47 bc	3.56 bcd	25.03 ab	14.16 de	65.99 ab
Package 5	21.67 bc	2.49 cd	24.16 abc	10.23 e	75.34 a
Package 6	25.00 a	2.20 d	27.20 a	8.04 e	80.63 a
Package 7	14.18 ef	7.69 a	21.87 bc	34.94b	16.32 d
Package 8	23.11 ab	2.27 cd	25.38 ab	8.85 e	78.70 a
Untreated	11.98 f	8.53 a	20.51 c	41.60 a	-
df	8,16	8,16	8,16	8,16	7,14
F	33.60	25.56	5.26	56.07	31.56
P	0.000	0.000	0.002	0.000	0.000

Means followed by the same letter in a column are not significantly different according to DMRT at $P \leq 0.05$.

Table 2. Effect of different IPM packages on fruit yield of brinjal against brinjal shoot and fruit borer infestation

IPM Packages	Healthy fruit yield		Infested fruit yield		Total fruit yield	
	t/ha	Increase over control (%)	t/ha	Decrease over control (%)	t/ha	Increase over control (%)
Package 1	14.60 b	72.17	2.41 b	44.34	17.01 a	32.79
Package 2	14.76 b	74.06	2.31 b	46.65	17.07 a	33.26
Package 3	11.60 c	36.79	2.43 b	43.88	14.03 b	9.52
Package 4	15.21 b	79.36	1.80 bc	58.43	17.01 a	32.79
Package 5	16.02 ab	88.92	1.32 c	69.52	17.34 a	35.36
Package 6	17.71 a	108.84	1.12 c	74.13	18.83 a	46.99
Package 7	10.04 cd	18.40	3.91 a	9.70	13.95 b	8.90
Package 8	16.37 ab	93.04	1.15 c	73.44	17.52 a	36.77
Untreated	8.48 d	-	4.33 a	-	12.81 b	-
df	8,16		8,16		8,16	
F	48.68		26.93		15.24	
P	0.000		0.000		0.000	

Means followed by the same letter in a column are not significantly different according to DMRT at $P \leq 0.05$.

Table 3. Benefit cost ratio of different IPM packages for the management of brinjal shoot and fruit borer

IPM Packages	No. of sprays	Variable cost of pest management (Tk/ha)				Healthy fruit yield (t/ha)	Gross return (Tk./ha)	Net return (Tk./ha)	Adjusted net return (Tk./ha)	Benefit cost ratio (BCR)
		Insecticide	Fertilizer	Labour	Total					
Package 1	6	7500	0	8360	15860	14.60	219000	203140	75940	4.79
Package 2	9	11250	1200	1980	14430	14.76	221400	206970	79770	5.53
Package 3	7	8750	0	8580	17330	11.60	174000	156670	29470	1.70
Package 4	5	6250	1200	8140	15590	15.21	228150	212560	85360	5.48
Package 5	5	6250	1200	15180	22630	16.02	240300	217670	90470	4.00
Package 6	8	10000	1200	15840	27040	17.71	265650	238610	111410	4.12
Package 7	0	0	1200	14080	15280	10.04	150600	135320	8120	0.53
Package 8	16	20000	0	3520	23520	16.37	245550	222030	94830	4.03
Untreated	0	0	0	0	0	8.48	127200	127200	-	-

Cost of insecticides : Flubendiamide 24WG @ Tk 5000.00/kg
Cost of spray : Two labourers/spray/ha @ Tk 110.00/day. Spray volume required: 500 l/ha
Cost of mechanical control : One labour/ha/week before fruiting stage for weeks; four labourers/ha/week starting from fruiting stage for 15 weeks (Islam et al., 1999)
Cost of field sanitation : Four labourers/ha/week starting from fruiting stage for 15 weeks.
Cost of muriate of potash : Tk 16.00/kg
Market price of brinjal : Healthy fruit Tk 15.00/ kg. (1U$= 69.00TK.)

THE DESCRIPTION OF A NATURAL INTERSPECIFIC HYBRID BETWEEN *CARABUS (ARCHIPLECTES) JUENTHNERI AVADCHARENSIS* KURNAKOV, 1972 AND *CARABUS (SPHODRISTOCARABUS) JANTHINUS RUGATUS* BREUNING, 1934 (COLEOPTERA, CARABIDAE).

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[**Obydov, D.** 2009. The description of a natural interspecific hybrid between *Carabus (Archiplectes) juenthneri avadcharensis* Kurnakov, 1972 and *Carabus (Sphodristocarabus) janthinus rugatus* Breuning, 1934 (Coleoptera, Carabidae). Munis Entomology & Zoology, 4 (1): 268-270]

ABSTRACT: A natural hybrid between *Carabus (Archiplectes) juenthneri avadcharensis* Kurnakov, 1972 and *Carabus (Sphodristocarabus) janthinus rugatus* Breuning, 1934 is described and figured.

KEY WORDS: Coleoptera, Carabidae, *Carabus*, *Archiplectes*, *Sphodristocarabus*, natural hybrid, Caucasus, Abkhazia.

Natural hybrids between species of the subgenera *Archiplectes* and *Sphodristocarabus* were not known till now. The description of a natural hybrid between *Carabus (Archiplectes) juenthneri avadcharensis* Kurnakov, 1972 and *Carabus (Sphodristocarabus) janthinus rugatus* Breuning, 1934 (Fig.2) is given below.

MATERIAL

Male: Caucasus, Abkhazia, 7,4 km from Ritza Lake to the north-east, 1,5 km from Kutykukh Village to the north, 1635 m, 19-25.VII.2008, A. Vlasenko leg.
Specimen is preserved in the collection of Mr. A.S Vlasenko (Moscow, Russia).

DESCRIPTION

***Carabus* (*Archiplectes*) *juenthneri avadcharensis* Kurnakov, 1972 (Fig.1)**

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***Carabus* (*Sphodristocarabus*) *janthinus rugatus* Breuning, 1934 (Fig.3)**

Body length is 25.4 mm (including mandibles), body width is 9.0 mm.

Body more convex than in *C. juenthneri avadcharensis* but less convex than in *C. janthinus rugatus*.

Head thickened; ratio width of pronotum/width of head 1.32; eyes prominent. Mandibles broader than in *C. janthinus rugatus* but narrower than in *C. juenthneri avadcharensis*; terebral tooth of the right and left mandibles bi-dentate, strongly prominent; retinaculum of the right mandible bigger, strongly prominent, retinaculum of the left mandible smaller, slightly prominent; surface of mandibles smooth. Frontal furrows broad and deep as in *C. juenthneri avadcharensis*, inside with few coarse wrinkles; frons and vertex nearly smooth as in *C. juenthneri avadcharensis*; neck with coarse punctures and wrinkles as in *C. janthinus rugatus*. Labrum wider than clypeus, slightly notched, with two lateral setae. Antenna long, protruding beyond the base of pronotum by five apical segments as in *C. juenthneri avadcharensis*, longer than in *C. janthinus rugatus*; palpi as in *C. juenthneri avadcharensis,* more dilated than in *C. janthinus rugatus*; penultimate segment of the maxillary palpi slightly longer than the last segment; penultimate segment of the labial palpi with two setae. Mentum tooth triangular broad as in *C. juenthneri avadcharensis*, slightly shorter than lateral lobes; submentum with two setiferous pores.

Prothorax broader than in *C. juenthneri avadcharensis* and *C. janthinus rugatus*; ratio width/length 1.96. Pronotum with more rough sculpture than in *C. juenthneri avadcharensis* but less rough than in *C. janthinus rugatus*; median longitudinal line distinct; basal foveae not deep as in *C. janthinus rugatus*, inside with dense coarse wrinkles as in *C. juenthneri avadcharensis*. Lobes of hind angles triangular, long, bent upwards as in *C. juenthneri avadcharensis*. Sides of pronotum narrowly margined and bent upward posteriorly, lateral margin with three setae.

Elytrae oval as in *C. janthinus rugatus* (in *C. juenthneri avadcharensis* elytrae oblong-oval), more convex than in *C. juenthneri avadcharensis* but less convex than in *C. janthinus rugatus*; widest at about middle; shoulders prominent as in *C. janthinus rugatus*, not so rounded as in *C. juenthneri avadcharensis*; sides of elytrae narrowly margined. Ratio length/width 1.50; ratio width of elytrae/width of pronotum 1.53. Elytral sculpture exactly intermediate between elytral sculpture of *C. juenthneri avadcharensis* and *C. janthinus rugatus*; primary elytral foveoles indistinct.

Abdominal sternites slightly wrinkled as in *C. juenthneri avadcharensis*, metepisternum with sparse fine wrinkles, not longer than its width; sternal sulci absent as in *C. juenthneri avadcharensis*. Legs longer than in *C. janthinus rugatus*; anterior tarsi with four dilated segments bearing hairy pads.

Shape of aedeagus and endophallic structure are conspecific with the genital structure of *C. juenthneri avadcharensis*.

Coloration black.

Distribution. Caucasus, Abkhazia, Ritza Lake environs.

Habitat. The specimen was collected in the brushwood near beech-fir forest.

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Figs 1-3. *Carabus* (general view): 1. *Carabus (Archiplectes) juenthneri avadcharensis*; 2. *Carabus (Archiplectes) juenthneri avadcharensis* X *Carabus (Sphodristocarabus) janthinus rugatus* interspecific hybrid; 3. *Carabus (Sphodristocarabus) janthinus rugatus*. All specimens from Caucasus, Abkhazia, Ritza Lake environs.

RICANIA GERMAR, 1818 SPECIES OF WESTERN PALAEARCTIC REGION (HEMIPTERA: FULGOROMORPHA: RICANIIDAE)

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[Demir, E. 2009. *Ricania* Germar, 1818 species of Western Palaearctic Region (Hemiptera: Fulgoromorpha: Ricaniidae). Munis Entomology & Zoology, 4 (1): 271-275**]**

ABSTRACT: In this study, *Ricania* species in western Palaearctic region are examined. Four species belonging to this genus are determined. These are; *Ricania aylae* Dlabola, 1983; *R. hedenborgi* Stal, 1865; *R. japonica* Melichar, 1898 and *R. soraya* Dlabola, 1983. *R. japonica* Melichar, 1898 is the first record for Turkish fauna.

KEY WORDS: *Ricania*, Fulgoromorpha, Hemiptera, Western Palaearctic region.

The family Ricaniidae is mostly distributed in Tropical regions. The family is represented only by the genus *Ricania* in the Palaearctic region. Melichar (1898) gave 48 species of the genus in his Ricanidae monograph. Nast (1972) reported 6 species in the check list in the Palaearctic region. At present, in Fulgoromorpha Lists on the Web, 93 species have been listed for the whole world except *R. aylae* Dlabola, 1983 and *R. soraya* Dlabola, 1983. Four species are known from the western Palaearctic region in the genus. These are *R. aylae* Dlabola, 1983; *Ricania hedenborgi* Stål, 1865; *R. japonica* Melichar, 1898 and *R. soraya* Dlabola, 1983. *Ricania hedenborgi* Stål, 1865 is the most widely distributed species in the region. In the western Palaearctic region, *R. japonica* Melichar, 1898 from Ukraine, *R. aylae* Dlabola, 1983 from Turkey and *R. soraya* Dlabola, 1983 from Iran are known. Also, *R. aylae* Dlabola, 1983 is endemic to Turkey and *R. soraya* Dlabola, 1983 is endemic to Iran.

The genus *Ricania* is one of the genera that include the most considerable species for Turkish fauna.

In this study, for the purpose of determining the status of *Ricania* species in Turkey, my own sent specimens of *R. japonica* and *Ricania* specimens in the Museum of Agricultural Struggle Institute are examined. *Ricania* specimens in the Museum are determined as two species, *R. aylae* and *R. hedenborgi*. In the museum, *R. aylae* and *R. hedenborgi* was identified by Dr. J. Dlabola. I checked them. So I confirmed their identification. Anyway, the specimens of *R. aylae* are paratypes.

On the other hand, some *Ricania* specimens were sent from Rize province (Eastern Black Sea Region) for identification to Ankara Agricultural Struggle Central Research Institute. The specimens were given by a member of staff (Dr. Işıl Özdemir) of the Institute to the author for identification. Some of the specimens are deposited in the museum of the Institute and some of them are in the personal collection of the author. The specimens were identified by the author as *R. japonica*. It is the first record to Turkey. This record is very important. Since the record of Turkey of this Far East distributed species (which occurs in Japan, China, Korea and Oriental region) also confirm the record for Ukraine and doubtful Georgian record.

Consequently, the western Palaearctic *Ricania* fauna now consists of four species.

Family: Ricaniidae Amyot et Serville, 1843
Genus: *Ricania* Germar, 1818

Type-species: *Cicada hyalina* Fabricius, 1775

Ricania aylae Dlabola, 1983

Dlabola, J. 1983. Ergebnisse der Tschechoslovakisch-Iranischen entomologischen Expeditionen 1970 und 1973 nach dem Iran. Acta entomologica Musei Nationalis Pragae 41: 91-97.

Distribution: Turkey (Dlabola, 1983). **Distribution in Turkey:** Elazığ prov., İzmir prov.: Selçuk, Muğla prov.: Marmaris, Muş prov. (Dlabola, 1983).

Ricania hedenborgi Stål, 1865

Stål, C. 1865. Homoptera nova vel minus cognita, Ofversigt af Kongliga Svenska Vetenskaps-Akademiens Förhandlingar. Stockholm 22: 145-165.

Distribution: Armenia, Afro-tropical region, Crete, Dodecanese Is., Greece, North Aegean Is., Near East, North Africa, Turkey (Nast, 1972, 1987; www.faunaeur.org). **Distribution in Turkey:** Diyarbakır prov.: Ergani, Mardin prov.: Nusaybin (Lodos & Kalkandelen, 1981).

Ricania japonica Melichar, 1898

Melichar, L. 1898. Vorlaufige Beschreibungen neuer Ricanideen, Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien. Wien 48: 384-400.

Distribution: Japan (Honshu, Kyushu, Shikoku), N China, Georgia?, Korea, Oriental region, Ukraine (Nast, 1972, 1987; www.faunaeur.org). **Distribution in Turkey:** This species is the first record to Turkey. **Materials:** Rize: Center, 26.08.2007, 45♂♂, 44♀♀ (Resul Yıldırım leg.) on *Vitis vinifera*, *Rubus* sp., *Camelia sinensis*, *Ficus carica*, *Phaseolus vulgaris*, *Cucumis sativus*, *Lycopersicum esculentum* and weeds. On the other side, this species was observed by agricultural engineers on the cultural plants in Rize province and numerous specimens were collected (Plate 1).

Ricania soraya Dlabola, 1983

Dlabola, J. 1983. Ergebnisse der Tschechoslovakisch-Iranischen entomologischen Expeditionen 1970 und 1973 nach dem Iran. Acta entomologica Musei Nationalis Pragae 41: 91-97.

Distribution: Iran (Dlabola, 1983).

DISCUSSION

As a result of examining all the specimens, diagnostic characters between *R. aylae* and *R. hedenborgi* given in the key by Dlabola (1983) could not be determined. Dlabola's key (1983) is given as follows. In the examined specimens, diagnostic characters between two species have not been observed in terms of mentioned characters, namely size, colour and apical spots on the wings in the key (Plate 2). Besides, genital structures of paratypes of *R. aylae* and male specimens of *R. hedenborgi* are examined.

As a result of the examination, it is seen that apophysis in apex of aedeagus is longer than that of *R. hedenborgi*. Any difference could not be seen between two species except this. Also, *R. japonica* specimens and wing patterns and genital structures of *R. soraya* described from İran by Dlabola are compared with them. Wings patterns are important to separate *Ricania* species such as given in monograph of Melichar.

I compared genital structures of *R. soraya, R. japonica, R. aylae* and *R. hedenborgi*. The species *R. soraya* and *R. japonica* are easily distinguished from other species by both wing patterns and genital structures are easily distinguished from the above two species. However, *R. aylae* and *R. hedenborgi* can not be separated to each other. Their genital structures are rather similar, but only, the length of apophysis in apex of aedeagus is different. It is possible that the difference is in populational variations. So, *R. aylae* may be a synonym of *R. hedenborgi*. More specimens should be examined for a certain decision of this approach.

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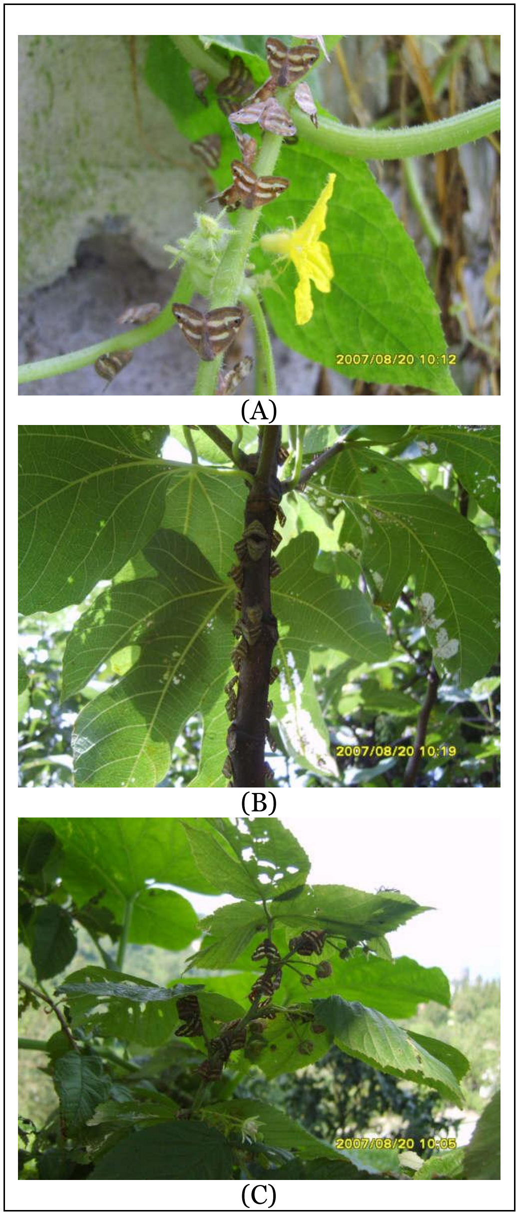

Plate 1: *Ricania japonica* specimens. A: on *Cucumis sativa*, B: on *Ficus carica* C: on *Rubus* sp.

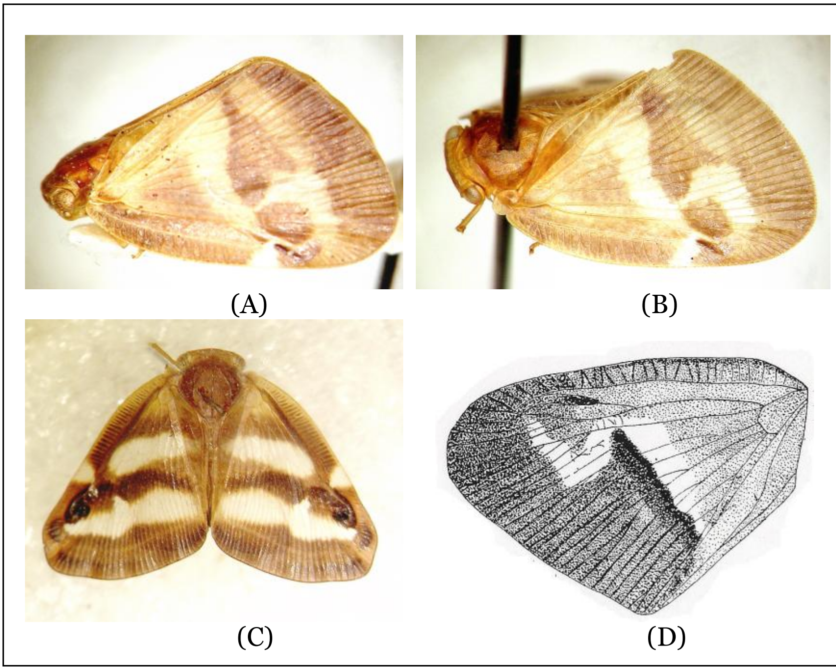

Plate 2: A: *Ricania aylae* (Paratypus male: İzmir prov: Selçuk), B: *R. hedenborgi* (Male: Mardin prov: Nusaybin), C: *R.japonica* (Male: Rize prov.), D: *R. soraya* from Dlabola (1983).

FIRST RECORDS OF SOME LEAFBEETLES FOR MEDITERRANEAN REGION IN TURKEY AND SOUTH TURKEY (COLEOPTERA: CHRYSOMELIDAE)

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[Özdikmen, H. 2009. First records of some leafbeetles for Mediterranean region in Turkey and south Turkey (Coleoptera: Chrysomelidae). Munis Entomology & Zoology, 4 (1): 276-279**]**

ABSTRACT: In this work, specimens of the family Chrysomelidae that were collected from various parts of the Amanos Mountains in 2006-2007 were evaluated faunistically and zoogeographically. As a result of this, a total of 10 species were determined as the first records for Mediterranean region in Turkey and 6 of them were also determined as the first records for the whole South Turkey.

KEY WORDS: Chrysomelidae, Turkey

The members of Chrysomelidae feed on plant materials (e.g., leaves, flowers etc.). For this reason, some of Chrysomelidae are regarded as pests in terms of agriculture and forestry. So Chrysomelidae data are very important for all countries.

Following from this aim, new Chrysomelidae data for Turkey are presented in this work. The examined specimens were collected from various parts of the Amanos Mountains (in Mediterranean region in Turkey) in 2006-2007. As a result of this, ten species were determined as the first records for Mediterranean region in Turkey such as *Crioceris asparagi* (Linnaeus, 1758), *Tituboea macropus* (Illiger, 1800), *Smaragdina concolor* (Fabricius, 1792), *Chrysolina chalcites* (Germar, 1824), *Chrysolina orientalis* (Olivier, 1807), *Prasocuris junci* (Brahm, 1790), *Galeruca pomonae* (Scopoli, 1763), *Calomicrus lividus* (Joannis, 1866), *Altica quercetorum* Foudras, 1860 and *Psylliodes hyoscyami* (Linnaeus, 1758). Six species among these were also determined as the first records for whole South Turkey such as *Crioceris asparagi* (Linnaeus, 1758), *Smaragdina concolor* (Fabricius, 1792), *Galeruca pomonae* (Scopoli, 1763), *Calomicrus lividus* (Joannis, 1866), *Altica quercetorum* Foudras, 1860 and *Psylliodes hyoscyami* (Linnaeus, 1758).

Subfamily CRIOCERINAE

Crioceris asparagi (Linnaeus, 1758)

Material examined: Osmaniye: Zorkun road, Çiftmazı place, 223 m, N 37 01 E 36 17, 20.05.2006, 1 specimen. **Distribution in Turkey:** İzmir (Gül-Zümreoğlu, 1972); Amasya (Tomov & Gruev, 1975); Kars (Aslan, 2000); Aksaray, Kayseri, Karabük (Özdikmen & Turgut, 2008). **Range:** From Iberian Peninsula to Central Asia, introduced also to N America, Argentina and Tanzania (Warchalowski, 2003). **Chorotype:** Mainly Holarctic. **Remarks:** The species has three subspecies (incl. nominative subspecies) in the world. It is represented only by the subspecies *C. asparagi maculipes* (Gebler, 1834) in Turkey. Until now, it has been reported only from N, W and C Turkey. It is reported for the first time both for Mediterranean region in Turkey and whole S Turkey.

Subfamily CLYTRINAE

Tituboea macropus (Illiger, 1800)

Material examined: Osmaniye: Küllü village, 1707 m, N 36 57 E 36 24, 25.06.2006, 3 specimens, Hasanbeyli, Kalecikli village, 587 m, N 37 09 E 36 27, 19.05.2006, 7 specimens, Zorkun-Karıncalı-Hassa road, Küllü plateau, 1603 m, N 36 57 E 36 21, 25.06.2006, 1 specimen, Bahçe, 551 m, N 37 11 E 36 33, 18.05.2006, 1 specimen, Hınzırlı plateau, Kalaycıbatıran place, 1465 m, N 36 58 E 36 27, 25.06.2006, 1 specimen; **Hatay**: Entry of Belen, Çakallı, 652 m, N 36 28 E 36 13, 19.05.2006, 1 specimen, Erzin, Gökgöl, N 36 57 E 36 17, 600 m, 04.06.2007, 5 specimens; **Kilis**: Hassa–Kilis road, Hisar village, 16.05.2006, 2 specimens. **Distribution in Turkey:** Konya, Ankara, Sivas, Kars (Kasap, 1987); Aegean region (Aydın, 1988); Konya, Aydın, Çanakkale, İzmir, Muğla (Aydın & Kısmalı, 1990); Artvin, Erzurum, Konya, Aydın, Çanakkale, İzmir, Muğla (Aslan & Özbek, 1998). **Range:** European Russia, Caucasus, Turkmenia, Ozbekistan, S and C Europe, Asia Minor, Syria, W Iran (Lopatin, 1977); Distributed in SE Europe and Asia Minor, from Austria and Albania to basin of Volga and Caucasian countries (Warchalowski, 2003). **Chorotype:** Turano-Mediterranean. **Remarks:** Until now, it has been reported only from N, W, NE and C Turkey. It is reported for the first time for the Mediterranean region in Turkey.

Smaragdina concolor (Fabricius, 1792)

Material examined: Hatay: Antakya, Saint Pierre church env., N 16 12 E 36 10, 210 m, 30.03.2007, 5 specimens, Harbiye-Yayladağı road, N 36 07 E 36 08, 275 m, 30.03.2007, 5 specimens, Harbiye, N 36 07 E 36 08, 273 m, 30.03.2007, 1 specimen, Alahan castle, N 36 19 E 36 11, 147 m, 30.03.2007, 3 specimens, Yayladağı, N 35 55 E 36 06, 787 m, 20.04.2007, 1 specimen, Aktepe, N 36 39 E 36 27, 207 m, 18.05.2007, 1 specimen, Akbez, N 36 50 E 36 32, 464 m, 22.04.2007, 1 specimen; **Gaziantep**: Nurdağı, N 37 10 E 36 42, 814 m, 17.05.2007, 2 specimens, Fevzipaşa, Türkbahçe village, N 37 04 E 36 37, 521 m, 18.05.2007, 2 specimens, Nurdağı, Gökçedere village, N 37 09 E 36 43, 496 m, 17.05.2007, 1 specimen; **Osmaniye**: Hasanbeyli, N 37 07 E 36 32, 711 m, 21.04.2007, 1 specimen, 31.03.2007, 2 specimens. **Distribution in Turkey:** İstanbul (Lefevre, 1872); Bursa, Ankara, Samsun, Tokat (Medvedev, 1970); İstanbul, Samsun (Tomov & Gruev, 1975); Gümüşhane, Bursa (Gruev & Tomov, 1979); İstanbul, Bursa, Samsun, Tokat, Gümüşhane, Ankara, Trabzon, Kastamonu (Kasap,1987); Asia Minor (Medvedev, 1990). **Range:** Spain, France, Italy, Bulgaria, Romania and Asia Minor (Warchalowski, 2003). **Chorotype:** S-European. **Remarks:** The species has three subspecies (incl. nominative subspecies) in the world. It is represented only by the subspecies *S. concolor hypocrita* (Lacordaire, 1848) in Turkey. Until now, it has been reported only from N, NW and North of C Turkey. It is reported for the first time both for the Mediterranean region in Turkey and the whole S Turkey.

Subfamily CHRYSOMELINAE

Chrysolina chalcites (Germar, 1824)

Material examined: Osmaniye: Zorkun road, Çiftmazı place, 223 m, N 37 01 E 36 17, 20.05.2006, 1 specimen, Fakıuşağı village, 655 m, N 36 01 E 36 12, 19.05.2006, 1 specimen, 145 m, N 37 02 E 36 13, 09.04.2006, 1 specimen, Boğaz plateau, 713 m, N 37 04 E 36 22, 18.05.2006, 1 specimen; **Gaziantep**: Kilis-Gaziantep road, turn of Oğuzeli, 16.05.2006, 3 specimens. **Distribution in Turkey:** Sakarya, Konya (Bodemeyer, 1900); Denizli, Bursa (Bechyne, 1952); Anadolu (Gruev, 1973); Amasya, Samsun (Tomov & Gruev, 1975); Asia Minor (Warchalowski, 1976); Amasya, Samsun, İzmir, İstanbul, Diyarbakır (ex Aslan & Özbek, 1999); Artvin, Erzurum (Aslan & Özbek, 1999). **Range:** SE Europe, Caucasus, Asia Minor, Near East and Central Asia (Warchalowski, 2003). **Chorotype:** Turano-Mediterranean. **Remarks:** Until now, it has been reported only from N, W, C and SE Turkey. It is reported for the first time for the Mediterranean region in Turkey.

Chrysolina orientalis (Olivier, 1807)

Material examined: Hatay: Dörtyol, Kuzuculu, 119 m, N 36 54 E 36 13, 07.04.2006, 2 specimens, Entry of Belen, Çakallı, 652 m, N 36 28 E 36 13, 19.05.2006, 1 specimen; **Osmaniye**: Kalecik-Hasanbeyli road, 679 m, N 37 09 E 36 28, 19.05.2006, 2 specimens. **Distribution in Turkey:** Amasya (Weise, 1884); Konya (Bodemeyer, 1900); İstanbul, Bilecik, Bursa, Afyon (Bechyne, 1952); Asia Minor, S Turkey (Warchalowski, 1976, 2003). **Range:** Greece, Turkey, Lebanon, Israel (Warchalowski, 2003). **Chorotype:** Turano-Mediterranean. **Remarks:** The species has three subspecies (incl. nominative subspecies) in the world. It is represented by two subspecies, the nominative subspecies and *C. orientalis thraeissa* Bechyne, 1950 in Turkey. The examined materials in this work belong to the subspecies *C. orientalis thraeissa* Bechyne, 1950. Until now, it has been reported only from N, NW and C Turkey. It is reported for the first time for the Mediterranean region in Turkey.

Prasocuris junci (Brahm, 1790)

Material examined: Gaziantep: Nurdağı, Gökçedere village, 496 m, N 37 09 55 E 36 43 10, 17.05.2007, 1 specimen; **Osmaniye**: Bahçe, Kabacalı village, 722m, N 37 11 57 E 36 36 05, 02.06.2007, 1 specimen. **Distribution in Turkey:** Gümüşhane, Samsun (Tomov & Gruev, 1975); Asia Minor (Warchalowski, 1976); Afyon, Ankara, Eskişehir, Kayseri, Kırşehir, Konya, Muğla, Nevşehir, Sivas, Yozgat, Samsun, Erzurum (Aslan & Özbek, 1999). **Range:** W, C and S Europe, S Turkey, Azerbaijan (Warchalowski, 2003). **Chorotype:** W-Palaearctic. **Remarks:** Until now, it has been reported only from N, W and C Turkey. It is reported for the first time both for the Mediterranean region in Turkey.

Subfamily GALERUCINAE

Galeruca pomonae (Scopoli, 1763)

Material examined: Osmaniye: Entry of Yarpuz, 930 m, N 37 03 E 36 25, 18.05.2006, 17 specimens, Zorkun, Karıncalı-Hassa road, Küllü plateau, 1603 m, N 36 57 E 36 21, 25.06.2006, 8 specimens, Zorkun road, Karacalar village, 381 m, N 37 02 E 36 16, 24.06.2006, 1 specimen, Küllü-Islahiye road, Hınzırlı plateau, 1620 m, N 36 57 E 36 25, 25.06.2006, 1 specimen. **Distribution in Turkey:** Konya (Bodemeyer, 1900); Çankırı (Tomov & Gruev, 1975); Asia Minor (Warchalowski, 1976); Erzurum (Aslan, 1998); Rize (Aslan et al., 2000). **Range:** From portugal and Ireland to Central Asia, intruduced also in N America (Warchalowski, 2003). **Chorotype:** W-Palaearctic + Nearctic. **Remarks:** Until now, it has been reported only from N and C Turkey. It is reported for the first time both for the Mediterranean region in Turkey and the whole S Turkey.

Calomicrus lividus (Joannis, 1866)

Material examined: Osmaniye: Kuşcubeli pass, 1134 m, N 37 06 675 E 36 36 525, 19.05.2006, 19 specimens. **Distribution in Turkey:** Asia Minor (Laboissière, 1912; Warchalowski, 1976); Erzurum (Aslan, 1998); Erzincan, Kars (Aslan et al., 2000). **Range:** E Turkey, Syria and Lebanon (Warchalowski, 2003). **Chorotype:** E-Mediterranean (Palaestino-Taurian). **Remarks:** Until now, it has been reported only from NE Turkey. It is reported for the first time both for the Mediterranean region in Turkey and the whole S Turkey.

Subfamily ALTICINAE

Altica quercetorum Foudras, 1860

Material examined: Osmaniye: Bıçakçı village, 293 m, N 37 09 35 E 36 17 22, 21.04.2007, 1 specimen. **Distribution in Turkey:** Turkey (Acatay, 1963); İstanbul (Tomov & Gruev, 1975); Asia Minor (Warchalowski, 1976). **Range:** In Europe from N Spain, Netherlands and S Norway to basin of Volga, also in Asia Minor, Caucasus (Warchalowski, 2003). **Chorotype:** European. **Remarks:** Until now, it has been reported only from N Turkey. It is reported for the first time both for the Mediterranean region in Turkey and the whole S Turkey.

Psylliodes hyoscyami (Linnaeus, 1758)

Material examined: Hatay: Akbez, 527 m, N 36 51 10 E 36 32 13, 18.05.2007, 1 specimen. **Osmaniye**: Düziçi, Yarbaş, 376 m, N 37 11 01 E 36 25 04, 02.06.2007, 1 specimen. **Distribution in Turkey:** Asia Minor (Warchalowski, 1976); Bayburt, Erzurum (Aslan et at., 1999). **Range:** Transpalaearctic species, from British Isles to Russian Far East and in European part of Mediterranean area (Warchalowski, 2003). **Chorotype:** Sibero-European. **Remarks:** Until now, it has been reported only from N Turkey. It is reported for the first time both for the Mediterranean region in Turkey and the whole S Turkey.

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PRELIMINARY REPORT ON THE FULGOROMORPHA (HEMIPTERA) FAUNA OF KEMALİYE (ERZİNCAN) WITH A NEW RECORD FOR TURKEY

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[**Demir, E.** 2009. Preliminary report on the Fulgoromorpha (Hemiptera) fauna of Kemaliye (Erzincan) with a new record for Turkey. Munis Entomology & Zoology, 4 (1): 280-286]

ABSTRACT: In this study, 227 samples of Fulgoromorpha species collected from Kemaliye (Erzincan) region in east Turkey during field studies in the years 2006-2007 are examined 29 species belonging to 9 families are found to be distributed in the region. Among these, 12 species belong to the Family Cixiidae, 5 species to Delphacidae, 1 species to Meenoplidae, 1 species to Derbidae, 1 species to Dictyopharidae, 5 species to Tettigometridae, 1 species to Caliscelidae, 2 species to Issidae and 1 species to Ricaniidae. Distribution of these species in Turkey and their host plants are given along with their locality records. 27 of these examined species are new records for Kemaliye, 20 are new records for Erzincan, 7 are new records for East Anatolien and *Tettigometra laeta* Herrich-Schäffer, 1835 is a new record for Turkey's fauna.

KEY WORDS: Hemiptera, Fulgoromorpha, fauna, new record, Turkey.

Kemaliye is a district where the Fırat River passes through the middle of it placed in South Erzincan in East Anatolia. It is between 38° 15' - 39° 0' east longitude and 39° 30' – 39° 0' north latitude. It has different properties than the general structure of the East Anatolian Region in terms of flora and fauna because of having local climatical regions.

In the study of Lodos and Kalkandelen (1980-1988) in Turkey Auchenorrhyncha list 14 Fulgoromorph records from Erzincan and 2 records from Kemaliye were given. In the result of scanning present literature it is seen that there is not any record from related region except Lodos and Kalkandelen.

With this study the determination of fauna of the Kemaliye region is given by analysing collected specimens.

MATERIAL AND METHODS

Field studies were carried out in the years 2006 and 2007. 227 adult Fulgoromorpha specimens were collected and analyzed. Samples were collected by sweeping the herbaceous plants with a wood shaft net. The host plants of samples collected from only one species of herbaceous plant, tree or bush by wood shaft net were determined. Hemipterans, which were found in the wood shaft net after sweeping the plants, were vacuumed with an aspirator. The samples in the aspirator were then killed in ethyl acetate in a jar and put in standard envelopes. These samples were brought to the lab in envelopes and prepared according to standard methods to produce museum material.

RESULTS

It was found that there were 29 species of Fulgoromorpha suborder in the study area. Along with their distribution in Turkey and the plants found to be their host, the examined materials of these species are given as a list, below.

Suborder: Fulgoromorpha Evans, 1946
Family: Cixiidae Spinola, 1839
Subfamily: Cixiinae Spinola, 1839
Tribe: Cixiini Spinola, 1839

Cixius* (*Ceratocixius*) *pallipes Fieber, 1876
Distribution in Turkey: Adıyaman, Afyon, Ankara, Antalya, Artvin, Aydın, Balıkesir, Çanakkale, Diyarbakır, Erzincan (BahçeliVillage), Erzurum, Gaziantep, Giresun, Gümüşhane, Hakkari, Yüksekova, İzmir, Konya, Kütahya, Malatya, Mardin, Muğla, Ordu, Urfa (Lodos & Kalkandelen, 1980a; Dlabola, 1981; Demir, 2007a). **Materials:** Kemaliye: Yuva Village, 03.06.2007, 1♂, 970 m, Yeşilyayla Village (Subaşı), 04.06.2007, 2♂♂, 1350 m, Kekikpınarı Village (Köprü), 06.07.2006, 1♀, 1320 m.

Cixius* (*Ceratocixius*) *remotus Edwards, 1888
Distribution in Turkey: Adana, Ankara, Antalya, Erzurum, Konya (Kalkandelen, 1988; Demir, 2007a, 2007b). **Materials:** Kemaliye: Sarıçiçek (Subatan), 11.06.2006, 1♂, 8♀♀, 1890 m, Salihli Village (Opposite of Dump), 09.07.2006, 1♀, 1500 m, Sarıçiçek (Subatan), 02.06.2007, 5♂♂, 5♀♀, 1890 m.

Tachycixius bidentifer Dlabola, 1971
Distribution in Turkey: Adana, Gaziantep, Hakkari, İçel, Kahramanmaraş, Mardin (Dlabola, 1971; Kalkandelen, 1988). **Materials:** Kemaliye: Yeşilyayla Village (Subaşı), 04.06.2007, 1♀, 1350 m.

Tribe: Duiliini
Duilius fasciata (Horvath, 1894)
Distribution in Turkey: Çankırı, Erzincan (Kalkandelen, 1989). **Materials:** Kemaliye: Yeşilyamaç Village (Geşo Pass), 08.07.2006, 1♂, 1670 m.

Duilius seticulosus (Lethierry, 1874)
Distribution in Turkey: Antalya, Erzincan (Ilıç), Kahramanmaraş, Nevşehir (Kalkandelen, 1989; Lodos & Kalkandelen, 1988; Demir, 2007a). **Materials:** Kemaliye: Rabat River (Tunceli border), 03.07.2007, 3♂♂, 1♀ on *Tamarix*.

Tribe: Pentastirini Emeljanov, 1971

Pentastiridius* (*s. str.*) *leporinus (Linnaeus, 1761)
= *latifrons* Walker, 1851 = *pallens* Germar, 1818 = *pallida* Herrich-Schäffer, 1835.
Distribution in Turkey: Adana, Ağrı, Ankara, Antalya, Aydın, Bitlis, Çankırı, Diyarbakır, Erzurum, Hatya, İçel, Kars, Konya, Kahramanmaraş, Mardin, Nevşehir, Niğde (Fahringer, 1922; Lodos & Kalkandelen, 1980; Kalkandelen, 1990; Demir, 2007a). **Materials:** Kemaliye: Yuva Village, 03.06.2007, 3♂♂, 3♀♀, 970 m.

Setapius barajus (Dlabola, 1957)
Distribution in Turkey: Adana, Ağrı, Ankara, Bursa, Denizli, Diyarbakır, Elazığ, Erzincan (BahçeliVillage), Erzurum, Gümüşhane, İçel, İzmir, Iğdır, Malatya, Mardin, Muş, Nevşehir, Samsun, Sinop, Siirt, Sivas, Uşak (Linnavuori, 1965; Lodos & Kalkandelen, 1980a; Dlabola, 1981; Kalkandelen, 1990). **Materials:** Kemaliye: Rabat River (Tunceli border), 03.07.2007, 1♂, Salihli Village (Opposite of Dump), 09.07.2006, 1♂, 2♀♀, 1500 m.

Reptalus (s. str.) horridus (Linnavuori, 1962)
= *zercanus* Dlabola, 1965.
Distribution in Turkey: Adana, Ankara, Antalya, İzmir (Kalkandelen, 1994; Demir, 2007a, 2007b). **Materials:** Kemaliye: Sarıçiçek (Mazman Well), 07.07.2006, 2♂♂, 1♀, 1690 m, Yeşilyamaç Village (Geşo Pass), 08.07.2006, 1♂, 1670 m, Yuva Village, 08.07.2006, 1♂, 930 m.

Reptalus (s. str.) melanochaetus (Fieber, 1876)
Distribution in Turkey: Ankara, Artvin, Aydın, Bilecik, Diyarbakır, Edirne, Erzurum, Giresun, Hatay, Isparta, İzmir, İstanbul, Kırklareli, Kırşehir, Muğla, Tekirdağ (Linnvuori, 1965; Lodos & Kalkandelen, 1980a; Kalkandelen, 1994). **Materials:** Kemaliye: Sarıçiçek (Mazman Well), 07.07.2006, 5♂♂, 1690 m, Kabataş Village (İkisu Place), 03.06.2007, 1♀, 1550 m.

Hyalesthes luteipes Fieber, 1879
Distribution in Turkey: Ankara, Antalya, Aydın, Çorum, Diyarbakır, İçel, İstanbul, Kayseri, Kırşehir, Konya, Kahramanmaraş, Karaman, Nevşehir, Yozgat, Zonguldak (Linnvuori, 1965; Lodos & Kalkandelen, 1980a; Dlabola, 1981; Hoch & Remane, 1985; Kalkandelen, 2000; Demir, 2007a). **Materials:** Kemaliye: Yeşilyamaç Village (Geşo Pass), 08.07.2006, 1♂, 2♀♀,1670 m.

Hyalesthes mlokosiewiczi Signoret, 1879
Distribution in Turkey: Adana, Adıyaman, Afyon, Ankara, Antalya, Aydın, Bilecik, Burdur, Çankırı, Diyarbakır, Gaziantep, Isparta, İzmir, Kahramanmaraş, Kilis, Malatya, Mardin, Muğla, Siirt, Şırnak, Tokat, Urfa (Lodos & Kalkandelen, 1980a; Dlabola, 1981; Kalkandelen, 2000; Demir, 2007a). **Materials:** Kemaliye: Yuva Village, 03.06.2007, 1♂, 970 m, Kekikpınar Village, 06.07.2006, 1♂, 1070 m, Kırkgöz, 08.07.2006, 1♀, 1300 m on *Salix*, Yuva Village, 08.07.2006, 1♀, 930 m.

Hyalesthes obsoletus Signoret, 1865
= *albolimbatus* Kirschbaum, 1868.
Distribution in Turkey: Adıyaman, Afyon, Ağrı, Ankara, Antalya, Aydın, Balıkesir, Bolu, Burdur, Çanakkale, Çankırı, Çorum, Diyarbakır, Düzce, Elazığ, Erzincan (BahçelikVillage, Demirpınar), Erzurum, Eskişehir, Gaziantep, Giresun, Hakkari, Iğdır, Isparta, İçel, İstanbul, Kahramanmaraş, Kars, Konya, Malatya, Manisa, Mardin, Muğla, Nevşehir, Ordu, Rize, Sakarya, Sinop, Sivas, Tokat, Trabzon, Urfa, Van (Fahringer, 1922; Lodos & Kalkandelen, 1980a; Dlabola, 1981; Hoch & Remane, 1985; Kalkandelen, 2000; Demir, 2007a). **Materials:** Sarıçiçek (Subatan), 07.07.2006, 4♂♂, 1♀, 1890 m.

Family: Delphacidae Leach, 1815
Subfamily: Kelisiinae
Kelisia ribauti Wagner, 1938
= *guttula* auct.
Distribution in Turkey: Ankara, Antalya, Bitlis, Diyarbakır, Erzurum, Hakkari, Sinop, Van (Lodos & Kalkandelen, 1980b; Güçlü, 1996; Demir, 2007a). **Materials:** Kemaliye: Kabataş Village (İkisu Place), 03.06.2007, 3♂♂, 1♀, 1550 m.

Subfamily: Delphacinae Leach, 1815
Tribe: Delphacini Leach, 1815
Dicranotropis (Leimonodite) beckeri Fieber 1866
Distribution in Turkey: Ankara (Asche, 1982; Demir, 2007a). **Materials:** Kemaliye: Yeşilyayla Village (Hınsoy), 04.06.2007, 13♂♂, 18♀♀, 1500 m, Yeşilyayla Village (Subaşı),

04.06.2007, 1♀, 1350 m, Sarıçiçek (Mazman Well), 02.06.2007, 1♂, 2♀♀, 1650 m, Çanakçı Village, 02.06.2007, 2♂♂, 3♀♀, 1400 m.

Chloriana unicolor (Herrich-Schaffaer, 1835)
= *canariensis* Lindberg, 1954 = *edwardsi* Le Quesne, 1960 = *oranensis* Matsumura, 1910
Distribution in Turkey: Ankara, Erzurum (Lodos & Kalkandelen, 1980b; Güçlü, 1996). **Materials:** Kemaliye: Rabat River (Tunceli border), 03.07.2007, 4♂♂, 1♀.

Laodelphax striatellus (Fallen, 1826)
= *akashiensis* Matsumura, 1900 = *devastans* Matsumura, 1900 = *fimbriata* Rey, 1894 = *giffuensis* Matsumura, 1900 = *haupti* Lindberg, 1936 = *lateralis* Fieber, 1879 = *maikoensis* Matsumura, 1900 = *minonensis* Matsumura, 1900 = *nipponica* Matsumura, 1900 = *niveopicta* Haupt, 1927 = *reyana* Metcalf, 1943.
Distribution in Turkey: Adıyaman, Ankara, Antalya, Diyarbakır, Erzincan, Erzurum, Iğdır, İçel, İzmir, Kahramanmaraş, Malatya, Muğla, Nevşehir, Niğde, Ordu, Rize, Şırnak (Lodos & Kalkandelen, 1980b; Dlabola, 1981; Güçlü, 1996; Demir, 2007a). **Materials:** Kemaliye: Sarıçiçek (Subatan), 02.06.2007, 2♀♀, 1890 m, Yeşilyamaç Village (Geşo Pass), 11.06.2006, 1♂, 1689 m.

Toya propinqua (Fieber, 1866)
= *cataniae* Matsumura, 1910 = *hamatula* Kirschbaum, 1868 = *marshalli* Scott, 1873 = *shirozui* Ishihara, 1949 = *subfusca* Muir, 1919 = *terminalis* Van Duzee, 1907 = *tuckeri* Van Duzee, 1912.
Distribution in Turkey: Adana, Afyon, Amasya, Ankara, Antalya, Aydın, Çanakkale, Denizli, Diyarbakır, Erzurum, Gaziantep, Hatay, Kastamonu, Mardin, Mersin, Muğla, Ordu, Samsun, Siirt, Sinop (Linnavuori, 1965; Lodos & Kalkandelen, 1980b; Güçlü, 1996; Demir, 2007a). **Materials:** Kemaliye: Kabataş Village (Pınarbaşı Well), 25.09.2006, 1♀, 1640 m, Munzur Mountain (Doymuş Top), 04.06.2007, 1♂, 2350 m.

Family: Meenoplidae Fieber, 1872
Subfamily: Meenoplinae Fieber, 1872
Meenoplus albosignatus Fieber, 1866
Distribution in Turkey: Adıyaman, Ankara, Antalya, Bolu, Hakkari, Malatya, Mardin, Muş (Linnavuori, 1965; Lodos & Kalkandelen, 1980c; Demir, 2007a). **Materials:** Kemaliye: Kocaçimen Village (Silk Road), 04.07.2007, 3 ♂♀, 1300 m on *Quercus*, Ocak Village, 06.07.2006, 6♂♀, 1480 m, Ocak Village-Kuşak Village, 10.06.2006, 2♂♀, 1025 m on *Quercus*, Yeşilyamaç Village (Geşo Park), 11.06.2006, 1♂♀, 1320 m on *Salix*.

Family: Derbidae Spinola, 1839
Subfamily: Derbinae Spinola, 1839
Tribe: Cenchreini
Malenia bosnica (Horvath, 1907)
Distribution in Turkey: Mardin (Lodos & Kalkandelen, 1980c). **Materials:** Kemaliye: Yuva Village, 03.06.2007, 1♀, 970 m, Başpınar (Konsar Village), 04.06.2007, 1♂, 1468 m, Kuşak Village (Dere), 06.07.2006, 1♂, 1070 m on *Salix*.

Family: Dictyopharidae Spinola, 1839
Subfamily: Dictyopharinae Spinola, 1839
Dictyophara (Euthremma) multireticulata Mulsant et Rey, 1855
= *heydenii* Kirschbaum, 1868 = *curvata* Matsumura, 1910 = *nemourensis* Matsumura, 1910 = *oertzeni* Matsumura, 1910.
Distribution in Turkey: Ankara, Antalya, Denizli, Van (Lodos & Kalkandelen, 1980c; Demir, 2006, 2007a). **Materials:** Kemaliye: Ocak Village, 06.07.2006, 2♂♂, 1480 m, Kırkgöz, 08.07.2006, 1♂, 1300 m.

Family: Tettigometridae Germar, 1821
Tettigometra (Hystrigonia) hexaspina Kolenati, 1857
= *callosa* Signoret, 1866 = *hispidula* Fieber, 1865

Distribution in Turkey: Ağrı, Ankara, Antalya, Gaziantep, Giresun, Isparta, Tekirdağ, Urfa (Lodos & Kalkandelen, 1980c; Demir, 2007a). **Materials:** Kemaliye: Ocak Village-Kuşak Village, 10.06.2006, 3♂♀, 1025 m.

Tettigometra (Mitricephalus) leucophaea (Preyssler 1792)

= *obliqua* Panzer, 1799

Distribution in Turkey: Adıyaman, Ağrı, Ankara, Antalya, Bilecik, Bolu, Burdur, Çanakkale, Çankırı, Çorum, Diyarbakır, Elazığ, İstanbul, İzmir, Mardin, Nevşehir, Sivas, Tekirdağ, Urfa (Linnavuori, 1965; Lodos & Kalkandelen, 1980c; Demir, 2007a). **Materials:** Kemaliye: Sarıçiçek (Subatan), 04.07.2007, 3♂♀, 1890 m, Karanlık Canyon (Venkağ Top), 09.07.2006, 1♂♀, 1400-1680 m.

***Tettigometra laeta* Herrich-Schäffer, 1835**

= *lepida* Fieber, 1876

Distribution in Turkey: This species is the first record in Turkey. **Materials:** Kemaliye: Sarıçiçek (Subatan), 11.06.2006, 1♂♀, 1890 m, Karanlık Canyon (Venkağ Top), 09.07.2006, 1♂♀, 1400-1680 m, Sarıçiçek (Subatan), 07.07.2006, 1♂♀, 1890 m, Salihli Village (Opposite of Dump), 09.07.2006, 2♂♀, 1500 m, Başpınar (Konsar Village), 04.06.2007, 1♂♀, 1468 m.

Tettigometra* (*s. str.*) *sulphurea Mulsant et Rey, 1855

Distribution in Turkey: Antalya, Artvin, Aydın, Bilecik, Bursa, Diyarbakır, Elazığ, İzmir, Kütahya, Nevşehir, Sakarya, Urfa, Uşak, Van (Lodos & Kalkandelen, 1980c; Demir, 2007a). **Materials:** Kemaliye: Rabat River (Tunceli border), 03.07.2007, 1♀ on *Fraxinus*, Salihli Village (Opposite of Dump), 09.07.2006, 1♂, 1500 m.

Tettigometra* (*s. str.*) *virescens (Panzer, 1799)

= *dorsalis* Latreille, 1804

Distribution in Turkey: Adana, Adıyaman, Ankara, Antalya, Diyarbakır, Elazığ, Erzincan (Kemaliye), Gaziantep, Hatay, Iğdır, Mardin, Tunceli, Urfa, Van (Lodos & Kalkandelen, 1980c; Demir, 2007a). **Materials:** Salihli Village (Opposite of Dump), 09.07.2006, 1♂, 1500 m.

Family: Caliscelidae
Subfamily: Caliscelinae
Tribe: Caliscelini

Peltonotellus punctifrons Horváth 1895

= *melichari* Horvath, 1897

Distribution in Turkey: Ankara, Kırşehir, Yozgat (Dlabola, 1957; Kartal, 1985; Demir, 2007b). **Materials:** Kemaliye: Sarıçiçek (Subatan), 04.07.2007, 1♂, 1890 m, Karanlık Canyon (Venkağ Top), 09.07.2006, 1♀, 1400-1680 m.

Family: Issidae Spinola, 1839
Subfamily: Issinae Spinola, 1839
Tribe: Issini

Scorlupella discolor (Germar, 1821)

Distribution in Turkey: Ankara, Yozgat (Dlabola., 1957; Kartal, 1985; Demir, 2006). **Materials:** Kemaliye: Sarıçiçek (Mazman Well), 02.06.2007, 2♂♂, 3♀♀, 1650 m, Kabataş Village (İkisu Place), 03.06.2007, 1♀, 1550 m.

Scorlupella montana (Becker, 1865)

= *arundinis* Becker, 1865

Distribution in Turkey: Ankara, Erzincan, Kars, Yozgat (Lodos & Kalkandelen, 1981a; Kartal, 1985; Demir, 2006). **Materials:** Kemaliye: Yeşilyayla Village (Hınsoy), 04.06.2007, 21♀♀, 1500 m, Sarıçiçek (Subatan), 02.06.2007, 1♀, 1890 m, Sarıçiçek (Mazman Well), 02.06.2007, 18♀♀, 1650 m, Sarıçiçek (Subatan), 11.06.2006, 8♀♀, 1890 m, Sarıçiçek (Subatan), 11.06.2006, 13♀♀, 1890 m, Sarıçiçek (Mazman Well), 04.07.2007, 3♀♀, 1650 m, Sarıçiçek (Mazman Well), 07.07.2006, 1♀, 1690 m, Karanlık Canyon (Venkağ Top), 09.07.2006, 1♀, 1400-1680 m, Sarıçiçek (Subatan), 07.07.2006, 2♀♀, 1890 m.

Family: Ricaniidae Amyot et Serville, 1843
Ricania aylae Dlabola, 1983

Distribution in Turkey: Elazığ, Muğla, Muş (Dlabola, 1983). **Materials:** Kemaliye: Yuva Village, 23.09.2006, 1♀, 970 m on *Ficus carica*.

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SCIENTIFIC NOTE

A NEW NAME, *ASLIHANA* FOR THE PREOCCUPIED MOTH GENUS *ECPHYSIS* FLETCHER, 1979 (LEPIDOPTERA: GEOMETRIDAE)

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[Özdikmen, H. 2009. A new name, *Aslıhana* for the preoccupied moth genus *Ecphysis* Fletcher, 1979 (Lepidoptera: Geometridae). Munis Entomology & Zoology 4 (1): 287-288**]**

One proposed genus name in the order Lepidoptera is nomenclaturally invalid, as the genus group name has already been used by a different author in Hymenoptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

Order LEPIDOPTERA

Family GEOMETRIDAE
Genus *ASLIHANA* nom. nov.

Ecphysis Fletcher, 1979. In Nye [Ed.] The generic names of moths of the world. Vol. 3. Geometroidea. Publications Br. Mus. nat. Hist. No. 812: 69. (Insecta: Lepidoptera: Geometroidea: Geometridae: Larentiinae). Preoccupied by *Ecphysis* Townes, 1969. Mem.Am.ent.Inst. No.11: 202. (Insecta: Hymenoptera: Ichneumonoidea : Ichneumonidae: Cryptinae: Claseini).

Remarks on nomenclatural change: The neotropical genus *Ecphysis* was erected by Townes (1969) with the type species *Ecphysis cyanea* Townes, 1969 from Chile in Hymenoptera. It is still used as a valid genus name. Subsequently, the Australian moth genus name *Ecphysis* was proposed by Fletcher (1979) as an objective replacement name for *Probolaea* Turner, 1943 that was preoccupied by *Probolaea* Meyrick, 1886 (Lepidoptera) with the type species *Probolaea roboginosa* Turner, 1943 by monotypy in Geometridae. Thus the moth genus name *Ecphysis* Fletcher, 1979 is a junior homonym of the valid genus name *Ecphysis* Townes, 1969. So I propose here that *Ecphysis* Fletcher, 1979 should be replaced with the new name *Aslihana*, as a replacement name.

Etymology: The name is dedicated to my student Aslıhan Begüm Gökçınar (Turkey).

Summary of nomenclatural changes:

Aslihana **nom. nov.**
pro *Ecphysis* Fletcher, 1979 (non Townes, 1969)

Aslihana roboginosa (Turner, 1943) **comb. nov.**
from *Ecphysis roboginosa* (Turner, 1943)
Probolaea roboginosa Turner, 1943

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SCIENTIFIC NOTE

A SUBSTITUTE NAME FOR A GENUS OF FOSSIL NEUROPTERA

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[Özdikmen, H. 2009. A substitute name for a genus of fossil Neuroptera. Munis Entomology & Zoology 4 (1): 289-290**]**

One proposed genus name in fossil Neuroptera is nomenclaturally invalid, as the genus group name has already been used by a different author in Trilobita. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

Order NEUROPTERA
Family POLYSTOECHOTIDAE
Genus *PANFILOVDVIA* nom. nov.

Kasachstania Panfilov in Dolin & Pritikina, 1980. [Fossil insects of the Mesozoic.] Inst. Zool., Akad. Nauk ukrain. SSR, Naukova Dumka, Kiev: 94. (Insecta: Neuroptera: Hemerobioidea: Polystoechotidae). Preoccupied by *Kasachstania* Maksimova, 1971. In Nalivkin (Ed.). The boundary between the Silurian and the Devonian etc. Trans.III Internat.Symp. 1: 147. Vses. nauch.-issled. geol. Inst., Akad.Nauk SSSR, Minist.goel.SSSR, Leningrad. (Trilobita: Phacopida: Phacopina: Dalmanitoidea: Dalmanitidae).

Remarks on nomenclatural change: Firstly, the trilobite genus *Kasachstania* was described by Maksimova (1971) with the type species *Dalmanites saryarkensis* Maksimova, 1960 from Kokbaytel Stage, Kazakhstan. It is still used as a available valid genus name in the family Dalmanitidae (e. g. Jell & Adrain, 2003).

Subsequently, the fossil neuropteran genus *Kasachstania* was established by Panfilov (1980) with the type species *Kasachstania fasciata* Panfilov, 1980 by original designation from the Late Jurassic of Kazakhstan. Also, it is still used as a valid generic name in the family Polystoechotidae (e. g. Makarkin & Archibald, 2005; Archibald & Makarkin, 2006).

Thus the genus *Kasachstania* Panfilov, 1980 is a junior homonym of the valid genus name *Kasachstania* Maksimova, 1971. So I propose here that *Kasachstania* Panfilov, 1980 should be replaced with the new name *Panfilovdvia*, as a replacement name.

Etymology: The name is dedicated to D. V. Panfilov who is the current author of the preexisting genus *Kasachstania*.

Summary of nomenclatural changes:

Panfilovdvia **nom. nov.**
pro *Kasachstania* Panfilov, 1980 (non Maksimova, 1971)

Panfilovdvia fasciata (Panfilov, 1980) **comb. nov.**
from *Kasachstania fasciata* Panfilov, 1980

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SCIENTIFIC NOTE

A NEW NAME, *PICOMICROLYCUS* FOR THE PREOCCUPIED BEETLE GENUS *MICROLYCUS* PIC, 1922 (COLEOPTERA: LYCIDAE)

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[**Özdikmen, H.** 2009. A new name, *Picomicrolycus* for the preoccupied beetle genus *Microlycus* Pic, 1922 (Coleoptera: Lycidae). Munis Entomology & Zoology 4 (1): 291-292]

One proposed genus name in the family Lycidae is nomenclaturally invalid, as the genus group name has already been used by a different author in Hymenoptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

Order COLEOPTERA

Family LYCIDAE
Genus *PICOMICROLYCUS* nom. nov.

Microlycus Pic, 1922. Échange, 38, no. 409, 22. (Insecta: Coleoptera: Lycidae). Preoccupied by *Microlycus* Thomson, 1878. Hym. Scandin., 5, 253. (Insecta: Hymenoptera: Chalcidoidea: Eulophidae: Eulophinae).

Remarks on nomenclatural change: The genus *Microlycus* was established by Thomson (1878) with the type species *Microlycus heterocerus* Thomson, 1878 in Hymenoptera. It has currently 9 species as *Microlycus biroi* Erdös, 1951; *Microlycus collaris* Szelényi, 1980; *Microlycus erdoesi* Boucek, 1959; *Microlycus gyorfii* (Erdös, 1954); *Microlycus harcalo* (Walker, 1852); *Microlycus heterocerus* Thomson, 1878; *Microlycus pulcherrimus* Kerrich, 1969; *Microlycus scaurus* Askew, 2001 and *Microlycus virens* Erdös, 1951. Subsequently, the beetle genus *Microlycus* was described by Pic (1922) with the type species *Microlycus minutus* Pic, 1922 in Lycidae. Thus the beetle genus name *Microlycus* Pic, 1922 is a junior homonym of the valid genus name *Microlycus* Thomson, 1878. So I propose here that *Microlycus* Pic, 1922 should be replaced with the new name *Picomicrolycus*, as a replacement name.

Etymology: The name is dedicated in honor of the famous coleopterist M. Pic (France).

Summary of nomenclatural changes:

Picomicrolycus **nom. nov.**
pro *Microlycus* Pic, 1922 (non Thomson, 1878)

Picomicrolycus minutus (Pic, 1922) **comb. nov.**
from *Microlycus minutus* Pic, 1922

Picomicrolycus mexicanus (Bacakova, 2001) **comb. nov.**
from *Microlycus mexicanus* Bacakova, 2001

LITERATURE CITED

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Kazantsev, S. V. 2006. A review of the genera *Microlycus* Pic, 1922 and *Teroplas* Gorham, 1884 (Coleoptera: Lycidae). Russian Entomological Journal, 14 (4): 275–280.

Pic, M. **1922**. L'**Echange**. Vol.**38**. No.409. p. 22.

Thomson, C. G. 1878. Hymenoptera Scandinaviae 5. Pteromalus (Svederus) continuatio: 307 pp.

SCIENTIFIC NOTE

A SUBSTITUTE NAME FOR A PREOCCUPIED GENUS OF SPRINGTAILS (COLLEMBOLA)

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[Özdikmen, H. 2009. A substitute name for a preoccupied genus of springtails (Collembola). Munis Entomology & Zoology 4 (1): 293-294**]**

One proposed genus name in springtails is nomenclaturally invalid, as the genus group name has already been used by a different author in Echinodermata. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

TAXONOMY

Family NEANURIDAE
Genus *CASSAGNAUA* nom. nov.

Pectinura Cassagnau, 1983. Nouvelle Revue Ent. 13 (1): 18. (Insecta: Collembola: Poduromorpha: Neanuroidea: Neanuridae: Neanurinae: Lobellini). Preoccupied by *Pectinura* Forbes, 1843. Proc. Linn. Soc. London, 1 (17), 167. (Echinodermata: Asterozoa: Stelleroidea: Ophiuroidea: Ophiurida: Ophiurina: Ophiodermatidae).

Remarks on nomenclatural change:

Cassagnau (1983) proposed the generic name *Pectinura* as a genus of springtails with the type species *Womersleya hongkongensis* Yosii, 1976 from Victoria peak, Hongkong. It is still used as a valid genus name.

Unfortunately, the generic name was already preoccupied by Forbes (1843), who had proposed the genus name *Pectinura* as a echinoderm genus with the type species *Pectinura vestita* Forbes, 1843. It is still used as a valid genus name (e. g. Hansson, 2001, Stöhr & O'Hara, 2008). In this genus, many species has been described by various authors until now. However, most of the species was transfered by different authors in the other valid genera. So, according to Stöhr & O'hara (2008), the genus *Pectinura* Forbes, 1843 has four species currently as *Pectinura angulata* Lyman, 1883; *Pectinura honorata* Koehler, 1904; *Pectinura verrucosa* Studer, 1876 and *Pectinura vestita* Forbes, 1843.

Thus, the genus group name *Pectinura* Cassagnau, 1983 is a junior homonym of the generic name *Pectinura* Forbes, 1843. So I propose a new replacement name *Cassagnaua* **nom. nov.** for *Pectinura*

Cassagnau, 1983. The name is dedicated to P. Cassagnau who is current author of the preexisting genus *Pectinura*.

Summary of nomenclatural changes:

Cassagnaua **nom. nov.**
pro *Pectinura* Cassagnau, 1983 (non Forbes, 1843)

Cassagnaua hongkongensis (Yosii, 1976) **comb. nov.**
from *Pectinura hongkongensis* (Yosii, 1976)
Womersleya hongkongensis Yosii, 1976

LITERATURE CITED

Cassagnau, P. 1983. Un nouveau modèle phylogénétique chez les Collemboles Neanurinae. Nouv. Rev. Ent., 13 (1): 3-27.

Forbes, E. 1843. Report on the molluscs and radiata of the Aegean Sea and on their distribution considered as bearing on geology. Rept. Brit. Acad. Adv. Sci., 13: 130-93.

Hansson, H. G. 2001. Echinodermata, In: Costello, M. J. et al. (Ed.) (2001). European register of marine species: a check-list of the marine species in Europe and a bibliography of guides to their identification. Collection Patrimoines Naturels, 50: 336-351.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Stöhr, S. & O'Hara, T. 2007. World Ophiuroidea database. Available online at http://www.marinespecies.org/ophiuroidea. Consulted on 2008-08-06.

SCIENTIFIC NOTE

A NEW NAME, *ISOYVESIA* FOR THE PREOCCUPIED ISOPOD GENUS *YVESIA* COINEAU & BOTOSANEANU, 1973 (CRUSTACEA: ISOPODA)

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[Özdikmen, H. 2009. A new name, *Isoyvesia* for the preoccupied Isopod genus *Yvesia* Coineau & Botosaneanu, 1973 (Crustacea: Isopoda). Munis Entomology & Zoology 4 (1): 295-296**]**

One proposed genus name in the order Isopoda is nomenclaturally invalid, as the genus group name has already been used by a different author in Porifera. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

Order ISOPODA

Family MICROCERBERIDAE
Genus *ISOYVESIA* nom. nov.

Yvesia Coineau & Botosaneanu, 1973. In Orghidan, Nunez Jimenez, et al. (Eds). Resultats Exped. biospeleol. Cubano Roum. Cuba 1: 209. (Crustacea: Malacostraca: Eumalacostraca: Peracarida: Isopoda: Microcerberoidea: Microcerberidae). Preoccupied by *Yvesia* Topsent, 1890. Bull. Soc. zool. France, 15, 29. (Porifera: Demospongiae: Poecilosclerida: Myxillina: Crellidae: *Crella*).

Remarks on nomenclatural change: The genus group name *Yvesia* was proposed by Topsent (1890) with the type species *Halichondria albula* Bowerbank, 1866 in porifera. *Yvesia* Topsent, 1890 is a subgenus of the genus *Crella* Gray, 1867 in the family Crellidae. It has currently 15 species as *Crella (Yvesia) albula* (Bowerbank, 1866); *Crella (Yvesia) dispar* (Topsent, 1927); *Crella (Yvesia) fallax* (Topsent, 1890); *Crella (Yvesia) gracilis* (Alander, 1942); *Crella (Yvesia) guernei* (Topsent, 1890); *Crella (Yvesia) hanseni* (Topsent, 1890); *Crella (Yvesia) linguifera* (Topsent, 1890); *Crella (Yvesia) mamillata* (Arnesen, 1903); *Crella (Yvesia) nodulosa* Sarà, 1959; *Crella (Yvesia) pertusa* (Topsent, 1890); *Crella (Yvesia) pyrula* (Carter, 1876); *Crella (Yvesia) richardi* (Topsent, 1890); *Crella (Yvesia) ridleyi* (Topsent, 1890); *Crella (Yvesia) rosea* (Topsent, 1890) and *Crella (Yvesia) topsenti* (Babiç, 1922).

Subsequently, the monotypic isopod genus *Yvesia* was described by Coineau & Botosaneanu (1973) with the type species *Yvesia striata* Coineau & Botoseneanu, 1973 in Crustacea. Thus the genus name *Yvesia*

Coineau & Botosaneanu, 1973 is a junior homonym of the valid genus group name *Yvesia* Topsent, 1890. So I propose here that *Yvesia* Coineau & Botosaneanu, 1973 should be replaced with the new name *Isoyvesia*, as a replacement name.

Etymology: from the Latin prefix "iso-" (meaning "equal" in English) + the preexisting genus name *Yvesia*.

Summary of nomenclatural changes:

Isoyvesia **nom. nov.**
pro *Yvesia* Coineau & Botosaneanu, 1973 (non Topsent, 1890)

Isoyvesia striata (Coineau & Botosaneanu, 1973) **comb. nov.**
from *Yvesia striata* Coineau & Botosaneanu, 1973

LITERATURE CITED

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Ooghidan, T., Nunez-Jimenez, A., Botosaneanu, L., Decou, V., Negrea, S. & Vina-Bayes, N. (Eds). 1973. Résultats des expéditions biospéologiques cubano-roumaines à Cuba. Volume 1. Academiei Republicii Socialiste România, Bucarest, 424 pp.

Topsent, E. 1890. Notice préliminaire sue les spongiaires recueillis durant les campagnes de l'Hirondelle (1886-1887-1888), Golfe de Gascogne, Acores, Terre-Neuve. Bulletin de la SociétéZoologique de France, 15: 26-32.

SCIENTIFIC NOTE

SUBSTITUTE NAMES FOR TWO GENERA OF HARPACTICOIDA (CRUSTACEA: COPEPODA)

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[**Özdikmen, H.** 2009. Substitute names for two genera of Harpacticoida (Crustacea: Copepoda). Munis Entomology & Zoology 4 (1): 297-298]

Two proposed genus names in Copepoda is nomenclaturally invalid, as the genus group names have already been used by different authors in Phoronida and Trilobita. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus names.

Order HARPACTICOIDA
Family HUNTEMANNIIDAE
Genus *DAHMSOPOTTEKINA* nom. nov.

Talpina Dahms & Pottek, 1992. Microfauna Mar 7: 28. (Crustacea: Copepoda: Neocopepoda: Podoplea: Harpacticoida: Huntemanniidae). Preoccupied by *Talpina* Hagenow, 1840. N. Jahrb. f. Min., 1840, 670. (Phoronida: Phoronidae).

Remarks on nomenclatural change: Firstly, the phoronid ichnogenus *Talpina* was erected by Hagenow (1840). It is still used as an available valid genus name in the family Phoronidae. Subsequently, the copepod genus *Talpina* was established by Dahms & Pottek (1992) with the type species *Talpina curticauda* (Becker, Noodt & Schriever, 1979 by original designation in the family Cletodidae. Also, it is still used as a valid generic name in the family Huntemanniidae. Thus the genus *Talpina* Dahms & Pottek, 1992 is a junior homonym of the valid genus name *Talpina* Hagenow, 1840. So I propose here that *Talpina* Dahms & Pottek, 1992 should be replaced with the new name *Dahmsopottekina*, as a replacement name.

Etymology: The name is dedicated to H. U. Dahms and M. Pottek who are current authors of the preexisting genus *Talpina*.

Summary of nomenclatural changes:

Dahmsopottekina **nom. nov.**
  pro *Talpina* Dahms & Pottek, 1992 (non Hagenow, 1840)
Dahmsopottekina bathyalis (Dahms & Pottek, 1992) **comb. nov.**
  from *Talpina bathyalis* Dahms & Pottek, 1992
Dahmsopottekina bifida (Schriever, 1984) **comb. nov.**
  from *Talpina bifida* (Schriever, 1984)
Dahmsopottekina curticauda (Becker, Noodt & Schriever, 1979) **comb. nov.**
  from *Talpina curticauda* (Becker, Noodt & Schriever, 1979)
Dahmsopottekina fodens (Dahms & Pottek, 1992) **comb. nov.**
  from *Talpina fodens* Dahms & Pottek, 1992
Dahmsopottekina furcispina (Dahms & Pottek, 1992) **comb. nov.**
  from *Talpina furcispina* Dahms & Pottek, 1992
Dahmsopottekina micracantha (Gamo, 1981) **comb. nov.**
  from *Talpina micracantha* (Gamo, 1981)

Dahmsopottekina noodti (Dahms & Pottek, 1992) **comb. nov.**
from *Talpina noodti* Dahms & Pottek, 1992
Dahmsopottekina pacifica (Becker, Noodt & Schriever, 1979) **comb. nov.**
from *Talpina pacifica* (Becker, Noodt & Schriever, 1979)
Dahmsopottekina pectinata (Dahms & Pottek, 1992) **comb. nov.**
from *Talpina pectinata* Dahms & Pottek, 1992
Dahmsopottekina peruana (Becker, Noodt & Schriever, 1979) **comb. nov.**
from *Talpina peruana* (Becker, Noodt & Schriever, 1979)
Dahmsopottekina talpa (Becker, Noodt & Schriever, 1979) **comb. nov.**
from *Talpina talpa* (Becker, Noodt & Schriever, 1979)

Family MIRACIIDAE
Genus *MUOHUYSIA* nom. nov.

Hicksia Mu & Huys, 2002. Cah. Biol. Mar. 43 (2): 204. (Crustacea: Copepoda: Neocopepoda: Podoplea: Harpacticoida: Miraciidae). Preoccupied by *Hicksia* Delgado, 1904. Commiss. Serv. geol. Portugal, Commun., 5 (2), 327. (Trilobita: Corynexochida: Corynexochina: Dorypygidae).

Remarks on nomenclatural change: The genus *Hicksia* was described by Delgado (1904) with the type species *Hicksia elvensis* Delgado, 1904 in Trilobita from Haut Alemtejo, Portugal. Subsequently, the monotypic copepod genus *Hicksia* was erected by Mu & Huys (2002) with the type species *Hicksia xylophila* (Hicks, 1988) in Crustacea. Thus the genus name *Hicksia* Mu & Huys, 2002 is a junior homonym of the valid genus name *Hicksia* Delgado, 1904. So I propose here that *Hicksia* Mu & Huys, 2002 should be replaced with the new name *Muohuysia*, as a replacement name.

Etymology: The name is dedicated to F. H. Mu and R. Huys who are the current authors of the preexisting genus *Hicksia*.

Summary of nomenclatural changes:
Muohuysia **nom. nov.**
pro *Hicksia* Mu & Huys, 2002 (non Delgado, 1904)
Muohuysia xylophila (Hicks, 1988) **comb. nov.**
from *Hicksia xylophila* (Hicks, 1988)

LITERATURE CITED

Dahms, H. U. & Pottek, M. 1992. Metahuntemannia Smirnov, 1946 and Talpina gen. nov. (Copepoda, Harpacticoida) from the deep-sea of the high Antarctic Weddell Sea with a description of eight new species. Microfauna Marina, 7: 7-78.

Delgado, J. F. N. 1904. Faune Cambrienne du Haut-Alemtejo (Portugal). Comunicacoes da Commissao dos Trabalhos Servico Geologico de Portugal, 5: 307-374.

von Hagenow, F. 1840. Monographie der Rügen'schen Kreideversteinerungen. Abtheilung 2. Radiarien und Annulaten nbest Nachträge zur I. Abtheilung. Neues Jahrbuch für Mineralogie, Geognosie Geologie und Petrefactenkunde, 1840:631-672.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Mu, F.-H. & Huys, R. 2002. New species of Stenhelia (Copepoda, Harpacticoida, Diosaccidae) from the Bohai Sea (China) with notes on subgeneric division and phylogenetic relationships. Cah. Biol. Mar., 43 (2): 179-206.

SCIENTIFIC NOTE

PLATNICKNIA NOM. NOV., A NEW NAME FOR THE PREOCCUPIED SPIDER GENUS *BRYANTINA* BRIGNOLI, 1985 (ARANEAE: PHOLCIDAE)

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[**Özdikmen, H. & Demir, H.** 2009. *Platnicknia* nom. nov., a new name for the preoccupied spider genus *Bryantina* Brignoli, 1985 (Araneae: Pholcidae). Munis Entomology & Zoology 4 (1): 299-300]

One proposed genus name in the spider family Pholcidae is nomenclaturally invalid, as the genus group name has already been used by a different author in Diptera. In accordance with Article 60 of the International Code of Zoological Nomenclature, we propose a substitute name for this genus name.

Family PHOLCIDAE
Genus *PLATNICKNIA* nom. nov.

Bryantina Brignoli, 1985. Bulletin Br. arachnol. Soc. 6 (9): 380. (Arachnida: Araneae: Pholcidae). Preoccupied by *Bryantina* Malloch, 1926. Philippine J. Sci., 31, 506. (Insecta: Diptera: Muscidae).

Remarks on nomenclatural change: The monotypic orientalic genus *Bryantina* was firstly introduced by Malloch (1926) with the type species *Bryantina javensis* Malloch, 1926 from Java (Indonesia) in Diptera. It is still used as a valid genus name.

Subsequently, the neotropical spider genus name *Bryantina* was proposed by Brignoli (1985) as an objective replacement name for *Bryantia* Mello-Leitão, 1946 that preoccupied by *Bryantia* Schaus, 1922 (Lepidoptera) with the type species *Systenita coxana* Bryant, 1940 in Pholcidae. Also, it is still used as a valid generic name in Pholcidae (Platnick, 2008).

Thus the spider genus name *Bryantina* Brignoli, 1985 is a junior homonym of the valid genus name *Bryantina* Malloch, 1926. So we propose here that *Bryantina* Brignoli, 1985 should be replaced with the new name *Platnicknia*, as a replacement name.

Etymology: The name is dedicated to the well known arachnologist Norman I. Platnick (USA).

Summary of nomenclatural changes:

Platnicknia **nom. nov.**
pro *Bryantina* Brignoli, 1985 (non Malloch, 1926)

Platnicknia coxana (Bryant, 1940) **comb. nov.**
from *Bryantina coxana* (Bryant, 1940)
Bryantia coxana (Bryant, 1940)
Systenita coxana Bryant, 1940

Platnicknia incerta (Bryant, 1940) **comb. nov.**
from *Bryantina incerta* (Bryant, 1940)
Bryantia incerta (Bryant, 1940)
Systenita incerta Bryant, 1940

LITERATURE CITED

Brignoli, P. M. 1985. On some generic homonymies in spiders (Araneae). Bull. Br. arachnol. Soc. 6: 380.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Malloch, J. R. 1926. Notes on Oriental Diptera, with descriptions of new species. Philipp. J. Sci. 31: 491-512.

Mello-Leitão, C. F. de. 1946. Notas sobre os Filistatidae e Pholcidae. Anais Acad. bras. Cienc. 18: 39-83.

Platnick, N. I. 2008a. The world spider catalog, Version 9.0. Fam. Pholcidae. Last updated May 6, 2008. Available from: http://research.amnh.org/entomology/spiders/catalog/PHOLCIDAE.html

ON TURKISH *CERAMBYX* LINNAEUS, 1758 WITH ZOOGEOGREPHICAL REMARKS (COLEOPTERA: CERAMBYCIDAE: CERAMBYCINAE)

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[Özdikmen, H. & Turgut, S. 2009. On Turkish *Cerambyx* Linnaeus, 1758 with zoogeogrephical remarks (Coleoptera: Cerambycidae: Cerambycinae). Munis Entomology & Zoology 4 (2): 301-319**]**

ABSTRACT: All taxa of the genus *Cerambyx* Linnaeus, 1758 in Turkey and the whole world are evaluated. The genus is also discussed in detail. The main aim of this catalogic work is to clarify current status of the genus in Turkey. New faunistical data are given in the text.
A key for Turkish *Cerambyx* species is also given in the text.

KEY WORDS: *Cerambyx,* Cerambycinae, Cerambycini, Cerambycidae.

Subfamily CERAMBYCINAE Latreille, 1802

Tribe CERAMBYCINI Latreille, 1802

= Cerambycina Latreille, 1804
= Cérambyçaires Mulsant, 1839
= Cérambycitae verae Thomson, 1860
= Cerambycites Fairmaire, 1864
= Cerambycina Thomson, 1866
= Cérambycides virais Lacordaire, 1869
= Sphallotrichina Martins & Monné, 2002

Type genus: *Cerambyx* Linnaeus, 1758

The size is large in general. It has brown reddish coloration, slightly brilliant. Head is more or less salient. It is projecting, with very pronounced furrows. Antennae are variable length and long in general, the segments are either smoothed and hornlike or flattened or streamlined. The eyes are large, strongly cut away. They present strong necklines and very rude facets. The maxillary palpus has triangular last segment; tongue membranous, strongly bilobed. The protorax is rugulose, in general it has conspicuous teeth laterally. It is wrinkled or pleated from side to side. The elytra are long, subparallel or cuneiform and they are covered with a thin hairiness. Front femora globulose, angled or not outside. Intermadiate coxal cavity opened. The claws are long and robust. The tribe is wide in distribution, almost cosmopolitan or subcosmopolitan, more abundant in the tropical regions (Villiers, 1978; Vives, 2000).

The tribe includes currently at least 77 genera as *Aeolesthes* Gahan, 1890; *Allodisus* Schwarzer, 1926; *Amphelictus* Bates, 1884; *Atiaia* Martins & Monné, 2002; *Bolbotritus* Bates, 1871; *Bothrocerambyx* Schwarzer, 1929; *Butherium* Bates, 1870; *Calocerambyx* Heller, 1905; *Calpazia* Pascoe, 1857; *Cerambolbus* Quentin & Villier, 1979; *Cerambyx* Linnaeus, 1758; *Cevaeria* Tavakilian, 2003; *Coelodon* Audinet-Serville, 1832; *Coelodoniella* Adlbauer, 2005; *Coleoxestia* Aurivillius, 1912; *Criodion* Audinet-Serville, 1833; *Cyriopalus* Pascoe, 1866;

Derolus Gahan, 1891; *Derolydnus* Hüdepohl, 1989; *Dialeges* Pascoe, 1856; *Dissopachys* Reitter, 1886; *Djabiria* Duvivier, 1891; *Dymasius* Thomson, 1864; *Elydnus* Pascoe, 1869;*Falsoxoanodera* Pic, 1923; *Gibbocerambyx* Pic, 1923; *Hamaticherus* Audinet-Serville, 1834; *Hirtobrasilianus* Fragoso & Tavakilian, 1958; *Hoplocerambyx* Thomson, 1864; *Imbrius* Pascoe, 1866; *Ischionorox* Aurivillius, 1922; *Jebusaea* Reiche, 1877; *Juiaparus* Martins & Monné, 2002; *Jupoata* Martins & Monné, 2002; *Lachnopterus* Thomson, 1864; *Macrambyx* Fragoso, 1982; *Margites* Gahan, 1891; *Massicus* Pascoe, 1867; *Melathemma* Bates, 1870; *Metacriodion* Fragoso, 1970; *Micrambyx* Kolbe, 1893; *Mimosebasmia* Pic, 1946; *Nadezhdiella* Plavilstshikov, 1931; *Neocerambyx* Thomson, 1860; *Neoplocaederus* Sama, 1991; *Ochrodion* Fragoso, 1982; *Opsamates* Waterhouse, 1879; *Pachydissus* Newman, 1838; *Paracriodion* Fragoso, 1982; *Parasphallenum* Fragoso, 1982; *Peruanus* Tippmann, 1960; *Plocaederus* Megerle in Dejean, 1835; *Pneumida* J.Thomson, 1864; *Poeciloxestia* Lane, 1965; *Potiaxixa* Martins & Monné, 2002; *Prosphilus* Thomson, 1864; *Pseudaeolesthes* Plavilstshikov, 1931; *Ptycholaemus* Chevrolat, 1858; *Rhytidodera* White, 1853; *Sebasmia* Pascoe, 1859; *Sphallambyx* Fragoso, 1982; *Sphallenopsis* Fragoso, 1981; *Sphallenum* Bates, 1870; *Sphallopterus* Fragoso, 1982; *Sphallotrichus* Fragoso, 1982; *Tapinolachnus* Thomson, 1864; *Taurotagus* Lacordaire, 1869; *Teraschema* Thomson, 1860; *Trachylophus* Gahan, 1888; *Trirachys* Hope, 1841; *Utopia* Thomson, 1864; *Xenopachys* Sama, 1999; *Xestiodion* Fragoso, 1981; *Xoanodera* Pascoe, 1857; *Xoanotrephus* Hüdepohl, 1989; *Zatrephus* Pascoe, 1857 and *Zegriades* Pascoe, 1869. *Diorthus* Gahan, 1891 is a synonym of *Tapinolachnus* Thomson, 1864. The tribe is represented by only one genus, *Cerambyx* Linnaeus, 1758 in Turkey.

Genus *CERAMBYX* Linnaeus, 1758

= *Hamaticherus* Dejean, 1821 (Type sp.: *Cerambyx heros* Scopoli, 1763)
= *Hammaticherus* Germar, 1824
= *Hammaticherus* Redtenbacher, 1845
= *Hammatochaerus* Bach, 1856
= *Microcerambyx* Miksic & Georgijevic, 1973
= *Mesocerambyx* Zagaikevitch, 1991

Type species: *Cerambyx cerdo* Linnaeus, 1758

Body length is large generally. It is approximately between 17 and 56 mm.

Head is large, robust, elongated and deeply grooved medially. Eyes very distant from mandibules, into rude facets, deeply incurved. Antennae are long to very long, basal antennal segments swollen apically, distal segments somewhat flattened laterally with a feeble carina. Pronotum is transverse with lateral tooth, transversely wrinkled or ridged on disc, anteriorly narrower than the base. The prosternum expands to the apex. Elytra are long, slightly tapering posteriorly, with or without sutural spines. Femora are long, flattened laterally. First segment of hind tarsi is almost so long as following two segments (Villiers, 1978; Bily & Mell, 1989; Vives, 2000).

Larval and pupal developments are in broadleaf trees (e.g. *Prunus, Crateagus, Quercus, Juglans, Ceratonia, Platanus, Fagus, Castanea, Carpinus, Betula, Ulmus, Salix, Populus, Syringa, Tilia, Corylus, Malus, Amygdalus, Pyrus, Vitis, Acer* etc.) (Bense, 1995; Sama, 2002).

Larva characterized by large body, inconspicuous hairy cover on abdominal pleura, large spiracles laterally on abdominal segment I, which are not smaller than on mesothorax (Cherepanov, 1990).

Pupation is in wood. Life cycle is 2-4 years (Bense, 1995; Sama, 2002; Hoskovec & Rejzek, 2009).

The main aim of this work is to clarify current status of the genus in Turkey and the world. 26 species have been known in the world fauna as *Cerambyx apiceplicatus* Pic, 1941; *C. bifasciatus* Linnaeus, 1767; *C. carinatus* (Küster, 1846); *C. castaneus* Voet, 1778; *C. cerdo* Linnaeus, 1758; *C. clavipes* Forster, 1771; *C. dux* (Faldermann, 1837); *C. elbursi* Jurecek, 1924; *C. fasciatus* Voet, 1778; *C. ferrugineus* Goeze, 1777; *C. heinzianus* Demelt, 1976; *C. juvencus* Linnaeus, 1767; *C. klinzingi* Podany, 1964; *C. lucidus* Olivier, 1790; *C. miles* Bonelli, 1823; *C. multiplicatus* Motschulsky, 1859; *C. nodulosus* Germar, 1817; *C. paludivagus* (Lucas, 1842); *C. petechizans* Voet, 1778; *C. praepes* Voet, 1778; *C. quadripunctatus* Fabricius, 1801; *C. rufus* Voet, 1806; *C. scopolii* Füsslins, 1775; *C. surinamensis* Voet, 1778; *C. umbraticus* Olivier, 1795 and *C. welensii* (Küster, 1846). However, Monné & Hovore (2002, 2005), Monné et al., (2007) and Monné & Bezark (2009) stated the species, *C. castaneus* Voet, 1778 (America); *C. clavipes* Forster, 1771 (North America); *C. ferrugineus* Goeze, 1777 (America); *C. lucidus* Olivier, 1790 (America); *C. praepes* Voet, 1778 (America); *C. rufus* Voet, 1806 (America) and *C. umbraticus* Olivier, 1795 (Fr Guiana), as uncertain identity. According to Monné & Bezark (2009), *C. bifasciatus* Linnaeus, 1767 is a synonym of *Hileolaspis auratus* (Linnaeus, 1758) in the tribe Mallaspini. Also, Monné & Bezark (2009) never includes the species, *Cerambyx fasciatus* Voet, 1778; *C. juvencus* Linnaeus, 1767; *C. petechizans* Voet, 1778; *C. quadripunctatus* Fabricius, 1801 and *C. surinamensis* Voet, 1778. With the same approach, Vives (2000) mentioned that the tribe Cerambicini is missing in North America. Since, the taxa names of Voet (1778) are incertae sedis.

As the same above, Newman (1850)'s Australian taxa names, *Cerambyx lativitta* and *C. subserratus*, given by Aurivillius (1912) and Zicha (2009) are also incertae sedis.

So, as mentioned by Vives (2000), we can say that *Cerambyx* Linnaeus, 1758 is a genus distributed in Western Palaearctic Region. It is represented by thirteen species there.

In addition to this, 3 more or less wide spread species have subspecies. These are: *Cerambyx cerdo cerdo* Linnaeus, 1758; *C. cerdo acuminatus* Motschulsky, 1852; *C. cerdo iranicus* Heyrovský, 1951; *C. cerdo mirbecki* (Lucas, 1842); *C. cerdo pfisteri* Stierlin, 1864; *C. welensii welensii* (Küster, 1846); *C. welensii centurio* Czawallina, 1841; *Cerambyx scopolii scopolii* Füsslins, 1775 and *C. scopolii nitidus* Pic, 1892.

The endemic species are *Cerambyx apiceplicatus* Pic, 1941 to Iraq, *C. elbursi* Jurecek, 1924 to Iran, *C. heinzianus* Demelt, 1976 to Turkey, *klinzingi* Podany, 1964 to Caucasus and *C. paludivagus* (Lucas, 1842) to North Africa. Recently, *C. scopolii paludivagus* (Lucas, 1842) was raised by Sama (2008) to species level again. Sama (2008) stated that "*C. paludivagus was originally described as a distinct species (Lucas, 1842), then (Lucas, 1846) regarded as "une varieté du C.*

cerdo" [very likely C. cerdo Scopoli (not Linnaeus), currently C. scopolii Fuesslins, 1775]. It is, in facts, a distinct species, more similar to C. multiplicatus Motschulsky, 1860 than to C. scopolii, not a variety of the latter as stated by Pic (1893, 1896), Normand (1937), Vives (2000) or an aberration (Plavilsthsikov, 1931), or a subspecies (Villiers, 1946)". He also mentioned that this species is only known from Tunisia and Algeria, not in southern Spain. Other species in this genus are more or less wide spread in Western Palaearctic Region.

In Europe, this genus includes seven species as *C. carinatus* (Küster, 1846); *C. cerdo* Linnaeus, 1758; *C. dux* (Faldermann, 1837); *C. miles* Bonelli, 1823; *C. nodulosus* Germar, 1817; *C. scopolii* Füsslins, 1775 and *C. welensii* (Küster, 1846). All species occur also in Turkey.

Demelt (1976) presented a key for Anatolian *Cerambyx* species with the description of the species *Cerambyx heinzianus*. He gave 8 species (6 species plus 2 subspecies) without any exact locality in his key for Anatolia as *Cerambyx cerdo acuminatus, C. dux, C. heinzianus, C. miles, C. multiplicatus, C. nodulosus, C. scopolii nitidus* and *C. velutinus* (= *C. welensii*).

The first record of *Cerambyx carinatus* (Küster, 1846) in Turkey was given by Demelt (1963). Surprisingly, the species was not present for Turkey in Demelt (1976). Demelt (1976) included *C. multiplicatus* Motschulsky, 1859 but any record of this species has been known for Turkey. *C. multiplicatus* is distributed only in Caucasus (Azerbaijan, Georgia) and Iran.

As seen in the present text, however, 8 species (6 species plus 4 subspecies) are known to occur in Turkey in real as *Cerambyx carinatus* (Küster, 1846); *C. cerdo cerdo* Linnaeus, 1758; *C. cerdo acuminatus* Motschulsky, 1852; *C. dux* (Faldermann, 1837); *C. heinzianus* Demelt, 1976; *C. miles* Bonelli, 1823; *C. nodulosus* Germar, 1817; *C. scopolii scopolii* Füsslins, 1775; *C. scopolii nitidus* Pic, 1892 and *C. welensii welensii* (Küster, 1846).

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al. (1999). In the text, as far as possible as one chorotype description can be identified for each taxon.

It is widely accepted that the genus includes currently 2 subgenera as *Cerambyx* Linnaeus, 1758 and *Microcerambyx* Miksic & Georgijevic, 1973. The subgenus *Microcerambyx* includes three species as *C. elbursi* Jurecek, 1924; *C. multiplicatus* Motschulsky, 1859 and *C. scopolii* Füsslins, 1775. Other species belong to the nominative subgenus. Both subgenera are represented in Turkey.

Subgenus *CERAMBYX* Linnaeus, 1758

Type species: *Cerambyx cerdo* Linnaeus, 1758

The subgenus is represented by 7 species in Turkey.

carinatus Küster, 1846

Original combination: *Hammaticherus carinatus* Küster, 1846

Material examined: Ankara prov.: Güdül, 17.05.2002, 1 specimen, leg. H. Batur; Ankara prov.: Beytepe, 850 m, 07.07.2002, 2 specimens, leg. Y. Durmuş [These materials has never been published, but they mentioned in Özdikmen et al. (2009) under the title records in Ankara wrongly].
Records in Turkey: Denizli prov. (Schimitschek, 1944); Aydın prov.: Germencik (Demelt, 1963; Gül-Zümreoğlu, 1972); Denizli prov.: Sarayköy (Gül-Zümreoğlu, 1975); Turkey (Lodos, 1998; Alkan & Eroğlu, 2001; Özdikmen et al., 2005); Manisa prov.: Muradiye, İzmir prov.: Kemalpaşa (Tezcan & Rejzek, 2002).

Range: Europe (Croatia & Bosnia-Herzegovina, Serbia, Macedonia, Montenegro, Crete, Bulgaria, Malta), Turkey, Iran.

Chorotype: Turano-Mediterranean (Turano-Balkan)

Remarks: The species is distributed only from Croatia to Iran. Generally rare but locally it may be quite abundant. The first record of this species in Turkey was given by Demelt (1963). Surprisingly, the species was not present for Turkey in Demelt (1976).

cerdo Linnaeus, 1758
ssp. ***cerdo*** Linnaeus, 1758
?ssp. ***mirbecki*** Lucas, 1842
?ssp. ***acuminatus*** Motschulsky, 1852
?ssp. ***pfisteri*** Stierlin, 1864
?ssp. ***iranicus*** Heyrovský, 1951

Original combination: *Cerambyx cerdo* Linnaeus, 1758

Other names. *heros* Scopoli, 1763; *luguber* Voet, 1778; *manderstjernae* Mulsant & Godart, 1855.

Material examined: Konya prov.: Taşkent-Alanya road: 80 km to Alanya, 1482 m, N 36 46 E 32 27, 19-28.07.2006, 1 specimen, Hadim, Beyreli village env., 1322 m, N 36 47 E 32 26, 14.06.2007, 1 specimen, Hadim-Alanya road, 70 km to Alanya, 1298 m, N 36 45 E 32 27, 30. 07. 2007, 1 specimen; Osmaniye prov.: Mitisin plateau, N 36 58 E 36 21, 1402 m, 08.2006, 2 specimens, 07.07.2007, 1 specimen.

Records in Turkey: Hatay prov.: Akbez as *C. cerdo acuminatus* (Fairmaire, 1884); İçel prov.: Bolkar Mountains (Bodemeyer, 1906); İstanbul prov.: Belgrad forest (Acatay, 1943); İstanbul prov.: Bosphorus region (Belgrad Forest), Sinop prov.: Ayancık (Schimitschek, 1944); Turkey as *C. heros* (Alkan, 1946); Turkey (Acatay, 1948, 1961, 1963, 1968; Erdem, 1968; Danilevsky & Miroshnikov, 1985; Önder et al., 1987; Althoff & Danilevsky, 1997; Sama, 2002); Bursa prov.: near Soğukpınar (Çanakçıoğlu, 1956); Sakarya prov.: Sapanca (Nizamlıoğlu, 1957); Antalya prov.: near Aspendos (Belkıs) as *C. cerdo acuminatus* (Demelt & Alkan, 1962); Antalya prov.: Aspendos, İstanbul prov.: Polonez village as *C. cerdo acuminatus* (Demelt, 1963); İstanbul prov. as *C. cerdo acuminatus* (Villiers, 1967; Sama, 1982); Muğla prov.: Milas (Gül-Zümreoğlu, 1972); Kocaeli prov.: İzmit (Sapanca) (İren & Ahmed, 1973); Muğla prov.: Milas, İzmir prov.: Bergama / Bornova (Gül-Zümreoğlu, 1975); İstanbul prov.: Belgrad Forest, Sinop prov., Bursa prov., Muğla prov., İzmir prov. (Erdem & Çanakçıoğlu, 1977;

Çanakçıoğlu, 1983); İstanbul prov.: Belgrad Forest (Öymen, 1987); Tunceli prov., İstanbul prov.: Üsküdar as *C. cerdo acuminatus* (Adlbauer, 1988); İstanbul prov., Kastamonu prov., Sinop prov., Bursa prov., Muğla prov., İzmir prov., Kahramanmaraş prov. (Kanat, 1998); İstanbul prov.: Belgrad Forest, Bursa prov., Kastamonu prov., Sinop prov.: Ayancık, İzmir prov.: various parts, Muğla prov.: Milas (Lodos, 1998); Niğde prov.: Ulukışla, Adana prov.: Pozantı (Ulusoy et al., 1999); Adıyaman prov.: Karadut village as *C. cerdo acuminatus* (Rejzek & Hoskovec, 1999); Tunceli prov. as *C. cerdo acuminatus* (Tauzin, 2000); Artvin prov.: Ardanuç (Tepedüzü village) (Alkan & Eroğlu, 2001); İzmir prov.: Kemalpaşa (Armutlu) as *C. cerdo acuminatus* (Tezcan & Rejzek, 2002); Antalya prov.: Alanya (Çayarası), Kırklareli prov.: İğneada-Saka lake (Sivriler village) (Özdikmen & Çağlar, 2004); Ankara prov.: Hacıkadın, Kayseri prov. (Özdikmen et al., 2005); Kahramanmaraş prov.: Pazarcık, Kırklareli prov.: Demirköy / İslambeyli, İstanbul prov.: Şile, Sinop prov. as *C. cerdo acuminatus* (Malmusi & Saltini, 2005); Çanakkale prov.: Central (Kordonboyu), Sinop prov.: Türkeli as *C. cerdo acuminatus* (Özdikmen, 2006); Samsun prov.: Central (Çobanlı village), Ankara prov.: Kayaş (Bayındır dam env.), Osmaniye prov.: Mitis's plateau (Özdikmen & Demir, 2006); Kahramanmaraş prov.: Pazarcık (Bağdınısağır) (Özdikmen & Okutaner, 2006); Denizli prov., Bartın prov.: Gafhar district (Özdikmen & Şahin, 2006); Artvin prov.: Şavşat, Şırnak prov.: Central (Özdikmen, 2007); Manisa prov.: Kırkağaç (Tezcan & Can, 2009); Ankara prov.: Kayaş (Özdikmen et al., 2009).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Sardinia, Malta, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, Czechia, Slovakia, Poland, Sweden, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia), North Africa (Algeria, Morocco, Tunisia), Caucasus, Transcaucasia, Near East, Turkey, Iran, Iraq, Israel, Palestine, Syria, Lebanon, Jordan.

Chorotype: Turano-Europeo-Mediterranean

Remarks: It is the most wide spread species of the genus *Cerambyx*. It is also widely distributed in Turkey. The species is represented by two subspecies in Turkey as *C. cerdo cerdo* Linnaeus, 1758 and *C. cerdo acuminatus* Motschulsky, 1852. Materials of this work belongs to the nominative subspecies. It is the first record for Konya province. The species has 5 subspecies in the world as *C. cerdo acuminatus* (Motschulsky, 1852) (in Turkey, Lebanon, Syria, Iran, Crimea, Armenia), *C. cerdo pfisteri* Stierlin, 1864 (in Sicily, ?Italy, ?Malta, ?Greece), *C. cerdo mirbecki* Lucas, 1842 (Portugal, Spain, Algeria, Morocco, Tunisia), *C. cerdo iranicus* Heyrovský, 1951 (Iran) and the nominative *C. cerdo cerdo*. In Sama (2002), he did not accept as distinct subspecies *C. cerdo acuminatus* (Motschulsky, 1852) and *C. cerdo pfisteri* Stierlin, 1864 due to large variability of *C. cerdo* in the size and body shape. We share the same idea, as seen above because of the known data of *C. cerdo acuminatus* (Motschulsky, 1852) in Turkey is unavailable to the allopatric distribution rule of subspecies theoretically. Vives (2000) mentioned that in the whole Iberian peninsula, the species *C. cerdo* is represented by the subspecies *C. cerdo mirbecki* (Lucas, 1842) that was described in North Africa. According to Sama (2002), the status and distribution of *C. cerdo mirbecki* is unclear. He stated that "*specimens from central Morocco as well as specimens from Spain* *which I have seen are indistinguishable from C. cerdo cerdo from central and western Europe*". So, we share the approach of Danilevsky (2009a) on this subject. According to this approach, "Different populations of *Cerambyx cerdo* do not show distinct differentiations on subspecies level in real. Since the species, *C. cerdo,* has a large variability in the size and body shape".

dux Faldermann, 1837

Original combination: *Hammaticherus dux* Faldermann, 1837

Other names: *orientalis* Küster, 1846; *thirki* Küster, 1846; *intricatus* Fairmaire, 1848; *nodosus* Mulsant, 1863.

Material examined: Osmaniye prov.: Central, 150 m, 19.05.2006, 1 specimen; Kahramanmaraş prov.: Pazarcık, Bağdınısağır district, N 37 35 E 36 46, 787 m, 29.06.2006, 2 specimens, Pazarcık, Central, 07.06.2007, 4 specimens, 20.06.2007, 8 specimens.

Records in Turkey: Hatay prov.: Akbez (Fairmaire, 1884); Antalya prov.: Toros Mountains, Niğde prov.: Çamardı (Bodemeyer, 1900); İçel prov.: Bolkar Mountains (Bodemeyer, 1906); İstanbul prov.: Belgrad Forest (Acatay, 1943); Turkey (Alkan, 1946; Erdem, 1968; Avidov & Harpaz, 1969; Çanakçıoğlu, 1983; Danilevsky & Miroshnikov, 1985; Önder et al., 1987; Sama & Rapuzzi, 2000 Özdikmen & Şahin, 2006); Central Anatolia, Hatay prov.: Dörtyol (Bodenheimer, 1958); İzmir prov.: Bornova, Kayseri prov. (Demelt, 1963); Kahramanmaraş prov., Hatay prov.: Dörtyol (Nizamlıoğlu & Gökmen, 1964); Denizli prov.: Sarayköy (Tuatay et al., 1972); İzmir prov.: Bornova (Gül-Zümreoğlu, 1972); Southern Anatolia, Northern Anatolia, Marmara Region (İren & Ahmed, 1973); Denizli prov.: Sarayköy (Gül-Zümreoğlu, 1975); Van prov.: Tatvan, Bingöl prov.: Kuruca pass (Adlbauer, 1988); İzmir prov., Denizli prov., Kayseri prov., Mediterranean Region, Aegean Region (Lodos, 1998); Niğde prov.: Ulukışla, Adana prov.: Pozantı (Ulusoy et al., 1999); Adıyaman prov.: Karadut village (Rejzek & Hoskovec, 1999); Tunceli prov.: Pülümür, Hatay prov.: Antakya (Tauzin, 2001); Antalya prov.: Central / Gazipaşa, Bilecik prov.: Central, Bingöl prov.: Central / Solhan (Buğlan pass), Burdur prov.: Central, Bursa prov.: Central / Uludağ, Elazığ prov.: Central, Erzincan prov.: Kemaliye (Sandıklı), Erzurum prov.: İspir, Hatay prov.: Cırtıman / İskenderun (Denizciler), Isparta prov.: Eğirdir, İçel prov.: Anamur, İzmir prov.: Kemalpaşa, Kars prov.: Sarıkamış (Karakurt), Kastamonu prov.: Central, Konya prov.: Güneysınır (Gürağaç) / Seydişehir, Malatya prov.: Central, Niğde prov.: Bor, Osmaniye prov.: Çiftmazı / Olukbaşı, Tokat prov.: Central (Tozlu et al., 2002); Adana prov., Ankara prov. (Özdikmen et al., 2005); Gaziantep prov.: Kuşçubeli pass / Islahiye (Kabaklar village / Köklü village), Hatay prov.: İskenderun (entry of Kurtbağı village, Üçgüllük) (Özdikmen & Demirel, 2005); Kahramanmaraş prov.: Pazarcık (Bağdınısağır / Sakarkaya village, Kısık / Botaş) / Çağlayancerit (Bozlar) / Nurhak (Nurhak-Malatya road, Tatlar) (Özdikmen & Okutaner, 2006); Kırklareli prov.: İğneada (Özdikmen & Demir, 2006); Niğde prov.: between Balcı-Aktaş villages (Özdikmen, 2006); Erzincan prov.: Kemaliye, Muğla prov.: Marmaris and Fethiye (Özdikmen, 2007).

Range: Europe (Macedonia, Bulgaria, Crimea), Caucasus, Transcaucasia, Turkey, Iran, Syria, Israel, Lebanon, Jordan.

Chorotype: Turano-Mediterranean (Turano-Balkan).

Remarks: It distributes widely in Turkey.

heinzianus Demelt, 1976

Original combination: *Cerambyx heinzianus* Demelt, 1976

Records in Turkey: Type loc.: Turkey, Bingöl prov.: Solhan (Demelt, 1976); Bitlis prov.: Tatvan, Bingöl prov.: Solhan (Adlbauer, 1988); Bitlis prov.: Reşadiye (Tauzin, 2001); Bitlis prov.: Güroymak (Malmusi & Saltini, 2005).

Range: Turkey.

Chorotype: Anatolian.

Remarks: It is endemic to Turkey. It is distributed in east Turkey. According to some authors, it may be a synonym of *C. klinzingi* Podany, 1964. Danilevsky (2009a,b) mentioned that *C. cerdo klinzingi* Podany, 1964 described from Caucasus. Danilevsky (2009a) stated that "*According to J. Vorisek (personal communication, 1992), C. cerdo klinzigi, described from Caucasus is a good species, described later as C. heinzianus from Turkey. I do not know Caucasian C. klinzigi, but I've got two pairs of Turkish C. heinzianus including one paratype. It is evident, that C. heinzianus is not close to C. cerdo because of rather short antennae: hardly longer than body in male and much shorter than body in female*". Consequently, we think that *C. heinzianus* Demelt, 1976 and *C. klinzingi* Podany, 1964 are separate and distinct species of the genus *Cerambyx*. Anyway, the species *C. heinzianus* was placed by Demelt (1976) into the *Cerambyx dux-miles-nodulosus* group. He never discussed it with *C. cerdo* rightly. Nevertheless, the species *C. klinzingi* was described by Podany from Caucasus at infraspecific rank of *C. cerdo* as *C. cerdo klinzingi* Podany, 1964. So, we accept both are separate and distinct species now and not synonym. *C. heinzianus* Demelt, 1976 is endemic to Turkey and *C. klinzingi* Podany, 1964 is endemic to Caucasus. *C. heinzianus* is very close to *C. dux*. *C. miles* and *C. nodulosus* are other related species to it.

miles Bonelli, 1812

Original combination: *Cerambyx miles* Bonelli, 1812

Other names: *militaris* Latreille, 1829; *rufescens* Pic, 1933.

Material examined: Antalya prov.: Alanya, Sarımut-Karapınar, 1092 m, N 36 37 E 32 24, 09.07.2007, 1 specimen; Osmaniye prov.: Düziçi, between Böcekli-Hıdırlı, N 3718 E 36 20, 266 m, 28.06.2006, 2 specimens.

Records in Turkey: İçel prov.: Bolkar Mts. (Bodemeyer, 1906); Diyarbakır prov. (Ex. Gül-Zümreoğlu, 1975); Denizli prov. (Gül-Zümreoğlu, 1975); Edirne prov.: Yerlisu (Sama, 1982); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998; Sama, 2002); İstanbul prov.: Belgrad forest (Öymen, 1987); European Turkey (Althoff & Danilevsky, 1997); Niğde prov.: Ulukışla, Adana prov.: Pozantı (Ulusoy et al., 1999); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Uşak prov.: Ulubey (Ovacık village), Konya prov.: Taşkent (Özdikmen & Çağlar, 2004); Kahramanmaraş prov.: Pazarcık (Özdikmen & Okutaner, 2005); Bitlis prov.: Güroymak, İçel prov.: Güzeloluk (Malmusi & Saltini, 2005); Afyon prov.: Akkale hill (Özdikmen, 2006); Bitlis prov.: Reşadiye (Özdikmen & Demir, 2006).

Range: Europe (Spain, Portugal, France, Italy, Sicily, Malta, Slovenia, Croatia and Bosnia and Herzegovina, Serbia, Macedonia, Albania, Greece, Bulgaria, Romania, Hungary, ?Austria, Slowakia, Switzerland, Crimea), Caucasus, Transcaucasia, Turkey, Syria, Lebanon, ?North Africa (Morocco).

Chorotype: S-European. According to Sama (2002), the records of Morocco appear rather doubtful.

Remarks: It distributes rather widely in Turkey (especially west half of Turkey and south Anatolia). The present materials are the first record of Antalya and Osmaniye provinces. Danilevsky (2009a) stated "*according to A. Miroshnikov (2004), Cerambyx miles Bonelli was described in 1812, but not in 1823*".

nodulosus Germar, 1817

Original combination: *Cerambyx nodulosus* Germar, 1817

Other names: *nodicornis* Küster, 1846.

Records in Turkey: Asia Minor as *C. nodulosus nodicornis* Küster, 1846 (Winkler, 1924-1932); İstanbul prov.: Belgrad Forest as *Cerambyx nodicornis* (Acatay, 1943); İstanbul prov.: Bosphorus region (Bahçeköy) (Schimitschek, 1944); Turkey (Acatay, 1948, 1961, 1968; Erdem, 1968; Çanakçıoğlu, 1983; Danilevsky & Miroshnikov, 1985; Lodos, 1998); Bursa prov.: Gürsü Forest (Çanakçıoğlu, 1956); İstanbul prov. (Villiers, 1967); İçel prov.: Namrun, İstanbul prov.: Alem Mountain (Demelt, 1967); Manisa prov.: Demirci (Gül-Zümreoğlu, 1972); İzmir prov.: Bornova (Gül-Zümreoğlu, 1975); Erzurum prov. and near (Özbek, 1978); Bingöl prov.: Central, Osmaniye prov.: Nurdağı pass, Mardin prov.: Hop pass (Adlbauer, 1992); European Turkey (Althoff & Danilevsky, 1997); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Isparta prov.: Eğirdir (Tauzin, 2000); Adana prov.: Seyhan, Antalya prov.: Manavgat, Artvin prov.: Yusufeli, Erzurum prov.: Tortum (Kaledibi), İçel prov.: Tarsus (Bağlarbaşı) (Tozlu et al., 2002); Manisa prov.: Muradiye (Tezcan & Rejzek, 2002); Uşak prov.: Ulubey (Ovacık village, Gökgöz hill), Muğla prov.: Kemer (Ceylan village), Konya prov.: Taşkent (İshaklı village, Gevne valley), Antalya prov.: Alanya (Çayarası plateau-Sarımut bridge), İçel prov.: Gözne (Özdikmen & Çağlar, 2004); İçel prov.: from Tarsus to Çamlıyayla (Malmusi & Saltini, 2005); Kahramanmaraş prov.: Pazarcık (Botaş) (Özdikmen & Okutaner, 2006); Bitlis: Nemrut Mountain (Özdikmen, 2007).

Range: Europe (Italy, Malta, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Crimea), Caucasus, Transcaucasia, Turkey, Syria.

Chorotype: Turano-Mediterranean (Turano-Apenninian) + Turano-European (Turano-Sarmato-Pannonian).

Remarks: It distributes Italy to Caucasus and rather widely in Turkey. It occurs very likely in Iran.

welensii Küster, 1846
ssp. ***welensii*** Küster, 1846
ssp. ***centurio*** Czawallina, 1841

Original combination: *Hammaticherus welensii* Küster, 1846

Other names: *velutinus* Brullé, 1832; *tuniseus* Pic, 1891; *tunisicus* Pic, 1892; *minor* Pic, 1926.

Material examined: Antalya prov.: Alanya: Sarımut env., 1113 m, N 36 37 E 32 23, 09.07.2007, 2 specimens; Akseki, Yarpuz env., 1615 m, N 37 13 E 31 55, 10.07.2007, 1 specimen; Kahramanmaraş prov.: Pazarcık, Bağdınısağır district, 2005, 2 specimens; Konya prov.: Beyşehir-Akseki road, Huğlu env., 1398 m, N 37 28 E 31 37, 11.07.2007, 1 specimen; Taşkent: Avşar, 1556 m, N 36 54 E 32 30, 09.07.2007, 1 specimen; Osmaniye prov.: Düziçi, between Böcekli-Hıdırlı, N 37 18 E 36 20, 266 m, 28.06.2006, 1 specimen.

Records in Turkey: İçel prov.: Bolkar Mts. as *C. velutinus* (Bodemeyer, 1906); İstanbul prov.: Belgrad Forest as *C. velutinus* (Acatay, 1943); İstanbul prov.: Polonez village, Alem Mountain as *C. velutinus* (Demelt, 1963); Turkey as *C. velutinus* (Erdem, 1968; Çanakçıoğlu, 1983; Lodos, 1998); İstanbul prov.: Belgrad forest as *C. velutinus* (Öymen, 1987); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Turkey (Sama & Rapuzzi, 2000; Sama, 2002); Antalya prov., Karaman prov. (Tozlu et al., 2002); Antalya prov.: Alanya (Çayarası plateau-Sarımut bridge) (Özdikmen & Çağlar, 2004); Kahramanmaraş prov.: Pazarcık, İçel prov.: Ortagören-Mut (Malmusi & Saltini, 2005); İstanbul prov.: Çamlıca (Özdikmen & Demir, 2006); İzmir prov.: Kınık (Tezcan & Can, 2009).

Range: Europe (Spain, Portugal, France, Italy, Sicily, Malta, Slovenia, Croatia and Bosnia and Herzegovina, Serbia, Greece, Crete, Bulgaria, Romania, Hungary, Ukraine), Caucasus, Turkey, Middle East (Syria, Jordan, Lebanon, Israel), Iran.

Chorotype: S-European.

Remarks: It distributes rather widely in Turkey (especially west half of Turkey and south Anatolia). The present materials are the first record of Konya and Osmaniye provinces. The species is represented by the nominative subspecies in whole Turkey. Other subspecies of the species, *C. welensii centurio* Czawallina, 1841 only known from Syria. *Cerambyx velutinus* Brullé, 1832 (nec F., 1775) was replaced with *C. welensii* Küster, 1846 by Sama (1991).

Subgenus *MICROCERAMBYX* Miksic & Georgijevic, 1973

= *Mesocerambyx* Zagaikevitch, 1991

Type species: *Cerambyx scopolii* Füsslins, 1775

The subgenus is represented by 1 species in Turkey.

scopolii Füsslins, 1775
ssp. ***scopolii*** Fusslins, 1775
ssp. ***nitidus*** Pic, 1892

Original combination: *Cerambyx scopolii* Füsslins, 1775

Other names: *cerdo* Poda, 1761 (preocc.); *heros* Bergstraesser, 1778; *gallicus* Voet, 1778; *piceus* Geoffroy, 1785; *helveticus* Stierlin, 1879.

Material examined: Osmaniye prov.: Zorkun road, Fenk plateau, N 36 59 E 36 20, 1049 m, 24.06.2006, 7 specimens; 22.07.2006, 2 specimens.

Records in Turkey: İçel prov.: Burna, Antalya prov.: Toros Mountains, Niğde prov.: Çamardı, Sakarya prov.: Sapanca (Gökdağ) (Bodemeyer, 1900); İstanbul prov.: Belgrad Forest (Acatay, 1943); İstanbul prov.: Bosphorus region (Belgrad Forest), Sinop prov.: Ayancık, Trabzon prov.: Meryemana Forest (Schimitschek, 1944); Turkey (Acatay, 1948, 1961, 1968; Erdem, 1968; Çanakçıoğlu, 1983; Danilevsky & Miroshnikov, 1985; Althoff & Danilevsky, 1997; Lodos, 1998; Sama, 2002); İstanbul prov.: Polonez village (Demelt & Alkan, 1962; Demelt, 1963); Samsun prov.: Bafra, Rize prov.: Fındıklı (Villiers, 1967); İstanbul prov.: Polonez village (İren & Ahmed, 1973); Artvin prov.: Saçinka (Sekendiz, 1981); İstanbul prov.: Belgrad Forest (Öymen, 1987); Osmaniye prov.: Nurdağı pass as *C. scopolii nitidus* (Pic, 1892) (Adlbauer, 1988); Tokat prov.: Topçam Mountain (Adlbauer, 1992); Kars prov.: Sarıkamış (Tozlu, 2001); Artvin prov.: Arhavi (Kireçli), Bingöl prov.: Central, Kars prov.: Sarıkamış (Tozlu et al., 2002); Kırklareli prov.: İğneada-Saka lake (Sivriler village) / İğneada (Pedina lake) (Özdikmen & Çağlar, 2004); Kırklareli prov.: Demirköy, Bolu prov.: Abant (Malmusi & Saltini, 2005); Artvin prov.: Hopa, İçel prov.: Çamlıyayla as *C. scopolii nitidus* (Pic, 1892) (Malmusi & Saltini, 2005); Kırklareli prov.: İğneada (Özdikmen & Demir, 2006); Edirne prov. (Özdikmen & Şahin, 2006).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Sardinia, Malta, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Crete, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, ?Great Britain, Czechia, Slovakia, Norway, Poland, Sweden, ?Estonia, Latvia, ?Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia), Caucasus, Transcaucasia, Near East, Turkey.

Chorotype: European.

According to Sama (2002), records from North Africa are belonging to *C. paludivagus* Lucas, 1846.S-European.

Remarks: It distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. scopolii nitidus* (Pic, 1892) occurring only in South Turkey and the nominative *C. scopolii scopolii* occurring in other parts of Turkey. According to Sama (2002 and 2008), *C. paludivagus* Lucas, 1846 is a distinct species in North Africa and not a form of *C. scopolii*. The present materials belong to the subspecies *C. scopolii nitidus* Pic, 1892.

A short key for Turkish *Cerambyx* species

1. Apex of each elytron extended into a sutural spine...**2**

- Apex of each elytron rounded or blunt..**4**

2. Second antennal segment in the shape of a ring, nearly three times as wide as long... ***carinatus*** Küster, 1846

- Second antennal segment at the inner edge as long as wide, not in the shape of a ring...**3**

3. First and second segments of hind tarsus with a smooth glabrous furrow on the underside. Abdomen with a very fine and thin pubescence, macroscopically shining... ***cerdo*** Linnaeus, 1758
- Only first segment of hind tarsus with a smooth glabrous furrow on the underside. Abdomen with dense pubescence, macroscopically grey and dull......... .... ***welensii*** Küster, 1846

4. Second antennal segment at the inner edge as long as wide, not in the shape of a ring...**5**
- Second antennal segment in the shape of a ring, nearly three times as wide as long...**3**

5. Elytra totally black, with fine grey pubescence. Relatively small body................. .... ***scopolii*** Füsslins, 1775
- Elytra black or blackish onlt at the base, becoming paler, reddish brown towards the apex...**6**

6. Antennae reaching beyond the elytral apex or hardly longer than the body in males. Eyes large, the lower edge nearly reaching to the underside of the head.....**7**

- Antennae in males more longer than the body. Eyes smaller, the lower edge well removed from the underside of the head...**8**

7. 3 to 5 antennal segments in males very knobbly thickened.................................
....***dux*** Faldermann, 1837

- 3 to 5 antennal segments in males longer and less knobbly thickened..................
....***heinzianus*** Demelt, 1976

8 Front tarsus with very broad segments, second segment wider than its median length. In females, antennae only reaching to the middle of the elytra....................
....***miles*** Bonelli, 1812
- Front tarsus with less broad segments, second segment not wider than its median length. In females, antennae reaching to the last quarter of the elytra.........
....***nodulosus*** Germar, 1817

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Tablo 1. Undoubted taxa of the genus *Cerambyx* Linnaeus, 1758.

SPECIES	PRESENCE IN TURKEY	CHOROTYPE
Cerambyx apiceplicatus Pic, 1941	-	Iraqi endemic
C. carinatus (Küster, 1846)	+	Turano-Mediterranean (Turano-Balkan)
C. cerdo Linnaeus, 1758	+	Turano-Europeo-Mediterranean
C. dux (Faldermann, 1837)	+	Turano-Mediterranean (Turano-Balkan)
C. elbursi Jurecek, 1924	-	Endemic for Iran
C. heinzianus Demelt, 1976	+	Anatolian endemic
C. klinzingi Podany, 1964	-	Caucasusian endemic
C. miles Bonelli, 1823	+	S-European
C. multiplicatus Motschulsky, 1859	-	SW-Asiatic
C. nodulosus Germar, 1817	+	Turano-Mediterranean (Turano-Apenninian) + Turano-European (Turano-Sarmato-Pannonian)
C. paludivagus (Lucas, 1842)	-	North African endemic
C. scopolii Füsslins, 1775	+	European
C. welensii (Küster, 1846)	+	S-European

Tablo 2. Doubtful taxa of the genus *Cerambyx* Linnaeus, 1758.

SPECIES	CHOROTYPE	REMARKS
Cerambyx castaneus Voet, 1778	Nearctic	incertae sedis
C. clavipes Forster, 1771	Nearctic	incertae sedis
C. fasciatus Voet, 1778	Nearctic	incertae sedis
C. ferrugineus Goeze, 1777	Nearctic	incertae sedis
C. juvencus Linnaeus, 1767	Neotropic	incertae sedis
C. lativitta Newman, 1850	Australian	incertae sedis
C. lucidus Olivier, 1790	Neotropic	incertae sedis
C. petechizans Voet, 1778	Nearctic	incertae sedis
C. praepes Voet, 1778	Nearctic	incertae sedis
C. quadripunctatus Fabricius, 1801	Neotropic	incertae sedis
C. rufus Voet, 1806	Nearctic	incertae sedis
C. subserratus Newman, 1850	Australian	incertae sedis
C. surinamensis Voet, 1778	Neotropic	incertae sedis
C. umbraticus Olivier, 1795	Neotropic	incertae sedis

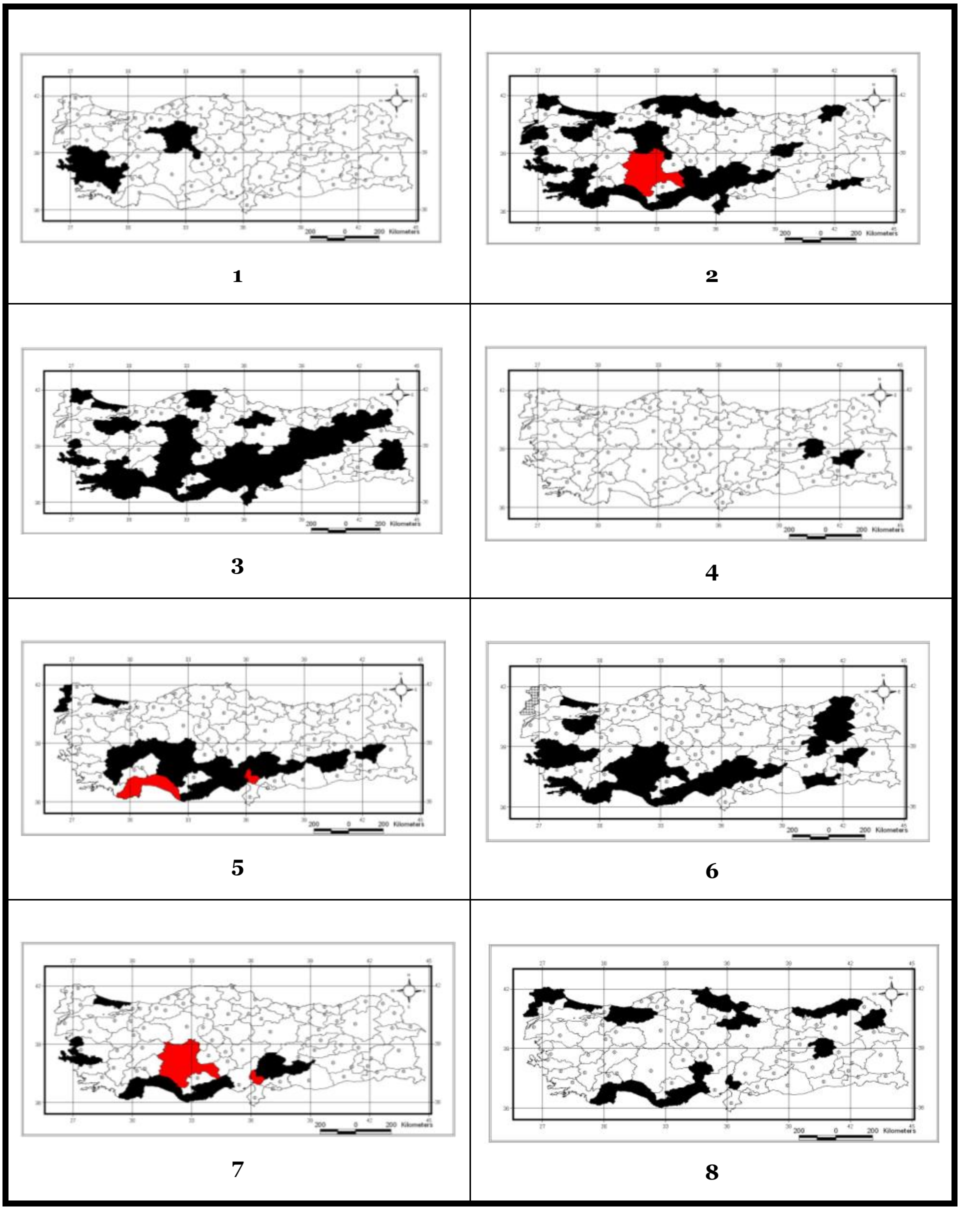

Plate I. Distributional map in Turkey of 1. *Cerambyx carinatus*, 2. *C. cerdo*, 3. *C. dux*, 4. *C. heinzianus*, 5. *C. miles*, 6. *C. nodulosus*, 7. *C. welensii*, 8. *C. scopolii*.

INVESTIGATION ON BIOLOGY OF OLIVE LEAF WORM *PALPITA UNIONALIS* HB. (LEPIDOPTERA: PYRALIDAE) IN CONSTANT LABORATORY CONDITIONS

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[Khaganinia, S. & Pourabad, R. F. 2009. Investigation on biology of olive leaf worm *Palpita unionalis* Hb. (Lepidoptera: Pyralidae) in constant laboratory conditions. Munis Entomology & Zoology, 4 (2): 320-326**]**

ABSTRACT: Olive leaf worm, as a quarantine pest in Iran, was reported in olive orchards in Roudbar city for the first time in August 1999. This insect is dispersed in Italy, Spain, Greece, west Asia, North Africa, Portugal, Sweden, Poland, Japan and tropical regions in America. The most important damage of the pest occurs on young trees, nurseries and shoots of old trees. The young larva of the pest feed beneath the leaves and as they grow larger, they consume entire leaves and buds. The he second generation, if they are abundant, feed on fruits and seeds as well. In order to control this important pest, it certain biological aspects were studied under constant laboratory conditions at 27 °C, 65% relative humidity and 16 hours photoperiod during 1999 in Agricultural Research Center of Zandjan province using caged individual 2- year old potted olive trees of yellow cultivator. According to the results the mean developmental time, from the egg through the adult stages, lasted for 34.9 days. The average generation time, under above-mentioned conditions, was estimated to be 38 days so that it could produce 9 generations per year. The sex ratio was shown to be 1: 1.12 (male: female). The percentage mortality of immature stages appeared to be 49.45%. The mean fecundity of females was 385 (with a range of 212 - 419) with adult longevity of 14.1 (range: 8 - 26) and 12.3 days (range: 7 and max 21) for male and female individuals, respectively.

KEY WORDS: Olive leaf worm, biology, *Palpita unionalis,* Lepidoptera

Trigiani, in 1971 introduced the olive leaf moth as *Palpita* (*Margaronia*) *unionalis* (Hb.) (Santorini & Vessiliana-Alexopoulou, 1976). Then internal reproductive organs of the males and females was described by Santorini in 1976 and Kitri prepared identification keys for various species of the genus Palpita in India, based on differences between the internal and external reproductive organs (Kitri & Rose, 1992; Santorini and Vessiliana-Alexopoulou, 1976). In 1972,Balachowsky with extensive studies expressed the dispersal regions of this pest as Italy, Spain, Greece, Asia Minor, North Africa, Portugal, Tropic Regions of America and also Japan (Balachowsky, 1972). Olive leaf worm has been reported from Sweden and Poland during 1977-1988 (Ryrholm, 1988, Santorini & Vessiliana-Alexopoulou, 1976; Sevensson, 1988). The pest as a quarantine pest in Iran was first reported in olive orchards of Roudbar City in August 1999 (Saieb, 1999).

-Appearance

Grossly, through profound studies in 2000, showed that the pest has 5 instars. Young larvae are peal yellow in color becoming gradually green. Maximum body length is 18-20mm. Eggs are white and flattened with appearance reticulated and 0.5-1mm in length. The female deposits about 600 eggs. The eggs are laid singly on olive branches and leaves. The pupa is brown in color, 12-16mm in length and 3-4mm in width. The embryonic and larval developmental time are 11-30 days and 18-25 days respectively, depending on seasonal conditions. The larva before changing into pupa, attaches a few leaves with silken filaments, and becomes pupa while spinning a cocoon.

Adults are peal or white and are seen as triangular at resting. The wings are semitransparent. Fore wings brown colored in the costal margin with two black spots in the middle. Adult with wingspan are 30mm in size. These nocturnal adults mate two days after emergence, taking 4-6 hours and females die immediately after egg lying. It overwinters as larvae. There are 2-3 and 5-6 generations in cold, temperate and tropic, semitropical regions respectively (Grossley, 2000). The pest has 10 and 5 generations per year in Egypt and Italy respectively (El- Sherif, 1977; Fodal et al., 1990).

The main host of pest is olive and alternative hosts are Jasmine, Strawberries and Vibernum. Olive leaf worm is one of the important olive pests in Italy, Egypt and Greece (El-Hakim & El-Helmy, 1982; El-Kifl et al., 1974; Longo, 1992; Pertich, 1988; Vassiliana & Santonivi, 1973). The most important damage of the pest occurs on young trees, nurseries and shoots of old trees (Grossley, 2000; Pinto & Salemo, 1995; Triggiani, 1971). Young larva feed on lower surface of leaf and as they grow larger, they consume entire leaves and buds and in second generation, they feed on fruits and seeds if they reach to high population levels (Grossley, 2000). Referring to Fodal's studies, if 90% of branches have been damaged, loss rate of yield will not be more than 20% (Fodal et al., 1990).

To control the pest, agrotecnical, biological and in the case of heavy infestations of leaves, chemical methods are recommended. Removing the infested twigs and shoots is one of the best control methods (Pertich, 1988; Triggiani, 1971). Based on investigations in Italy, larvae of *Syrphus corollae* F. and adults of following species: *Apanteles syleptae* F., *A. xanthostigmus* (Hal) and *Nemorilla maculosa* (Mg) have been introduced as predator and parasitoids respectively (El-Hakim & Hanna, 1982; El-Sherif, 1977; Fodal et al., 1990; Pinto & Salemo, 1995; Triggiani, 1971). Jardak (Jardak et al., 1979) reported a new Trichogramma species named as *T. olea* in France and Yugoslavia's olive orchards through his investigation on natural enemies. Based on Fodal's studies about chemical control of olive leaf worm, it was proved that *Bacillus thurengiensis* causes mortality on larva (Fodal, 1976).

Among the effective insecticides to control the pest carbaryl, methidathion, fenthion and dimethoate have been recommended (Fodal & Mule, 1990).

MATERIAL AND METHODS

Because of lack of water in olive leaves, cut branches dry soon, therefore to study biology of olive leaf worm, potted olive trees caged individually were used (Badavi et al., 1976). For this purpose, two-year-old olive trees of yellow cultivator, the dominate native olive cultivator in Tarom region, were planted in plastic pots with 20cm in diameter and 17cm in deeps with mixed soft sand soil and natural fertilizer in equal rate. All trees were cleared of other insects and spiders using number 2 brush then were placed in individual cages. The cages consisted of trance plastic cylinder 20cm in diameter and 55cm in deeps made from 0.45mm width PVC layer. The upper surface of the cages was covered by fine mesh muslin terylene to prevent the escape of the adult moths and also the entering of other insects (Fig. 1).

To study of various aspects of pest biology in constant condition an EHRET incubator made in Germany were used. Experiments were accomplished in constant laboratory conditions of 27° C and 65% relative humidity and 16 hours photoperiod (Badavi et al., 1976; Santorini & Vessiliana-Alexopoulou, 1976). To study the development time and mortality rate of various life stages of the pest, the pupae were collected from olive trees in olive research station in Gilvan city, then they were placed into rearing dishes.

After the mating the newly emerged adults, two fertilized females were released into each caged olive seedling and after 24 hours, all adults as well as eggs except 15 eggs were removed. The experiment was accomplished with 8 plotted seedlings (Fig. 2).

The daily observations were made by means of a hand lens to determine development time and mortality rate until the emergence of new adults.

Sex ratio in laboratory populations was measured by determining the newly emerged adults. To study the adult fecundity and longevity, newly emerged adults were needed so, a number of pupae were collected from above mentioned orchards and maintained in rearing dishes. Two pairs of males and females from newly emerged adults within a period of 24 hours were released on each caged seedling. The experiment was started with 6 caged seedlings and continued with the counting of the produced eggs every other day and daily countings of the adult mortalities along with sex determination of all dead individuals.

RESULTS AND DISCUSSION

- Development time of embryonic, larval and pupal stages:

Development time from embryonic to adult stages under laboratory constant conditions is indicated in Table 1.

Mean development time from the egg (Fig. 3) to the adult was estimated 34.9 days, where, Vassiliana and Santonivi (1973) mentioning it to be 21-26 days at 23.4°C.

Development time of various instars (Fig. 4) except the first one increased as the growing advanced, and it may be due to the fact that the older larvae spend more time in finding the most suitable feeding sites.

-Generation number:

Duration of total life cycle was recorded as 38 days, which is in accordance with the findings of Fodale and Mule i.e. 24 days and 39 days at 17° C and 26° C respectively (Fodal & Mule, 1990). Based on data obtained, it appears that the pest under constant laboratory condition could have 9 generations a year and this is confirmed by the studies of Badawi and et al. in Egypt at 27.5° C (Badavi et al., 1976).

-Sex ratio:

Out of 70 adults (Fig. 5) examined, 37 individuals were females thus the sex ratio was found to be 1: 1.12. The sex ratio mentioned by Fodal and mule (1990) was 1: 1.16.

-Mortality rate of immature stages:

The mortality rate of immature stages at laboratory constant conditions is mentioned in Table 2. Percentage mortality of immature stages was estimated to be 49.45%.

According to Loi's findings under constant temperature of 10ºC-35ºC, the percentage mortality was 100% and less than 50% at 10º C-35º C and 13ºC-30º C respectively (Loi, 1990). As the optimal development temperature for this insect has been recorded to be 27º C, it is more likely that examining the larvae by taking them out of their refuges had caused delayed larval development.

Table 2 shows that, the egg stage with 23% mortality was the most susceptible stage, whilst the susceptibility of the larvae was decreased as they grew up more so no mortality could be observed amongst the fifth instar larvae.

-Female fecundity and adult longevity:

The mean fecundity of adult females was 385 (range: 212 - 419) under constant condition whereas, Badawi and et al. mentioned it as 414 under constant conditions of 27.5º C and 65% relative humidity (1). Loi (1990) has expressed the mean number of eggs per female as 320 at 25º C. The present study showed that the longevity of the male is more than that of female. The mean longevity of adult male was 14.1 days (range: 8 - 26 days) and for that of the adult female being 12.3 days (range: 7 - 21 days). It is in accordance with the Loi's findings, which were 13.5 days for females and 15.3 days for males (Loi, 1990).

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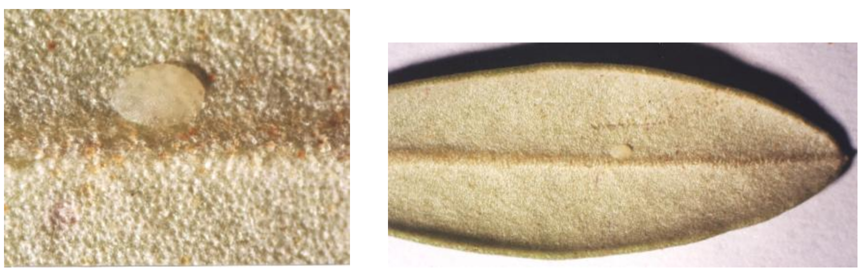
Fig. 1. Two-years old potted olive tree caged individually.

Fig. 2. Arrangement of potted olive trees caged individually in incubator.



(A) (B)

Fig. 3. Egg, large scale size A; small scale size B

(A) (B)

Fig. 4. Larvae, fifth instar A; first instar B.

(A) (B)

Fig. 5: Adults, male A; female B.

Table 1- Development time of life stages of olive leaf worm *Palpita unionalis* Hb. Under constant laboratory conditions.

Life stages	Egg	Instar larvae					Pupa
		1st	2nd	3rd	4th	5th	
Number examined	92	85	81	78	76	76	70
Mean development time ± Standard error(x± SE)	3.3±0.76	3.8±0.78	3.5± .7	3.8±.53	4.3±.75	5.5± .94	11.2±1.2

Table 2- Percentage mortality of the egg, larval and pupal stages of olive leaf worm *Palpita unionalis* Hb. Under constant laboratory conditions.

Life stages	Egg	Instar larvae					Pupa
		1st	2nd	3rd	4th	5th	
Number examined	120	92	85	81	78	76	76
%Mortaliy	23	7.6	4.7	3.7	2.56	-	7.89

A SHORT REVIEW ON THE GENUS *PARACLYTUS* BATES, 1884 (COL.: CERAMBYCIDAE: CERAMBYCINAE)

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[Özdikmen, H. 2009. A short review on the genus *Paraclytus* Bates, 1884 (Coleoptera: Cerambycidae: Cerambycinae). Munis Entomology & Zoology 4 (2): 327-332**]**

ABSTRACT: All taxa of the genus *Paraclytus* Bates, 1884 in the whole world are evaluated. The genus is also discussed in detail. The main aim of this catalogic work is to clarify current status of the genus in the world.

KEY WORDS: *Paraclytus,* Cerambycinae, Anaglyptini, Cerambycidae.

Subfamily CERAMBYCINAE Latreille, 1802

Tribe ANAGLYPTINI Lacordaire, 1869

= Anaglypti LeConte, 1873

The tribe includes currently at least 12 genera as *Anaglyptus* Mulsant, 1839; *Aphysotes* Bates, 1885; *Clytoderus* Linsley, 1935; *Cyrtophorus* LeConte, 1850; *Diphyrama* Bates, 1872; *Hirticlytus* K.Ohbayashi, 1960; *Microclytus* LeConte, 1873; *Miroclytus* Aurivillius, 1910; *Oligoenoplus* Chevrolat, 1863; *Paraclytus* Bates, 1884; *Pempteurys* Bates, 1885 and *Tilloclytus* Bates, 1885. The genus name *Miroclytus* Aurivillius, 1910 has been given by some authors (e.g. Bisby et al., 2008) as *Microclytus* erroneously. However, the genus *Microclytus* LeConte, 1873 is a neotropical genus and *Miroclytus* Aurivillius, 1910 (original spelling) that was also given by Aurivillius (1912) is a Madagascarian genus. The monotypic genus *Microclytus* Aurivillius, 1910 has only the species *Miroclytus brunneipennis* Aurivillius, 1910 as the type. But *Microclytus* LeConte, 1873 (type species *Clytus gazellula* Haldeman, 1847) includes two species as *Microclytus compressicollis* (Laporte & Gory, 1835) and *Microclytus gazellula* (Haldeman, 1847) from NE North America: Canada and United States (Monné & Hovore, 2005). So, these genera are not homonyms.

Genus *PARACLYTUS* Bates, 1884

Type species: *Paraclytus excultus* Bates, 1884

Body length is approximately between 10 and 20 mm.

Shortly, the genus *Paraclytus* is characterized by a comparatively long 4th antennal segment (barely shorter than 3rd), convex and compactly punctate pronotum, narrow and long episternum of metathorax, short hind tarsi, and other characters.

Adults differ from other genera of the tribe in relatively long antennae, and structure and pattern of elytra. Pronotum is barely oblong, broadly rounded laterally. Scutellum is generally elongate, triangular, pointed anteriorly. Elytra with paralel sides, convex, depressed on inner side humeri and on suture behind scutellum.

Larval and pupal developments are in deciduous trees (e.g. *Fagus, Crateagus, Quercus, Morus, Sorbus, Alnus* etc.) in forests.

The main aim of this catalogic work is to clarify the current status of the relict genus in the world. As commonly accepted that this chiefly Eastern Palaearctic genus *Paraclytus* Bates, 1884 [except the western Palaearctic species *P. luteofasciatus* (Pic, 1905); *P. raddei* (Ganglbauer, 1881); *P. reitteri* (Ganglbauer, 1881) and *P. sexguttatus* (Adams, 1817) which have SW Asiatic chorotype] is represented by 9 species (without subspecies) in the whole world. According to the data on range of these species, distributionally this genus is limited by Bulgaria and Greece in the West (Bulgaria, Greece, Turkey, Iran, Azerbaijan, Armenia) and Japan and Sakhalin Island in the East (China, Japan, Sakhalin Island) (e.g. Kraatz, 1864; Bates, 1884; Winkler, 1924-1932; Villiers, 1967; Demelt, 1972 and 1982; Cherepanov, 1990; Niisato, 2001; Mirosnikov, 2001; Sama, 2002; Holzschuh, 2003; Özdikmen & Demir, 2006; Özdikmen, 2007; Georgiev, 2008; Danilevsky, 2009a,b,c,d).

The most widely distributed species is *Paraclytus sexguttatus* (Adams, 1817) that is given as *P. sexmaculatus* by some authors (e.g. Sama, 2002). *P. raddei* (Ganglbauer, 1881) and *P. reitteri* (Ganglbauer, 1881) are following it. *Paraclytus excultus* Bates, 1884 that is the type species of the genus is only distributed in Far East (Sakhalin Island and Japan). The remaining are endemic taxa. Although *Paraclytus luteofasciatus* (Pic, 1905) is endemic to Greece, 4 species as *Paraclytus apicicornis* (Gressitt, 1937); *Paraclytus emili* Holzschuh, 2003; *Paraclytus primus* Holzschuh, 1992 and *Paraclytus shaanxiensis* Holzschuh, 2003 are endemic to China. The genus is represented only by two species as *Paraclytus luteofasciatus* (Pic, 1905) and *Paraclytus sexguttatus* (Adams, 1817) in Europe. The later was recorded as a first record for Europe by Georgiev & Stojanova (2003). Very recently, a work on distribution, biology and ecology of *Paraclytus sexguttatus* (Adams, 1817) has been published by Georgiev (2008). *Paraclytus sexguttatus* (Adams, 1817) is only species of this genus in Turkey.

In addition to this, Casey (1912) gave three species as *Paraclytus brevitarsis*; *Paraclytus crucialis* and *Paraclytus lanifer* in the genus *Paraclytus* from California (USA), but all taxa are synonyms of the species *Triodoclytus lanifer* (LeConte, 1873) in the tribe Clytini. Aurivillius (1912) mentioned the species *Oligoenoplus rosti* (Pic, 1911) in the genus *Paraclytus* mistakenly. Also Winkler (1924-1932) placed the species *Anaglyptus thibetanus* Pic, 1914 in the genus *Paraclytus*.

All taxa of this genus in the world are presented as follows:

apicicornis Gressitt, 1937

Original combination: *Aglaophis apicicornis* Gressit, 1937

It is Eastern Palaearctic species.

DISTRIBUTION: China
CHOROTYPE: Chineese endemic

emili Holzschuh, 2003

Original combination: *Paraclytus emili* Holzschuh, 2003

It is Eastern Palaearctic species.

DISTRIBUTION: China
CHOROTYPE: Chineese endemic

excultus Bates, 1884

Original combination: *Paraclytus excultus* Bates, 1884

It is Eastern Palaearctic species.

DISTRIBUTION: Sakhalin Island, Japan
CHOROTYPE: Eastern Palaearctic

luteofasciatus Pic, 1905

Original combination: *Anaglyptus luteofasciatus* Pic, 1905

Other names: *moreanus* Demelt, 1972

It is Western Palaearctic species.

DISTRIBUTION: Greece
CHOROTYPE: Greek endemic

primus Holzschuh, 1992

Original combination: *Paraclytus primus* Holzschuh, 1992

It is Eastern Palaearctic species.

DISTRIBUTION: China
CHOROTYPE: Chineese endemic

raddei Ganglbauer, 1881

Original combination: *Anaglyptus raddei* Ganglbauer, 1881

It is Western Palaearctic species.

DISTRIBUTION: Caucasus (Azerbaijan), Iran
CHOROTYPE: SW-Asiatic (Irano-Caucasian)

reitteri Ganglbauer, 1881

Original combination: *Anaglyptus reitteri* Ganglbauer, 1881

It is Western Palaearctic species.

DISTRIBUTION: Caucasus (Azerbaijan), Iran
CHOROTYPE: SW-Asiatic (Irano-Caucasian)

sexguttatus Adams, 1817

Original combination: *Clytus sexguttatus* Adams, 1817

Other names: *caucasicus* Motschulsky, 1839; *bruckii* Kraatz, 1864; *disjunctus* Pic, 1909

It is Western Palaearctic species.

MATERIAL EXAMINED: Bolu province: Near Abant Lake, 2007, 1 specimen.
RECORDS IN TURKEY: Northern Turkey (Danilevsky & Miroshnikov, 1985); Artvin prov.: Saçinka (Alkan, 2000); Kırklareli prov.: Demirköy, Bolu prov.: Abant lake (Akçaalan) (Özdikmen & Demir, 2006).
DISTRIBUTION: Europe (Bulgaria), Caucasus (Georgia, Armenia, Azerbaijan), Turkey, Iran
CHOROTYPE: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian) + Turano-Mediterranean (Balkano-Anatolian)

shaanxiensis Holzschuh, 2003

Original combination: *Paraclytus shaanxiensis* Holzschuh, 2003

It is Eastern Palaearctic species.

DISTRIBUTION: China
CHOROTYPE: Chineese endemic

An important output: As this work also revealed that apparently the distributional areas of almost all species of this genus are much narrower than the past. So, these relict and rare forest species of the genus *Paraclytus* must be taken under protection for the future.

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A NEW UROPODINE MITE OF THE GENUS *URODIASPIS* BERLESE, 1916 (ACARINA, MESOSTIGMATA) FROM TURKEY

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ABSTRACT: A new species of the genus *Urodiaspis* (Acari, Mesostigmata, Urodinychidae), *Urodiaspis pannonicasimilis* n.sp., collected from Eastern Anatolia, Turkey, is described. Characteristic features and the figures of female, male and deutonymph of the new species have been given. Some critical morphological features of the new species is discussed with closely related species *Urodiaspis pannonica* Willmann 1951, and observed ecological information for the new species is presented.

KEY WORDS: Acari, Uropodina, Urodinychidae, *Urodiaspis*, new species, Turkey.

Berlese created the genus *Urodiaspis* in 1916, with the type species *Urodiaspis tecta* (Kramer, 1876). This genus has been studied by some authors since Berlese, and recently reviewed by Hirschmann (1979, 1984a, 1984b), Wiśniewski and Hirschmann (1993), and Zirngiebl-Nicol (1973). According to Wiśniewski & Hirschmann (1993) the genus represented in the world with 21 species. Hirschmann (1984a) divided the genus *Urodiaspis* into six species-groups for easy identification, and in the genus, *Urodiaspis pannonicasimilis* n.sp. belongs to the *rectangulovata* species-group.

Species of the genus *Urodiaspis* live in litter, soil substrates, moss, decaying wood, rotten leaves, humus and heterogeneous decomposed organic materials of various types of broad-leaved deciduous or coniferous forests (also in tropical forest). Occasionally, they colonise specific subcorticolous habitats, nests of vertebrates, ants and bumble-bees. They can also penetrate into cultivated landscape habitats (orchards, gardens and other degraded or agricultural stands in non-forested areas) (Hiramatsu, 1979, 1982; Hirschmann, 1972b; Hirschmann & Wiśniewski, 1993; Karg, 1989; Mašán, 2001).

Some uropodine specimens were collected from soil and litter under evergreen and deciduous trees, decayed and decaying wood, from the bark of trees and nest of ants at Gümüşhane and Erzincan and Erzurum provinces in Turkey. Among this material, *Urodiaspis pannonicasimilis* n.sp. is new for the science (Hirschmann & Wiśniewski, 1993; Özkan et al., 1994, 1998).

Morphological and setal nomenclature are mainly based on Athias-Binche and Evans (1981), Evans (1957, 1972, 1992), Evans and Till (1979), Krantz (1978) and Lindquist and Evans (1965). Specimen collection, extraction, preservation and preparation for examination were given by Bal and Özkan (2005). Specimens are mounted in Hoyer's medium and examined with a Nikon E-600 compound microscope equipped with differential interference contrast and phase contrast systems. All measurements are given in micrometers (μm). Materials are deposited in the Bal's mite collection, and in the Atatürk University Zoology Museum, (AUZM), Erzurum.

Abbreviations used on figures and in text are as follows: *Ad1-2*: Adanal seta; *cas*: camerostomal setae; DN: deutonymph; fd: fixed digit; *h1-4*: hypostomal setae; *i-I*: dorsocentral setae series; la: lacinia; md: movable digit; no: nodus; *Pa*: postanal seta; per: peritreme; *r-R*: marginal setae series; *s-S*: lateral setae series; st1-5: sternal setae; *V*: ventrianal setae series; *z-Z*: mediolateral setae series.

Urodiaspis pannonicasimilis n.sp. (Figs 1–7)

Examined materials: Erzincan province: Holotype ♀, Erzincan, Ahmediye village (39° 53' N, 39° 22' E), litter from under mixed deciduous trees (*Populus tremula, Quercus macranthera*). Paratypes, 16.4.2001, Refahiye, Dumanlı forests, decaying tree stump, 22 ♀, 8 DN.; 26.5.2001, Çayırlı, Keşiş mountain (39° 45' N, 39° 34' E), forest, from soil and litter under pine tree (*Pinus sylvestris*), 8 ♀, 7 DN.; 9.5.2001, Erzincan, Ahmediye village (39° 53' N, 39° 22' E), litter from under mixed deciduous trees (*Populus tremula, Quercus macranthera* subsp. *syspirensis, Viburnum lanata, Sorbus umbellata, Acer hyrcanum*), 42 ♀, 1 ♂, 14 DN. **Gümüşhane province:** Paratypes, 4.6.2005, Kelkit, Yeniyol village (39° 53' N, 39° 22' E), litter and bark of *Quercus macranthera*, 4 ♀. **Erzurum province:** Paratypes, 21.7.2000, Uzundere, Azot pine forests (*Pinus nigra*), soil and litter under pine trees, 2 ♀, 1 ♂; 31.5.2000, İspir, south of Bademli village, Petekli forests (40° 25' N, 40° 53' E), litter and soil from forest basin, 1♀, 1DN.

Female (Holotype). Idiosoma 510 μm long and 330 μm wide. Body well sclerotised and brown. Dorsal plate differentiated from post-dorsal and marginal plate. Marginal plate surrounding dorsal and post-dorsal plates. Marginal plate fused with post-dorsal plate posteriorly, marginal setae linked by a corrugated structure line, 2 pairs of dorsal setae in the posterior edge and 2 pairs of setae in front end brush-like, the remaining dorsal setae shortened and needle-like. Dorsal setae short, thorn-like, not reaching insertion of following setae. Dorsal, marginal and post-dorsal plates with 26–30, 15 and 6 setae pairs, respectively. Marginal setae short, smooth and simple. Postdorsal plate 60 μm long and 150 μm wide. Setae *i1* and *s1*, and a pair of postdorsal setae (*I4*) brush-like apically. Other postdorsal setae *I5* and *Z5* simple and small. Punctation of plates faint and dense. Lateral setae bearing a small denticles close to tip part (Fig. 1).

Epigynial plate iron-like, fulled with coxae II-IV, 40 μm width and 80 μm length. Plate with small shining circlets, posterior circlets bigger than others. Anterior prolongation of peritreme U-like, and inclined interiorly. Seta *st1* close to anterior border of plate, others at laterally located epigynium, *st2* at level coxa II, *st2* coxa III, *st4* between coxa II-IV, *st5* coxa IV, respectively. A pair of lyrifissures located on the sternal plate anteriorly. Dorsal, marginal and lateral setae puny and weaker from male. A pair of ventrianal setae very short out of anus. (Fig. 2).

Hypostomal laciniae long, narrow, sharply pointed, its inside with finely denticled; *h1* smooth and long, *h2* short and reach base of *h1*, *h3* extremly long, *h3*=3x*h2*, outside bearing 6-7 denticles; *h4* with 6-7 denticles outside and a bit longer than *h2* (Fig. 3A). Chelicerae with a small nodus, movable digit with denticles, fixed digit a sensillar seta on its hyaline appendage. Middle part of chelicera 105 μm, movable digit 20 μm and fixed digit 30 μm (Fig. 3D). Corniculus horn-like. Hypostome articulated between setae *h3*–*h4* (Fig. 3A). Epistome lancet-like and sides with denticulate, anterior part 3-branched (Fig.

3B). Tritosternum cup-shaped basally, lacinia triangular, with three branches apically, middle branch longer than others, and branches with fine spines (Fig. 3C).

All pedofossae well developed. Legs robust and powerful. Coxae I broad, hiding tritosternum and gnathosomal apparatus (Fig. 2). All legs terminating with a pulvillus and two claws. All leg tarsi bearing a pairs of digits on ambulacral prolongation apically; legs setae thorn-like. All femora bearing a membraneous flap (Fig. 4A-D).

Male. Idiosoma egg-like, 570 µm long and 370 µm wide. Sternal, ventrianal and endopodal plates densely punctated and especially sternal region with small subcircular depressions. Camerostomal setae pilosed. Genital plate circular, finely punctated, and situated between coxae II–IV. Setae *st1* just behind of coxae I, stae *st2* at level of coxae II, setae *st3* between coxae III, setae st4 between coxae III-IV, just outside of opening, and setae *st5* near posterior margin of genital plate. Setae *Ad1–Ad2* and postanal seta (*Pa*) smooth, long and thickened (Fig. 5). Other morphological and chaetotaxic features as in females.

Deutonymph: Idiosoma 500 µm long, 400 µm wide, egg-like. Dorsum with small shining pore circlets (Fig. 6). Lateralia slightly waved or indented. Sternal, ventrianal, endo- and exopodal plates with shining micropores; all dorsal and ventrianal setae thorn-like. Sternal plate anvil-like, 185-200 µm long and 70 µm wide, 48-50 µm at base, and bearing five pairs of setae (*st1–st5*). Ventrianal setae *V2, V3, V4, V6* and *V8* on ventrianal plate, but *V7* pair arising from soft membraneous integument out of ventrianal plate. Setae arising from soft cuticle on a small platelet. Anal plate boat in shape, 125 µm long and 155 µm wide, postanal seta (*Pa*) present. Anterior prolongation of peritreme smooth and bearing small chitinous bulges on interior margin. Stigmatic opening slightly widened and occurs at level of coxa II. Posterior prolongation of peritreme smooth, directed posteriorly. Pedofossae distinct and well developed, coxae I large, placed close to each other. Anal setae *Ad2* longer than *Ad1*. Gnathosomal, cheliceral, epistomal and tritosternal features as in adults (Fig. 7).

Protonymph and larva: Unknown

Remarks: *Urodiaspis pannonica* Willmann 1951, is a widespread species in central Europe (Austria, Belorussia, Czech Republic, Hungary, Lithuania, Moldavia, Poland, Romania, Slovakia and Ukraine). The species is only known from females and deutonymphs, and relatively extensive material of this species are examined by various researchers. Male specimens of *Urodiaspis pannonica* are unknown and the species is evaluated as a thelytokous species. The new species is very similar and closely related, but not conspecific with European species.

Habitats of Turkish specimens relatively agree with European congeners. *U. pannonica* is very common species abundantly occurring in leaf litter of warmer deciduous forests. The new species has been collected from barks of trees, especially collected from bark of *Populus tremula, Quercus macranthera* subsp. *syspirensis, Viburnum lanata, Sorbus umbellata, Acer hyrcanum, Pinus sylvestris* and *P. nigra*, also collected from litter in the forest basin.

These two species are easily distinguished, both by morphological characters and zoogeographic distribution. *Urodiaspis pannonica* appears to be confined to Central and Eastern Europe, but *Urodiaspis pannonicasimilis* n.sp has a more easterly distribution and may be characteristic of Eastern Anatolia, Turkey.

Some slight differences are present between female specimens of *Urodiaspis* from Europe and Turkey. In females of *Urodiaspis pannonicasimilis* n.sp., prestigmatic section of peritremes is conspicuously shorter and regularly curved in *U. pannonica* specimens, it is longer and with 2 distinct bends, and genital shield is usually otherwise sculptured. In *U. pannonica* large sculptural pores can be found also in anterior and lateral parts of genital shield. In deutonymphs of *U. pannonicasimilis* n.sp. prestigmatic section of peritremes is also more reduced in length, and ventrianal shield has relatively well developed lateral corners and uniform punctate ornamentation, in the contrary, ventrianal shield is subcircular to subpentagonal, subequal in length and width, and with punctate-reticulate ornamentation in posterior part in deutonymphs of *U. pannonica*. The most noticeable character for recognition of *U. pannonicasimilis* n.sp. presence of unique sculptural lines situated close to posterior margin of dorsal and marginal shields in deutonymphs, however, these linear structures absent in deutonymphs of *U. pannonica*.

Idiosomal length of the new species is in agreement with *U. pannonica* (Hirschmann & Wiśniewski, 1993; Karg, 1989). Besides, males of the new species apparently longer than its females. Hirschmann gave idiosomal size 450/300 µm for deutonymph of *U. pannonica*, according to this, deutonymphs of the new species is longer than *U. pannonica*.

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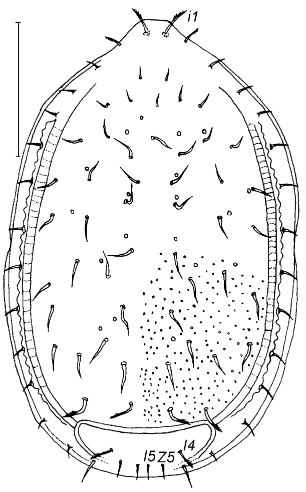

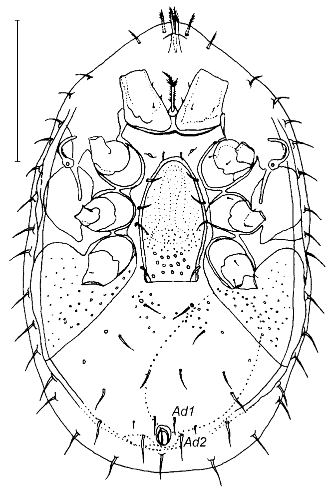

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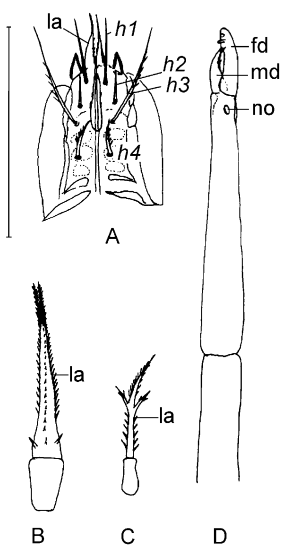
Fig. 1. *Urodiaspis pannonicasimilis* n.sp. (female): Dorsal view. Scale: 200 µm.
Fig. 2. *Urodiaspis pannonicasimilis* n.sp. (female): Ventral view. Scale: 200 µm.



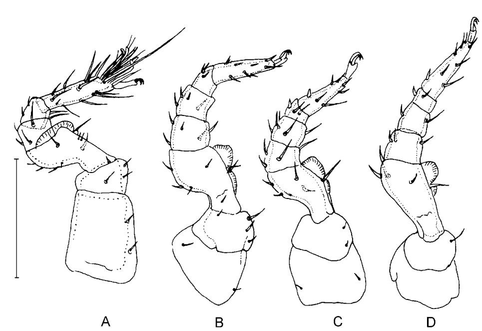


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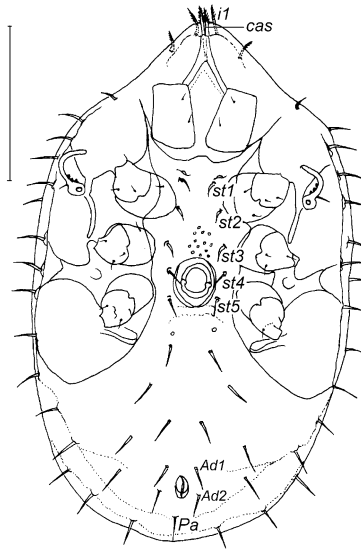
Fig. 3. *Urodiaspis pannonicasimilis* n.sp. (female): A – gnathosoma, B – epistome, C – tritosternum, D – chelicera. Scale: 100 µm.
Fig. 4. *Urodiaspis pannonicasimilis* n.sp. (female): A – leg I, B – leg II, C – leg III, D – leg IV. Scale: 100 µm.



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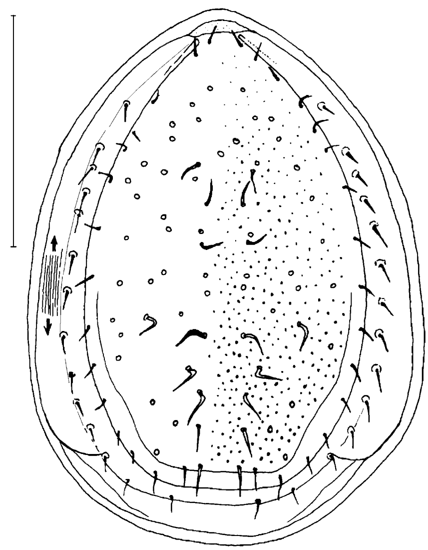

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Fig. 5. *Urodiaspis pannonicasimilis* n.sp. (male): Ventral view. Scale: 200 µm.
Fig. 6. *Urodiaspis pannonicasimilis* n.sp. (deutonymph): Dorsal view. Scale: 200 µm.

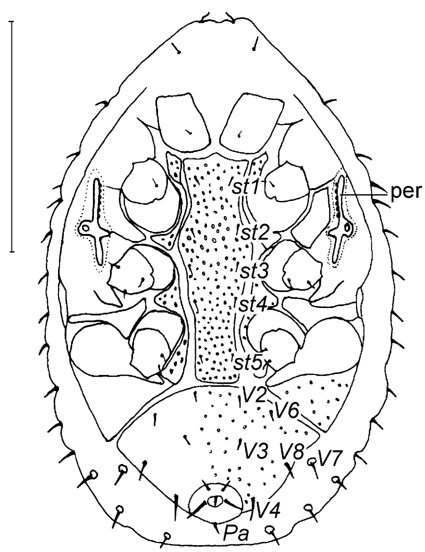

Fig. 7. *Urodiaspis pannonicasimilis* n.sp. (deutonymph): Ventral view. Scale: 200 µm.

GERROMORPHAN FAUNA OF ÇORUM PROVINCE IN TURKEY (INSECTA: HETEROPTERA)

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[Salur, A. & Mesci, S. 2009. Gerromorphan fauna of Çorum province in Turkey (Insecta: Heteroptera). Munis Entomology & Zoology 4 (2): 340-345**]**

ABSTRACT: As a result of revised literatures for determination of the Gerromorphan fauna of Çorum province and a scientific excursion in Çorum province between the years 2006-2008, 9 Gerromorphan species were found. All species are new records to Çorum province and the Black Sea Region of Turkey.

KEY WORDS: Heteroptera, Gerromorpha, Gerridae, Hydrometridae, Veliidae, Çorum, Turkey.

Çorum province is in the Black Sea Region of Turkey (Fig. 1). The research area is located in 39°53'-, 41°20'N North latitute and 33°57' - 35°33' East longitute and the altitude of Çorum is between about 800 m-1600 m. As a result of the researching reviewed literatures on Turkish Gerromorphan insects, it was determined that any taxa are known in Çorum. The aim of this study is to determine the Gerromorphan fauna of Çorum.

384 specimens were collected with field guides between April-September in 2006-2008 in Çorum located in Black Sea Region of Turkey. 9 species belong to 4 genus of 3 families in infraorder Gerromorphan were determined. One species of Veliidae, one species of Hydrometridae and seven species of Gerridae were collected from 15 localities in various aquatic habitats of the Çorum province. Phenologies and distributions of determined species in the study area were given. Distributions of each species were given in two categories, distributions in Turkey and distributions in the world. All species are here recorded for the first time from Çorum and the Black Sea Region of Turkey. Distributions in Turkey of species are shown on a separate map for each species (Fig. 2-10).

MATERIALS AND METHODS

The samples were collected from various aquatic habitats, with either a sieve, ladle or water-net having a 1 mm mesh size. The samples were killed with 70% alcohol. The genital apparatus were dissected under the stereo-microscope and left in 10% KOH solution for about 20-30 minutes. All the specimens were deposited in a private collection of the authors.

The samples were diagnosed using identification keys (Bei-Bienko, 1967; Poisson, 1949; 1957; Rabitsch, 2005, Stichel, 1958 - 1960, Savage, 1989). Former general distributional records from Turkey were given for each species (Hoberlandt, 1948, 1955; Seidenstucker, 1957, Özesmi and Önder, 1988, Kıyak, 2000, Kıyak and Özsaraç, 2001, Kıyak et al., 2004, 2007). Distributional records on the world were also given for all species (Aukema and Reiger, 1995; Hoberlandt, 1948, 1955; Rabitsch, 2005, Stichel, 1958 - 1960).

Information about the localities and the country codes are given below.

Localities : (Loc.1): Beydili village (marsh), 40° 37' N 34° 53' E; (Loc.2): Boğazönü village (bridge), 40° 19' N 34° 18' E; (Loc.3): Çatak (national park), 40° 41' N 34° 18' E; (Loc.4): Çorum dam, 40° 34' N 34° 59' E; (Loc.5): Göcenovacığı village (small lake), 40° 20' N 34° 50' E; (Loc.6): Gökçepınar village (small lake), 40° 22' N 35° 08' E; (Loc.7): Hatap (stream), 40° 23' N 34° 48' E; (Loc.8): İskilip (18. km road of İskilip-small stream), 40° 34' N 34° 45' E; (Loc.9): Kadıkırı village (stream), 40° 28' N 34° 52' E; (Loc.10): Kayı village (stream), 40° 24' N 35° 00' E; (Loc.11): Kızılırmak (40. km road of İskilip- small stream), 40° 37' N 34° 34' E; (Loc.12): Obruk dam, 40° 46' N 34° 47' E; (Loc.13): Sarılık bridge- small stream, 40° 23' N 35° 04' E; (Loc.14): Seydim (Seydim Lake), 40° 33' N 34° 44' E; (Loc.15): Türkler village (stream), 40° 38' N 34° 52' E.

Country Codes: A: Austria, AA: Açores, AFG: Afghanistan, AK: Albania, AND: Andora, ARM: Armenia, AUT: Palestine, AZ: Azerbaijan, B: Belgium, BAE: Balear Islands, BG: Bulgaria, BSBR: West Siberia, BY: Belarus, CH: Switzerland, CHN: China, CNL: Channel Islands, CRA: Canary Islands, CRC: Corsica, CZ: Czech Republic, CY: Cyprus, D: Germany, DK: Denmark, DSBR: EAST Siberia, DZ: Algeria, E: Spain, EST: Estonia, ET: Egypt,F: France, FIN: Finland, FL: Liechtenstein, GB: England, GBCHN: Southwest China, GBAS: Southwest Asia, GE: Georgia, GDCHN: Southeast China , GI: Crete, GR: Greece, GRUS: South Russia, GKO: South Korea, H: Hungary, HG: Hong Kong, HKJ: Jordan, HN: Croatia, I: Italy, IL: Israel, IR: Iran, IRL: Ireland, IRQ: Iraq, ISK: Scotland, J: Japan, KRUS: : North Russia, KS: Kirghizistan, KZ: Kazakhistan, KBCHN: Northwest China, KCHN: North China, KDCHN: Northeast China, KKO: North Korea, L: Luxembourg, LT: Lithuania, LV: Latvia, M: Malta, MA: Morocco, MD: Moldavia, MGL: Mongolia, MK: Macedonia, MNK: Monaco, MO: Makao, N: Norway, NL: Netherlands, OCHN: Middle China, ORUS: Middle Russia, P: Portugal, PL: Poland, RC: Taiwan, RL: Lebanon, RN: Rumania, RP: Philippines, RUS: Russia, S: Sweden, SBR: Siberia, SCL: Sicily, SGP: Slovakia, Sİ: Sinai, SLO: Slovenia, SM: San Marino, SRD: Sardinia, SYR: Syria, TJ: Tajikistan, TKT: Turkestan, TM: Turkmenistan, TN: Tunisia, TR: Turkey, TRK: Transcaucasia, UA: Ukraine, UD: Far East, UZ: Uzbekistan, YU: Yugoslavia.

RESULTS

Ordo Heteroptera

Infraorder Gerromorpha (Popov, 1971)

Family *Veliidae* (Brullé, 1836)

***Velia caprai* (Kolenati, 1857)**

Phenology: July .
Material Examined: 1♂, (Loc.15), 01.07.2006.
Distribution in Turkey (Fig. 2)**:** Kırşehir, Antalya, Aydın, Burdur, Isparta, Muğla (Kıyak et al., 2001, 2008).
Distribution in the world:: AND, A, B, CZ, DK, F, GB, D, GR, H, IRL, I, FL, L, NL, N, PL, P, RN, SGP, E, S, CH, YU [6]. (Aukema and Reiger, 1995; Rabitsch, 2005).

Family *Hydrometridae* (Billberg, 1820)

***Hydrometra stagnorum* (Linnaeus, 1758)**

Phenology: July and September.
Materials Examined: 2♂♂, 3♀♀, (Loc.9), 07.07.2007; 3♀♀, (Loc.2), 21.07.2007; 1♀, (Loc.13), 28.07.2007; 1♂, (Loc.2), 05.08.2007; 1♂, (Loc.7), 05.08.2007; 2♂♂, 1♀, (Loc.13),

12.08.2007; 1♂, 2♀♀, (Loc.2), 18.08.2007; 6♂♂, 3♀♀, (Loc.7), 18.08.2007; 1♀, (Loc.13) 25.08.2007; 3♂♂, 12♀♀, (Loc.7), 09.09.2007.
Distribution in Turkey (Fig. 3)**:** Adana, Afyon, Ankara, Antalya, Aydın, Bitlis, Bolu, Bulgar dağı, Burdur, Bursa, Denizli, Isparta, İzmir, Kırşehir, Muğla, Turunçlu (Hoberland, 1948, 1955; Kıyak, 2000; Kıyak et al., 2004, 2008).
Distribution in the world:: : AFG, D, AK, A, AA, AZ, B, BG, DZ, CZ, DK, ARM, MA, RP, AUT, FIN, F (CRC and MNK included), GE, HN, NL, IRQ, GB (CNL included), IR, IRL, ISK, E, IL, S, CH, I (SRD, SCL and SM included), CRA, KZ, CY, KS, FL, L, H, MK, ET?, N, UZ, PL, P, RN, GRUS, SRD, SBR, SCL, SGP, SYR, TJ, TRK, TN, TKT, TR, TM, UA, YU, GR (GI included) (Aukema and Reiger, 1995; Hoberlandt, 1948, 1955; Rabitsch, 2005, Stichel, 1958 - 1960).

Family *Gerridae* (Leach, 1815)

Gerris argentatus (Schummel, 1832)

Phenology: June and July.
Materials Examined: 1♂, 1♀, (Loc.1), 03.06.2006; 3♂♂, 2♀♀, (Loc.6), 15.07.2007.
Distribution in Turkey (Fig. 4)**:** Adana, Antalya, Aydın, Burdur, Denizli, Isparta, Kayseri, Muğla (Hoberland, 1948; Kıyak et al., 2008; Özesmi and Önder, 1988).
Distribution in the world:: D, AK, A, AZ, LT, EST, B, BG, DZ, CZ, DK, MA, AUT, FIN, F (CRC and MNK included), GE, NL, IRQ, GB (CNL included), IR, IRL, ISK, E, IL, S, CH, I (SRD, SCL and SM included), KZ, CY, KS, LV, FL, H, MK, MGL, MD, N, UZ, PL, RN, GRUS, ORUS, KRUS, DSBR, BSBR, SGP, SLO, SYR, TJ, TRK, TN, TKT, TR, TM, UA, YU, GR (GI included) (Aukema and Reiger, 1995; Hoberlandt, 1948; Rabitsch, 2005; Stichel, 1958 - 1960).

Gerris asper (Fieber, 1860)

Phenology: May and August.
Materials Examined: 1♂, 1♀, (Loc.5), 23.06.2007; 1♂, (Loc.10), 15.07.2007; 1♀, (Loc.13), 25.08.2007; 2♀♀, (Loc.3), 15.05.2008.
Distribution in Turkey (Fig. 5)**:** Adana (Seidenstücker, 1957).
Distribution in the world:: A, BG, HN?, CZ, F (CRC and MNK included), D, H, I (SRD, SCL and SM included), MK, PL, RN, GRUS, SGP, SLO, E?, CH, UA, YU, TR, IL, SYR, DZ?, MA (Aukema and Reiger, 1995; Seidenstücker, 1957).

Gerris lacustris (Linnaeus, 1758)

Phenology: April and September.
Materials Examined: 1♀, (Loc.3), 03.06.2006; 1♂, (Loc.3), 01.07.2006; 1♂, (Loc.15), 01.07.2006; 1♂, 2♀♀, (Loc.1), 01.07.2006; 2♂, 1♀, (Loc.3), 10.07.2006; 1♀, (Loc.13), 15.07.2007; 1♀, (Loc.10), 15.07.2007; 1♀, (Loc.2), 05.08.2007; 2♂♂, (Loc.10), 12.08.2007; 1♂, (Loc.2), 18.08.2007; 1♀, (Loc.7), 18.08.2007; 1♂, 1♀, (Loc.10), 25.08.2007; 2♂♂, 3♀♀, (Loc.7), 09.09.2007; 6♂♂, 10♀♀, (Loc.2), 26.04.2008; 2♂♂, 1♀, (Loc.1), 15.05.2008; 1♂, (Loc.5), 03.07.2008; 20♂♂, 15♀♀, (Loc.7), 03.07.2008.
Distribution in Turkey (Fig. 6)**:** Afyon, Antalya, Aydın, Bolu, Burdur, Denizli, Gaziantep, Isparta, İstanbul, Muğla, Sakarya (Hoberland, 1948; Kıyak et al., 2004, 2008).
Distribution in the world:: D, A, LT, EST, BY, B, BG, DZ, CZ, KDCHN, KBCHN, KCHN, DK, MA, FIN, F (CRC and MNK included), GE, HN, NL, GB (CNL included), IR, IRL, ISK, E, S, CH, I (SRD, SCL and SM included), J, KZ, KKO, GKO, LV, FL, L, H, MK, ET- Sİ? MGL, MD, N, PL, P, RN, GRUS, ORUS, KRUS, DSBR, UD, BSBR, SGP, SLO, TR, UA, YU, GR (GI included) (Aukema and Reiger, 1995; Hoberlandt, 1948; Rabitsch, 2005; Stichel, 1958 - 1960).

Gerris thoracicus (Schummel, 1832)

Phenology: April, May, August and September.
Materials Examined: 1♂, (Loc.3), 05.08.2006; 4♂♂, 2♀♀, (Loc.15), 05.08.2006; 2♂♂, 1♀, (Loc.15), 19.08.2006; 7♂♂, 5♀♀, (Loc.3), 19.08.2006; 2♀♀, (Loc.7), 05.08.2007; 1♂, (Loc.2), 05.08.2007; 2♂♂, 4♀♀, (Loc.2), 18.08.2007; 1♀, (Loc.7), 18.08.2007; 1♂, (Loc.2),

09.09.2007; 2♂♂, 3♀♀, (Loc.7), 09.09.2007; 1♀, (Loc.13), 12.08.2007; 5♂♂, 4♀♀, (Loc.2), 26.04.2008; 1♂,1 (Loc.4), 29.04.2008; 1♀, (Loc.1), 15.05.2008; 1♀, (Loc.3), 15.05.2008.
Distribution in Turkey (Fig. 7)**:** Adana, Afyon, Ankara, Antalya, Armutlu, Aydın, Burdur, Bursa, Denizli, Edirne, Isparta, İzmir, Kırşehir, Muğla (Hoberland, 1948; Kıyak et al., 2004, 2008; Seidenstücker, 1957).
Distribution in the world:: AFG, D, A, AZ, BAE, LT, EST, B, BG, DZ, CZ, DK, ARM, MA, FIN, F (CRC and MNK included), GE, HN, NL, IRQ, GB (CNL included), IR, IRL, ISK, E, IL, S, CH, I (SRD, SCL and SM included), CRA, KZ, CY, CRC, LV, FL, RL, L, H, MK, M, MD, N, UZ, PL, P, RN, GRUS, ORUS, KRUS, SGP, SLO, SYR, TJ, TRK, TN, TKT, TR, TM, UA, YU, GR (Aukema and Reiger, 1995; Hoberlandt (1948), Rabitsch, 2005; Seidenstücker, 1957, Stichel, 1958 - 1960).

Gerris gibbifer (schummel, 1832)

Phenology: May and July.
Materials Examined: 2♂♂, (Loc.2), 07.07.2007; 2♂♂, (Loc.1), 15.05.2008; 1♀, (Loc.8), 21.05.2008.
Distribution in Turkey (Fig. 8)**:** Antalya, Aydın, Burdur, Denizli, Isparta, Muğla (Kıyak et al., 2007).
Distribution in the world:: A, B, CZ, DK, F, GB, D, H, I, FL, L, NL, PL, P, SGP, SLO, E, S, CH, UA (Aukema and Reiger, 1995; Rabitsch, 2005).

Gerris costae (Herrich-Schaffer,1850)

Phenology: May and August.
Materials Examined: 1♂, (Loc.15), 03.06.2006; 1♀, (Loc.3), 03.06.2006; 9♂♂, 3♀♀, (Loc.15), 01.07.2006; 6♂♂, 2♀♀, (Loc.3), 01.07.2006; 1♂, (Loc.1), 01.07.2006; 2♂♂, 1♀, (Loc.3), 10.07.2006; 2♂♂, 3♀♀, (Loc.1), 10.07.2006; 8♂♂, 9♀♀, (Loc.15), 10.07.2006; 4♂♂, 18♀♀, (Loc.3), 29.07.2006; 2♂♂, 3♀♀, (Loc.15), 29.07.2006; 16♂♂, 19♀♀, (Loc.3), 05.08.2006; 1♀ (Loc.15), 05.08.2006; 1♀, (Loc.14), 05.08.2006; 2♂♂, 2♀♀, (Loc.3), 19.08.2006; 1♂, 2♀♀, (Loc.7), 23.06.2007; 1♂, 2♀♀, (Loc.7), 07.07.2007; 6♂♂, 5♀♀, (Loc.2), 07.07.2007; 1♂, 1♀, (Loc.5), 07.07.2007; 10♂♂, 8♀♀, (Loc.2), 21.07.2007; 6♂♂, 9♀♀, (Loc.7), 21.07.2007; 1♀, (Loc.10), 28.07.2007; 1♀, (Loc.13), 12.08.2007; 2♀♀, (Loc.1), 15.05.2008.
Distribution in Turkey (Fig. 9)**:** Ankara, Antalya, Aydın, Burdur, Bursa, Çankırı, Denizli, Isparta, İzmir, Kırşehir, Kocaeli, Muğla, Niğde, Sultandağları (Çete, 2000; Hoberland, 1948; Kıyak et al., 2004, 2008).
Distribution in the world:: GBAS, TRK, SYR, AUT, A, CZ, D, I, FL, SLO, CH (Aukema and Reiger, 1995; Hoberlandt, 1948).

Aquarius paludum (Fabricius, 1794)

Phenology: June and August.
Materials Examined: 1♂, (Loc.14), 30.06.2006; 4♂♂, 4♀♀, (Loc.14), 10.07.2006; 1♂, 1♀, (Loc.14), 29.07.2006; 2♂♂, 2♀♀, (Loc.14), 05.08.2006; 1♂, (Loc.11), 19.07.2008; 2♂♂, 3♀♀, (Loc.12), 04.08.2008.
Distribution in Turkey (Fig. 10)**:** Adana, Afyon, Antalya, Aydın, Burdur, Denizli, Edirne, İçel, Isparta, Muğla, Niğde (Hoberland, 1948; Kıyak et al., 2004, 2008).
Distribution in the world:: D, AK, A, AZ, LT, EST, BY, B, BG, CZ, OCHN, KDCHN, KCHN, KBCHN, GDCHN (MO, HG included), GBCHN, DK, ARM, AUT, FIN, F (CRC and MNK included), GE, NL, IRQ, GB (CNL included), IR, E, IL, S, CH, I (SRD, SCL and SM included), J, KZ, KKO, GKO, LV, FL, RL, L, H, MD, N, UZ, PL, RN, GRUS, ORUS, KRUS, DSBR, BSBR, UD, SGP, SLO, SYR, TJ, RC, TRK, TKT, TR, TM, UA, HKJ, YU, GR (GI included) (Aukema and Reiger, 1995; Hoberlandt, 1948; Rabitsch, 2005; Stichel, 1958 - 1960).

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We express our sincere thanks to Kemal MESCI and Adnan MESCI for their supports on the expeditions.

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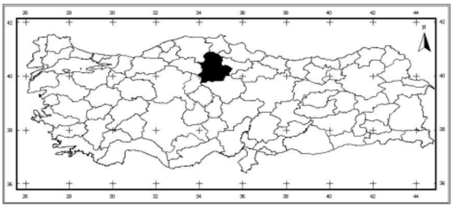

Fig.1 Map of Turkey. Corum is marked with black.

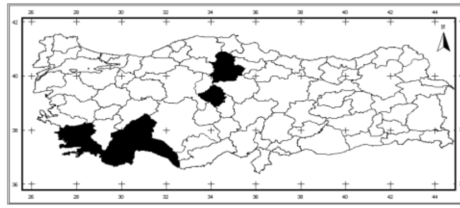

Fig.2 *Velia caprai* (Kolenati, 1857)

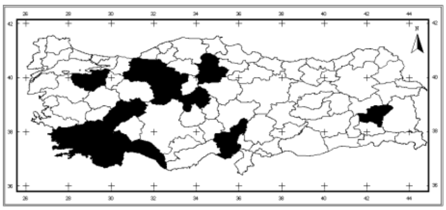

Fig. 3. *Hydrometra stagnorum* (Linnaeus, 1758)

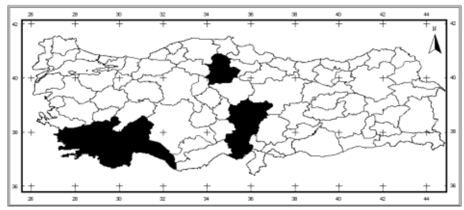

Fig. 4. *Gerris argentatus* (Schummel, 1832)

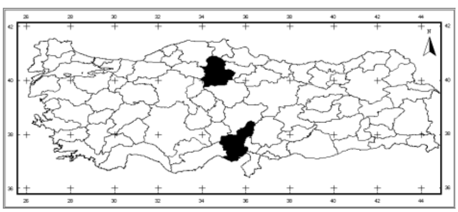

Fig. 5. *Gerris asper* (Fieber, 1860)

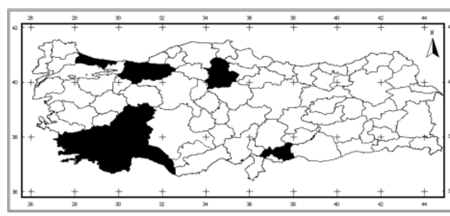

Fig. 6. *Gerris lacustris* (Linnaeus, 1758)

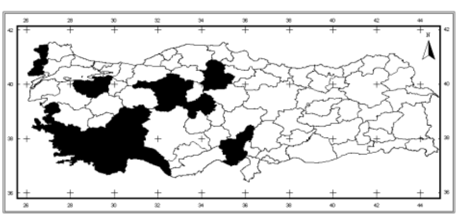

Fig. 7. *Gerris thoracicus* (Schummel, 1832)

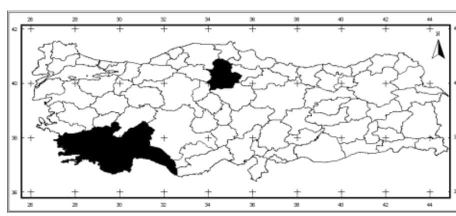

Fig. 8. *Gerris gibbifer* (Schummel, 1832)

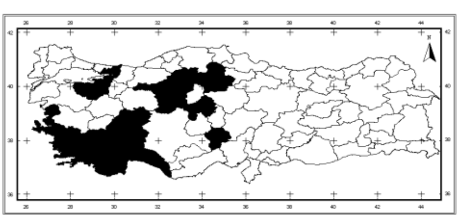

Fig. 9. *Gerris costae* (Herrich-Schaffer, 1850)

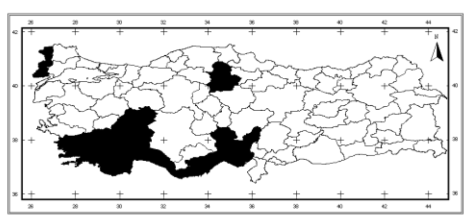

Fig. 10. *Aquarius paludum* (Fabricius, 1794)

SOME ADDITIONAL NOTES ABOUT STAPHYLININAE (COLEOPTERA: STAPHYLINIDAE) FAUNA OF TURKEY

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[**Anlaş, S. & Rose, A.** 2009. Some additional notes about Staphylininae (Coleoptera: Staphylinidae) fauna of Turkey. Munis Entomology & Zoology, 4 (2): 346-352]

ABSTRACT: In this study, additional notes on 41 species of Staphylininae new to certain Turkish provinces are given. Amongst those *Quedius cyprusensis* Last 1955 is the first record for the Turkish fauna. *Xantholinus marasicus* Assing, 2007 represents the first record since the describtion of the species.

KEYWORDS: Staphylinidae, Staphylininae, new record, fauna, Turkey.

The Staphylininae is a widespread and rather big subfamily of Staphylinidae, comprising more than 6.500 species worldwide out of 282 genera (Herman, 2001). According to Anlaş (2009), 346 species and subspecies of 39 genera belonging to Staphylininae have been reported for Turkey. Despite many new records there are still some parts of the country where the species inventory of Staphylininae is still rather poorly investigated.

The aim of this study is to enhance knowledge on the distribution of Turkish Staphylininae.

MATERIAL AND METHOD

The present paper is primarily based on material collected during three field trips to the province Antalya carried out by Armin Rose in March 2000, 2001, and 2002, as well as recent collections by Sinan Anlaş and Ersen Aydın Yağmur.

Classification and nomenclature of the Staphylinidae suggested by Herman (2001) and Löbl & Smetana (2004) have been followed in this study.

The material referred to in this study is deposited in the following collections:

cAnl .... first author's private collection

cAss .... private collection Volker Assing, Hannover

cRos .... second author's private collection

cSch .... private collection Michael Schülke, Berlin

cSol .... collection Alexey Solodovnikov, NHM Copenhagen

cYag .... private collection Ersen Aydın Yağmur, İzmir

RESULTS

In this study, 41 species of 18 genera belonging to four tribes of Staphylininae are newly reported for certain Turkish provinces. If not stated otherwise the formerly known distribution of these species for Turkey is given by Anlaş (2009).

Subfamily Staphylininae Latreille, 1802

Tribe Othiini Thomson, 1859

Othius punctulatus (Goeze, 1777)

Material examined: Aydın: Dilek Yarımadası, pine and oak litter, 950 m, 37°39'23"N, 27°08'14"E, 1 ex., 25.XII.2005, leg. Anlaş (cAnl).

Distribution in Turkey: Artvin, Bitlis, Bolu, İzmir, Gümüşhane, Kastamonu, Manisa.

Tribe Platyprosopini Lynch Arribálzaga, 1884

Platyprosopus hierichonticus Reiche & Saulcy, 1856

Material examined: İzmir: Bayındır, Osmanlar 2 km SE, 420 m, 38°18'07"N, 27°33'58"E, 2 exs., 12.XII.2008, leg. Anlaş (cAnl).

Distribution in Turkey: Diyarbakır, Gaziantep, Hatay, Manisa, Mersin?

Tribe Staphylinini Latreille, 1802

Subtribe Philonthina Kirby, 1837

Bisnius sordidus (Gravenhorst, 1802)

Material examined: Manisa: Central province, Otoman, 38°44'47"N, 27°10'34"E, 1 ex., 04.X.2008, leg. Anlaş.

Distribution in Turkey: Not locality cited (Smetana, 2004).

Cafius xantholoma (Gravenhorst, 1806)

Material examined: İzmir: Karaburun 25 km SE, 10 m, 38°21'02"N, 26°38'20"E, 2 exs., 19.XII.2008, leg. Anlaş (cAnl).

Distribution in Turkey: Istanbul, Mersin?

Gabrius astutoides A. Strand, 1946

Material examined: Antalya: Kemer 5 km NW, rocky riverbank in canyon, from gravel with leaves and roots, 197 m, 36°36'03"N, 30°29'03"E, 1 ex., 30.III.2001, leg. Rose (cRos).

Distribution in Turkey: Muğla (Anlaş, 2007).

Gabrius bishopi Sharp, 1910

Material examined: Antalya: Sakklikent, slope (SE) with snow fields, grassy litter at snow edges, sifted, 1905 m, 36°50'24"N, 30°19'53"E, 2 exs., 18.III.2002, leg. Rose (cRos).

Distribution in Turkey: Not locality cited (Smetana, 2004).

Gabrius latro Joy, 1913

Material examined: Antalya: near Yarbaşı, pure mountain creek, under stones, 1084 m, 36°44'33"N, 30°20'24"E, 2 exs., 29.III.2001, leg. Rose (cRos).

Distribution in Turkey: Adıyaman, Thrace-The European part of Turkey.

Gabrius nigritulus (Gravenhorst, 1802)

Material examined: Antalya: Kemer 5 km NW, rocky riverbank in canyon, on rotting meat, 197 m, 36°36'03"N, 30°29'03"E, 1 ex., 30.III.2001, leg. Rose (cRos).

Distribution in Turkey: Adana, Ankara, İzmir, Konya, Manisa, Mersin.

Gabronthus maritimus (Motschulsky, 1858)

Material examined: Antalya: Alanya, Taşkesiği, east bank of Karpuz river, compost and oak tree leaves, sifted, 50 m, 36°45'N, 31°37'E, 1 ex., 17.III.2000; Antalya, N Sağırı, Köprülü-Kanyon, semi-moist and moist foliage and conifer litter, sifted, 30 m, 37°04'33"N, 31°13'55"E, 1 ex., 22.III.2002, leg. Rose (cRos).

Distribution in Turkey: Adana, Aydın, Kilis, Manisa.

Neobisnius orbus (Kiesenwetter, 1850)

Material examined: Antalya: Alanya, Taşkesiği, east bank of Karpuz river, in gravel with hollows under fresh flotsam, 50 m, 36°45'N, 31°37'E, 2 exs., 17.III.2000; Söğütcumavi 4 km N, roadside, hillside creek, under gravel and leaves, 1006 m, 36°44'37"N, 30°23'44"E, 8 exs., 27.III.2001; near Yarbaşı, pure mountain creek, under stones, 1084 m, 36°44'33"N, 30°20'24"E, 4 exs., 29.III.2001, leg. Rose (cRos).

Distribution in Turkey: Balıkesir, Kilis.

Neobisnius procerulus (Gravenhorst, 1806)

Material examined: Antalya: Arif 2 km NW, dripping water under bridge, in gravel, 795 m, 36°31'23"N, 30°00'42"E, 4 exs., 26.III.2001, leg. Rose (cRos).

Distribution in Turkey: Adana (Smetana, 1967).

Philonthus atratus (Gravenhorst, 1802)

Material examined: Malatya: Arapgir 3 km NE, 912 m, 39°04'13"N, 38°30'34"E, 2 exs., 14.IX.2007, leg. Anlaş (cAnl).

Distribution in Turkey: Ankara, Konya Mersin, Niğde.

Philonthus carbonarius (Gravenhorst, 1802)

Material examined: Antalya: Alanya, Taşkesiği, east bank of Karpuz river, compost and oak tree leaves, sifted, 50 m, 36°45'N, 31°37'E, 1 ex., 17.III.2000; near Ovacık, semi-moist dip with clay soil, in old cow dropping, 1051 m, 36°38'37"N, 30°26'14"E, 1 ex., 31.III.2001, leg. Rose (cRos). **Manisa:** Soma, Hamidiye, 827 m, 39˚16'39"N, 27˚45'50"E, 2 exs., 08.IV.2007, leg. Anlaş (cAnl).
Distribution in Turkey: No locality cited (Herman, 2001; Smetana, 2004).

Philonthus concinnus (Gravenhorst, 1802)

Material examined: Antalya: Alanya, Kuzyaka, hillside meadow with creek, in nearly dry cow dropping, 180 m, 36°32'N, 32°08'E, 1 ex., 17.III.2000; Kemer 5 km NW, rocky riverbank in canyon, on rotting meat, 197 m, 36°36'03"N, 30°29'03"E, 2 exs., 30.III.2001; Central province 5 km S, from quite fresh mule dung, 273 m, 36°49'22"N, 30°32'16"E, 2 exs., 31.III.2001, leg. Rose (cRos).

Distribution in Turkey: Adana, Ankara, Bolu, Kayseri, Konya, Manisa, Mersin, Tunceli.

Philonthus cruentatus (Gmelin, 1790)

Material examined: Antalya: Alanya, mountain road near Ilıca, slope (SE), in old dry cow dung, 340 m, 1 ex., 15.III.2000; Central province 5 km S, from quite fresh mule dung, 273 m, 36°49'22"N, 30°32'16"E, 1 ex., 31.III.2001, leg. Rose (cRos).

Distribution in Turkey: Denizli, İstanbul.

Philonthus ebeninus (Gravenhorst, 1802)

Material examined: Antalya: Alanya, Kuzyaka, hillside meadow with creek, gravel and flotsam sifted, 180 m, 36°32'N, 32°08'E, 1 ex., 12.III.2000, leg. Rose (cRos).

Distribution in Turkey: Adana, Bursa, İzmir, Mersin?

Philonthus intermedius (Lacordaire, 1835)

Material examined: Antalya: Akseki, near Güçlüköy, dry hillside with terraces, 600 m, 36°48'N, 31°44'E, 1 ex., 14.III.2000, leg. Rose (cRos).

Distribution in Turkey: Ankara, Denizli, İzmir, Kahramanmaraş, Mersin?

Philonthus juvenilis Peyron, 1858

Material examined: Antalya: Central province, Büyükalan 5 km E, roadside, floated from mosses at hillside creek, 1352 m, 36°43'39"N, 30°21'12"E, 2 exs., 27.III.2001, leg. Rose (cRos, cSch).

Distribution in Turkey: Mersin, Niğde.

Philonthus nitidicollis (Lacordaire, 1835)

Material examined: Antalya: Akseki 10 km NW, stony grassland, 1283 m, 37°07'16"N, 31°49'05"E, 1 ex., 19.III.2002; Manavgat 3 km N, moist dip, from fresh cow dung, 15 m, 36°50'09"N, 31°28'48"E, 1 ex., 20.III.2002, leg. Rose (cRos).

Distribution in Turkey: Adana, Ankara, Gaziantep, İzmir, Konya.

Philonthus rufimanus Heer, 1839

Material examined: Tunceli: Pertek, Singeç creek, 38°54'44"N, 39°15'01"E, 1200 m, 2 exs., 14.IX.2007; Çemişgezek 1,5 km NW, Ormanyolu creek, 948 m, 39°04'06"N, 38°54'18"E, 2 exs., 14.IX.2007, leg. Anlaş & Yağmur (cAnl).

Distribution in Turkey: Aydın, Bayburt, İzmir, Kilis, Mersin?, Manisa.

Subtribe Quediina Kraatz, 1857

Quedius acuminatus Hochhuth, 1849

Material examined: Antalya: Alanya, Kuzyaka, hillside meadow with creek, pitfall trap, 180 m, 36°32'N, 32°08'E, 1 ex., 12.III.2000; Central province, Büyükalan 5 km E, roadside, under stones and leaves in runlet, 1352 m, 36°43'39"N, 30°21'12"E, 2 exs., 27.III.2001, leg. Rose (cRos).

Distribution in Turkey: Ağrı, Giresun.

Quedius cinctus (Paykull, 1790)

Material examined: Antalya: Akseki 4 km NW, northern slope, oak litter and mosses, sifted, 1250 m, 37°07'N, 31°49'E, 1 ex., 16.III.2000; Central province 5 km S, from quite fresh mule dung, 273 m, 36°49'22"N, 30°32'16"E, 1 ex., 31.III.2001, leg. Rose (cRos).

Distribution in Turkey: Bolu, İstanbul İzmir, Karaman, Mersin?

Quedius cyprusensis Last, 1955

Material examined: Antalya: Central province, Kuzyaka, hillside meadow with creek, gravel and flotsam sifted, 180 m, 36°32'N, 32°08'E, 3 exs., 12.III.2000, leg. Rose (cRos, cSol).

Remarks: The species was previously known from Cyprus and Lebanon (Smetana, 2004). It is reported from Turkey for the first time.

Quedius levicollis (Brullé, 1832)

Material examined: İzmir: Bayındır, Osmanlar 2 km SE, 420 m, 38°18'07"N, 27°33'58"E, 2 exs., 12.XII.2008; Yamanlar Dağı, ca. 680 m, 38°33'N, 27°10'E, 1 ex., 28.XII.2005, leg. Anlaş (cAnl).

Distribution in Turkey: Adana, Ankara, Manisa.

Quedius scintillans (Gravenhorst, 1806)

Material examined: Antalya: Çıralı 1 km W, riverbank (slightly brackish), flotsam, sifted, 5 m, 36°24'35"N, 30°28'04"E, 1 ex., 28.III.2001; Central province, 5 km S, from quite fresh mule dung, 273 m, 36°49'22"N, 30°32'16"E, 4 exs., 31.III.2001; near Armutlu, hillside creek, from leaves on gravel and clay, 1227 m, 36°42'49"N, 30°26'27"E, 1 ex., 31.III.2001; near Ovacık, semi-moist dip with clay soil, in old cow dropping, 1051 m, 36°38'37"N, 30°26'14"E, 2 exs., 31.III.2001; Sağırı, Köprülü-Kanyon, dry grassland near riverbank, under stones, 30 m, 37°04'33"N, 31°13'55"E, 1 ex., 17.III.2002, leg. Rose (cRos, cSol).

Distribution in Turkey: Denizli, İzmir (Sahlberg, 1913).

Subtribe Staphylinina Latreille, 1802

Creophilus maxillosus (Linnaeus, 1758)

Material examined: Antalya: Kemer 5 km NW, rocky riverbank in canyon, on rotting meat, 197 m, 36°36'03"N, 30°29'03"E, 1 ex., 30.III.2001; Manavgat 3 km N, moist dip, from fresh cow dung, 15 m, 36°50'09"N, 31°28'48"E, 1 ex., 20.III.2002, leg. Rose (cRos).

Distribution in Turkey Adana, Gaziantep, Hatay, İzmir, Kayseri, Manisa, Mersin?

Ocypus curtipennis Motschulsky, 1849

Material examined: Antalya: Akseki, near Çiçekoluk, close to pine wood, under stones on crest, 1020 m, 1 ex., 14.III.2000, leg. Bellmann (cRos).

Distribution in Turkey: Bursa, İstanbul, İzmir.

Ocypus mus (Brullé, 1832)

Material examined: Küthaya: Simav, Samat 2 km SW, 3 exs., 16.IV.2006, leg. Anlaş (cAnl).

Distribution in Turkey: Ankara, İzmir, Manisa, Mersin, Muğla, Şanlıurfa, Trabzon.

Ocypus orientis Smetana & Davies, 2000

Material examined: İzmir: Aliağa, Karakuzu, 38°44'N, 27°10'E, 1 ex., 04.X.2008, leg. Anlaş (cAnl).

Distribution in Turkey: Manisa.

Ocypus picipennis picipennis (Fabricius, 1793)

Material examined: Antalya: Akseki 10 km N, moist grassland with snowfields and stones, under stones, 1350 m, 2 exs., 16.III.2000, leg. Rose (cRos).

Distribution in Turkey: Afyonkarahisar, Ankara, Bolu, Isparta, İzmir, Kayseri, Manisa, Tunceli.

Ocypus sericeicollis (Ménétriés, 1832)

Material examined: Antalya: Akseki 4 km NW, northern slope, oak litter and mosses, sifted, 1250 m, 1 ex., 16.III.2000; Akseki 10 km N, moist grassland with snowfields and stones, under stones, 1350 m, 4 exs., 16.III.2000; Central province, near Armutlu, hillside meadow, moist patches, under stones, 1227 m, 36°42'49"N, 30°26'27"E, 5 exs., 31.III.2001, leg. Rose (cRos).

Distribution in Turkey: Ankara, İzmir, Manisa, Şanlıurfa.

Ontholestus murinus (Linnaeus, 1758)

Material examined: Gaziantep: Islahiye 1 km E, 37˚01'06"N, 36˚38'44"E, 1 ex., 15.XII.2007, leg. Yağmur (cYag). **Manisa:** Central province, Otoman, 38°44'47"N, 27°10'34"E, 1 ex., 04.X.2008, leg. Anlaş (cAnl).

Distribution in Turkey: İzmir, Kütahya.

Staphylinus caesareus Cederhjelm, 1798

Material examined: Antalya: Alanya, Kuzyaka, hillside meadow with creek, pitfall trap, 180 m, 36°32'N, 32°08'E, 2 exs., 12.III.2000; Alanya, near Konaklı, dry meadow near coastal road W Alanya, under stones, 10 m, 1 ex., 13.III.2000, leg. Rose (cRos).

Distribution in Turkey: Adıyaman, Ankara, Erzurum, Giresun, Kayseri, Malatya, Mersin, Niğde, Trabzon, Tunceli.

Tribe Xantholinini Erichson, 1839

Gauropterus sanguinipes (Reitter, 1889)

Material examined: Antalya: Alanya, Taşkesiği, east bank of Karpuz river, under stones, 50 m, 36°45'N, 31°37'E, 1 ex., 17.III.2000; Central province, near Yarbaşı, pure mountain creek, under stones, 1084 m, 36°44'33"N, 30°20'24"E, 1 ex., 29.III.2001, leg. Rose (cRos).
Distribution in Turkey: Ankara, Bilecik, Bolu, Diyarbakır, Isparta, İstanbul, Kilis, Kastamonu, Konya, Mersin, Sakarya.

Gyrohypnus fracticornis (O. Müller, 1776)

Material examined: Gaziantep: Şehitkamil, Köksalan, Yıldız Mezrası, 37°16'50"N, 37°12'36"E, 1 ex., 07.III.2008, leg. Yağmur (cAnl). **Kahramanmaraş:** Pazarcık, Çınar, 37°29'47"N, 37°20'25"E, 2 exs., 08.III.2008, leg. Yağmur (cYag).
Distribution in Turkey: Ankara, Giresun, İzmir, Manisa, Muğla, Ordu.

Leptacinus batychrus (Gyllenhal, 1827)

Material examined: Antalya: Central province, Arif 2 km NW, dripping water under bridge, in gravel, 795 m, 36°31'23"N, 30°00'42"E, 1 ex., 26.III.2001, leg. Rose (cRos).

Distribution in Turkey: Artvin, Bolu, Bursa, Hakkari, Van (Assing, 2007).

Leptacinus sulcifrons (Stephens, 1833)

Material examined: Antalya: near Manavgat, dry bushland, under and in old horse dung, 30 m, 1 ex., 13.III.2000, leg. Rose (cRos).

Distribution in Turkey: İzmir, Manisa, Muğla.

Megalinus scutellaris (Fauvel, 1900)

Material examined: Hatay: Dörtyol, Çömük Yaylası 2 km S, 36°49'45"N, 36°15'12"E, 1 ex., 11.V.2008, leg. Yagmur (cAnl).

Distribution in Turkey: Adana, Ankara, Antalya, Çanakkale, Denizli, İzmir, Manisa, Mersin.

Xantholinus audrasi Coiffait, 1956

Material examined: Tunceli: Pertek, Akdemir 3 km E, 1233 m, 38°57'24"N, 39°12'15"E, 14.IX.2007, 2 exs., leg. Anlaş (cAnl).

Distribution in Turkey: Ankara, Antalya, Ardahan, Artvin, Bolu, Burdur, Çankırı, Erzincan, Erzurum, Giresun, İzmir, Manisa, Mersin, Muğla.

Xantholinus graecus Kraatz, 1858

Material examined: Kütahya: Simav, Samat 2 km SW, 1 ex., 16.IV.2006, leg. Anlaş (cAnl).

Distribution in Turkey: Adana, Antalya, Bursa, Gaziantep, İzmir, Kahramanmaraş, Kırklareli, Mersin, Muğla.

Xantholinus marasicus Assing, 2007

Material examined: Gaziantep: Islahiye, Huzurlu Yaylası, 1582 m, 36°58'46"N, 36°28'37"E, 1 ex., 26.IV.2008, leg. Yağmur. **Hatay:** Dörtyol, 1304 m, 38°30'27"N, 35°08'04"E, 1 ex., 08.VII.2007, leg. Gramov & Koç (cAnl).

Remarks: This recently described species was previously known from only one locality from Kahramanmaraş (Assing, 2007).

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A SYNOPSIS OF TURKISH *CLYTUS* LAICHARTING, 1784 AND *SPHEGOCLYTUS* SAMA, 2005 WITH ZOOGEOGRAPHICAL REMARKS (COLEOPTERA: CERAMBYCIDAE: CERAMBYCINAE)

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ABSTRACT: All taxa of the genus *Clytus* Laicharting, 1784 and *Sphegoclytus* Sama, 2005 in Turkey are evaluated. These genera are also discussed in detail. The main aim of this work is to clarify current status of these genera in Turkey. Some new faunistical data are given in the text. A key for Turkish *Clytus* species is also given.

KEY WORDS: *Clytus, Sphegoclytus,* Cerambycinae, Clytini, Cerambycidae.

Subfamily CERAMBYCINAE Latreille, 1802

Tribe CLYTINI Mulsant, 1839

= *Clytaires* Mulsant, 1839
= *Clytitae* Thomson, 1860
= *Clytides* Thomson, 1866
= *Clytina* Reitter, 1912

Type genus: *Clytus* Laicharting, 1784

They are small longhorn beetles (~ 10 - 15 mm). Adult characterized by elongate or moderaltely elongate body. Head is vertical or subvertical, ventral surface oblique at a point below lower eye lobe. Frons has smooth median longitudinal carinae or median flat and wide groove, which is sometimes longitudinal. Eyes have minute facets, notched in upper half. Antennae are relatively short, do not extend beyond middle of elytra, rarely extend beyond or reach apex of elytra. Pronotum is cydariform or sometimes elongated, side rounded, never tuberculate. Fore coxa usually rounded externally, its cavity open posteriorly. Mid coxal cavity open to epimeron. Scutellum pointed posteriorly, triangular or rounded. Elytra are more or less elongate, apically truncate and generally dark-colored with white or yellowish lines or bands produced by combination of pubescence and color on disc itself. Epimeron of metathorax angulated and produced over first abdominal segment and hind coxae. Episternum of metathorax is wide. Legs relatively long; hind femora thicken gradually distally, rarely appear almost clavate (Cherepanov, 1990).

Genus *CLYTUS* Laicharting, 1784

= *Sphegestes* Chevrolat, 1863

Type species: *Leptura arietis* Linnaeus, 1758

Body length is small generally. It is between approximately 5 and 20 mm.

Frons vertical, without visible carinae, with deep punctuation. Eyes deep and comparatively broad notch with small upper lobe and minute facets. Antennae short and slightly thickened towards the apex, the third article a little longer than the fourth. Pronotum transverse or slightly oblong, laterally rounded, with markedly convex disc, the disc shows a dotted sculpture and lacks rasp-like carinae. Scutellum rounded or truncated in the apex. The elytra elongate, usually with parallel sides. Mesosternum very oblique in its previous part; as maximum, metaepisternum three times longer than wide. Front legs short, femora thick; hind tarsi long. Hind femora short and do not reach or barely reach elytral apex (Villiers, 1978; Cherepanov, 1990; Vives, 2000).

Larval development is in broadleaf trees (e.g. in Europe and Turkey, *Prunus, Crateagus, Quercus, Ficus, Morus, Fraxinus, Pistacia, Juglans, Fagus, Castanea, Ulmus, Padus, Frangula, Rhamnus, Salix, Pistacia, Robinia, Pyrus, Vitis, Acer, Carpinus, Paliurus, Styrax, Cistus, Corylus, Rosa, Ilex* etc.) or in conifers (*Picea, Abies, Larix, Juniperus*). Pupation is in the wood generally. Life cycle is about 2-3 years (Bense, 1995; Vives, 2000; Sama, 2002; Hoskovec & Rejzek, 2009).

The main aim of this work is to clarify current status of the genus in Turkey. The genus has about 50 species in the world fauna. At present, it probably will have to separate in other genera or different subgenera. For example, the genus *Sphegoclytus* was recently described by Sama (2005).

The genus *Clytus* Laicharting, 1784 has Holarctic + Oriental + Australian chorotypes. The genus is represented by 32 species in the Holarctic region, 10 species in Oriental region and 5 species in Australian region. In addition to this, it has 4 fossil species that are incertae sedis as *Clytus leporinus* Oustalet, 1874; *C. melancholicus* Heer, 1847; *C. pervetustus* (Cockerell, 1920) and *C. pulcher* Heer, 1865 in the world fauna. *C. carinatus* Laporte & Gory, 1835 was given by Monné & Bezark (2009) in the end of the species of *Xylotrechus* with a question mark for N America.

In Palaearctic region, the genus is represented by 22 species.

In Europe, this genus includes 7 species as *Clytus arietis* (Linnaeus, 1758); *C. arietoides* Reitter, 1900; *C. clavicornis* Reiche, 1860; *C. lama* Mulsant, 1850; *C. rhamni* Germar, 1817; *C. triangulimacula* Costa, 1854 and *C. tropicus* (Panzer, 1795). According to Sama (2002), *Clytus robertae* Mineau & Teocchi, 1986 is a nomen nudum. *C. clavicornis* Reiche, 1860 is endemic to Sicily and *C. triangulimacula* Costa, 1854 is endemic to Italy.

The genus *Clytus* Laicharting, 1784 is represented by 10 species as *Clytus arietis* (Linnaeus, 1758); *C. ciliciensis* (Chevrolat, 1863); *C. gulekanus* Pic, 1904; *C. kumalariensis* Johanides, 2001; *C. madoni* (Pic, 1890); *C. rhamni* Germar, 1817; *C. schneideri* Kiesenwetter, 1879; *C. schurmanni* Sama, 1996; *C. taurusiensis* (Pic, 1903) and *C. tropicus* (Panzer, 1795). 4 species as *Clytus ciliciensis* (Chevrolat, 1863); *C. gulekanus* Pic, 1904; *C. kumalariensis* Johanides, 2001 and *C. schurmanni* Sama, 1996 are endemic to Turkey.

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al.

(1999). As far as possible as one chorotype description can be determined for each taxon in the text.

The Turkish *Clytus* Laicharting, 1784 taxa are presented as follows:

arietis Linnaeus, 1758
ssp. ***arietis*** Linnaeus, 1758
ssp. ***lederi*** Ganglbauer, 1881
ssp. ***oblitus*** Roubal, 1932
?ssp. ***gazella*** Fabricius, 1792

Original combination: *Leptura arietis* Linnaeus, 1758

Other names. *arcuatus* Sulzer; *quadrifasciatus* DeGeer; *dasypus* Voet; *bourdilloni* Mulsant; *clouti* Thery; *incontans* Kuhnt; *sibiricus* Pic; *bickhardti* Pic; *heyrovskyi* Pic; *chapmani* Pic; *koslovskyi* Plavilstshikov; *triangulimaculus* Costa; *schepmani* Reclaire et Van Der Wiel; *carpelani* Heyrovsky; *quadripunctatus* Heyrovsky; *krupkai* Heyrovsky; *aliquoi* Tassi.

Body length 6-15 mm. Antennae brownish, blackish or dark brown towards to distal end (distal half of fifth segment to eleventh segments). Pronotum with yellow borders; anterior border complete, posterior border interrupted in the middle. Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra truncated in the apex. Elytra with four transverse bands and spots. In general: 1st band (humeral band or spot) clear, transverse, more or less smooth or slightly convex, not reaching to the suture at the end but run beyond the half of elytronal wideness; 2nd band so clear, oblique transverse (very concave undulating), reaching to the suture at the end, the lowest part in just middle of elytron and run obliquely to basal one fourth of elytron, begins and finishes in second quarter of elytron; 3rd band so clear, transverse, more or less smooth, reaching to the suture, just on three fourth of elytron; 4th band (band of elytral apex) so clear, concave, reaching to the suture. So 3 elytral bands reaching to the suture and 1 elytral band or spot (humeral band or spot) not reaching to the suture. Elytral bands with yellow hairs. Legs brown generally, front and middle femora blackish in the basal half.

In ssp. *lederi,* posterior border of pronotum complete and the elytral bands broader and more distinct.

Records in Turkey: İstanbul prov.: Alem Mt. (Bodemeyer, 1906; Demelt, 1963); Turkey (Acatay, 1948, 1961, 1968; Danilevsky & Miroshnikov, 1985; Lodos, 1998; Sama, 2002); Erzurum prov., Trabzon prov.: Hamsiköy, Zonguldak prov.: Safranbolu (Villiers, 1967); Gümüşhane prov.: Torul (Gfeller, 1972); Amasya prov.: Turhal (Gül-Zümreoğlu, 1972); Artvin prov.: Ardanuç as *C. arietis gazella* Fabricius, 1792 (Sama, 1982); Erzurum prov.: Tercan (Öymen, 1987); Kocaeli prov.: İzmit (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Artvin prov.: Ardanuç (Tosunlu) (Alkan, 2000); Kocaeli prov.: İzmit (Beşkayalar Natural Park) (Özdikmen & Demirel, 2005); Bolu prov.: Abant, Çanakkale prov.: Kirazlı, Çankırı prov.: Ilgaz Mt., Erzurum prov.: İspir, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Ankara prov.: Kızılcahamam (Yenimahalle village) (Özdikmen, 2006); Düzce prov.: Yığılca, Kastamonu prov.: Küre, Bolu prov.: Pazarköy env. (Özdikmen, 2007).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, Great Britain, ?Ireland, Czechia, Slovakia, Norway, Poland, Sweden, Finland, Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, ?European Kazakhstan), Central Asia, Turkmenistan, Caucasus, Azerbaijan, Transcaucasia, Turkey, Iran.

Chorotype: European

Remarks: It distributes in North and East Turkey. The species has three (or four) subspecies in the World. Danilevsky (2009a,b) stated that *"Clytus arietis gazella Fabricius" was recorded for Artvin (Turkey) by G.Sama (1982). According to personal communication by G. Sama (2004), the name was introduced by Fabricius for a colour form (black femurs) of Clytus arietis from "Kiliae = Kiel" and does not represent a separate taxon".* So, the species is represented by two subspecies in Turkey. *C. arietis lederi* Ganglbauer, 1881 occurs in Caucasus (Talysh, Kopet-Dag and North Iran), East Turkey (Danilevsky, 2009b) and the nominative *C. arietis arietis* (Linnaeus, 1758) occurs in other parts of North Turkey. Another subspecies is *C. arietis oblitus* Roubal, 1932 occurs only in Caucasus.

ciliciensis Chevrolat, 1863

Original combination: *Sphegestes ciliciensis* Chevrolat, 1863

Other names. *bifarius* Heyden; *reitteri* Thery; *griseofasciatus* Pic.

Body length 5-10 mm. Antennae brownish completely. Pronotum with very reduced white borders; anterior border into a trace just in the middle, posterior border more clear but very reduced and interrupted in the middle. Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra rounded in the apex. Elytra with two transverse bands, without humeral band and band of elytral apex. 1st band clear, oblique transverse (very concave undulating), almost reaching to the suture at the end, beginning near the middle of elytron and run obliquely to basal quarter of elytron; 2nd band clear, transverse (on the elytral margin slightly lower than the suture), reaching to so near the suture at the end. So, elytral bands not reaching to the suture or only 1 elytral band (the 1st band) almost reaching to the suture. Elytral bands with yellow hairs. Legs blackish generally, tibiae and tarsi brownish or dark brown.

Material examined: Osmaniye prov.: Kalecik-Hasanbeyli road, N 37 03 E 36 30, 689 m, 19.05.2006, 1 specimen; Hasanbeyli, Kalecikli village, N 37 09 E 36 27, 587 m, 19.05.2006, 2 specimens; Karaçay district, N 37 02 E 36 17, 212 m, 17.05.2006, 3 specimens; Zorkun road, Çiftmazı, N 37 01 E 36 17, 223 m, 20.05.2006, 1 specimen; Issızca village, N 37 08 E 36 20, 139 m, 21.04.2007, 1 specimen; Bıçakçı village, N 37 09 E 36 17, 293 m, 21.04.2007, 1 specimen; Bahçe, Horu stream env., N 37 10 E 36 27, 562 m, 17.05.2007, 2 specimens; Bahçe, Kabacalı village, N 37 11 E 36 36, 722 m, 02.06.2007, 3 specimens; Hatay prov.: Sazlık, N 36 54 E 36 07, 15 m, 17.05.2006, 1 specimen; Erzin-kaplıcalar place, N 36 57 E 36 15, 123 m, 17.05.2006, 1 specimen; Kuzuculu, N 36 53 E 36 15, 134 m, 23.04.2007, 1 specimen.

Records in Turkey: Type loc.: Caramanie (Tarsous) (Chevrolat, 1863); Turkey (Winkler, 1924-1932; Lodos, 1998); Hatay prov.: İskenderun (Demelt, 1963); İçel prov.: Gözne (Villiers, 1967); İçel prov.: Erdemli and Kuzucubelen (Adlbauer, 1988); Kahramanmaraş prov.: Ekinözü (Türkeli), Pazarcık, Central, Kahramanmaraş-Andırın road (Özdikmen & Okutaner, 2005); İçel prov.: Erdemli- Güzeloluk, Tarsus-Çamlıyayla (Malmusi & Saltini, 2005); İçel prov.: Erdemli (Limonlu) (Özdikmen et al., 2005); Osmaniye prov.: Düziçi (Gökçayır village) (Özdikmen & Demirel, 2005); İçel prov.: Erdemli-Güzeloluk road (Özdikmen, 2006).

Range: Turkey.

Chorotype: Anatolian

Remarks: The species is endemic to Turkey. Aurivillius (1912) recorded it for Anatolia, Syria and Cyprus, but its status in Syria and Cyprus is not clear. It distributes rather widely in only S Anatolia.

gulekanus Pic, 1904

Original combination: *Clytus gulekanus* Pic, 1904

Body length 6-15 mm. Antennae brownish completely. Pronotum with reduced yellow borders; both anterior and posterior borders interrupted in the middle, posterior border more reduced than the anterior. Scutellum covered with yellow hairs. Scutellum pointed in the apex. Elytra truncated in the apex. Elytra with 4 transverse bands and spots. 1st band (humeral spot) clear, oblique, not reaching to the suture, only in humeral part; 2nd band so clear, oblique transverse (very concave undulating), not reaching to the suture but in the length of one third at the end run parallelly along the suture, the lowest part just in the middle of elytron and run obliquely to basal one fourth of elytron, begins and finishes in second quarter of elytron; 3rd band so clear, more or less transverse but like a distinct spot, not reaching the elytral margin, almost reaching to the suture, just at the beginning part of apical quarter of elytron; 4th band (band of elytral apex) clear, more or less smooth or slightly concave, reaching to the suture. So, only 1 elytral band (band of elytral apex) reaching to the suture. Elytral bands with yellow hairs. Legs brown generally, all femora blackish with brown basal and apical end.

Records in Turkey: Type loc.: İçel prov.: Namrun and Tarsus (Ex Akşit et al., 2005); Taurus (Aurivillius, 1912); Turkey (Winkler, 1924-1932; Lodos, 1998); İçel prov.: Tarsus, Çamlıyayla (Adlbauer, 1988); Aydın prov.: Buharkent (Akşit et al., 2005).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey and according to the record of Akşit et al. (2005) it distributes rather widely in S and SW Anatolia. Host plant is *Ficus carica*.

kumalariensis Johannides, 2001

Original combination: *Clytus kumalariensis* Johannides, 2001

Body length 10-14 mm. Antennae brownish completely. Pronotum with yellow anterior border and without posterior border. Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra truncated in the apex.Elytra with 4 transverse bands and spots. 1st band (humeral spot) clear, transverse, more or less smooth or slightly convex, not reaching to the suture and elytral margin, only in humeral part; 2nd band so clear, oblique transverse (very concave undulating), not reaching to the suture but in the length of one third at the end run more or less parallel along the suture, the lowest part just in the middle of elytron and run obliquely to basal quarter of elytron (almost to level of humeral spot), begins in second quarter and finishes in first quarter of elytron; 3rd band so clear, transverse, slightly convex undulating, reaching to the suture, just on tree fourth of elytron; 4th band (band of elytral apex) clear, more or less smooth or slightly concave, reaching to the suture. So, two elytral band (3rd band and band of elytral apex) reaching to the suture. Elytral bands with yellow hairs. Legs brown generally, all femora blackish with brown basal and apical end but hind femora paler.

Records in Turkey: Type loc.: Afyon prov.: Kumalar Mountain (Şuhut-Başören) (Holotype and allotype), Afyon prov.: Kumalar Mountain (Şuhut-Başören), 3 km West of Başören (paratypes) (Johanides, 2001).

Range: Turkey.

Chorotype: Anatolian

Remarks: The species is endemic to Turkey. Until now it has been known only from the type locality. Probably the species distributes only in CW Turkey.

madoni Pic, 1890

Original combination: *Clytus* (*Clytantus*) *madoni* Pic, 1890

Other names. *preapicalis* Pic.

Body length 5-8 mm. Antennae brownish completely. Pronotum without borders. Scutellum covered with white hairs. Scutellum rounded in the apex. Elytra truncated in the apex. Elytra with two transverse bands, without humeral band and band of elytral apex. 1st band clear, oblique transverse (concave undulating), not reaching to the suture, beginning near the middle of elytron and run obliquely to the beginning part of second quarter of elytron (at the beginning level so lower than the end); 2nd band clear, oblique transverse, more or less smooth or slightly undulating, reaching to near the suture at the end (at the beginning level lower than the end). So, elytral bands not reaching to the suture. Elytral bands with white hairs. Legs blackish dark brown.

Records in Turkey: Type loc.: Palestine (Pic, 1890); Hatay prov.: Antakya (Adlbauer, 1992); Turkey (Lodos, 1998; Sama & Rapuzzi, 2000); Hatay prov.: Harbiye-Yayladağı (Malmusi & Saltini, 2005).

Range: Turkey, Israel, Palestine, Cyprus.

Chorotype: E-Mediterranean (Palestino-Cyprioto-Taurian)

Remarks: It distributes only in S Anatolia for Turkey. *Clytus preapicalis* Pic, 1939 was proposed by Holzschuh (1975) as a synonym.

rhamni Germar, 1817
ssp. ***rhamni*** Germar, 1817
ssp. ***temesiensis*** Germar, 1824
ssp. ***bellieri*** Gautier, 1862

Original combination: *Clytus rhamni* Germar, 1817

Other names. *gazella* Olivier; *corsicus* Chevrolat; *ferruginipes* Pic; *bifasciatus* Nicolas; *longicollis* Reitter; *siculus* Wagner; *innormalis* Pic; *paliuri* Depoli; *latevittatus* Schaefer; *kaszabi* Heyrovsky; *anticedivisus* Podany.

Body length 6-12 mm. Antennae brownish, blackish or dark brown towards to distal end (distal half of fifth segment to eleventh segment). Pronotum with yellow borders; anterior border complete, posterior border interrupted in the middle. Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra truncated in the apex. Elytra with four transverse bands and spots. 1st band (humeral spot) clear, more or less oblique or more or less circular, not reaching to the suture, only in humeral part; 2nd band so clear, oblique transverse (very concave undulating), reaching to the suture at the end, beginning near the middle of elytron and run obliquely to basal quarter of elytron (almost to level of humeral spot), begins in second quarter and finishes in first quarter of elytron (at the beginning level so lower than the end); 3rd band so clear, transverse, more or less smooth, reaching to the suture, just on tree fourth of elytron; 4th band (band of elytral apex) so clear, more or less smooth, reaching to the suture. So, 3 elytral bands reaching to the suture and 1 elytral band or spot (humeral band or spot) not reaching to the suture. Elytral bands with yellow hairs. Legs brown generally, all femora black and hind tibiae blackish or dark brown.

In ssp. *temesiensis*, posterior border of pronotum almost complete and front legs and antennae paler.

Material examined: Antalya prov.: Akseki, Murtiçi-Güzelsu, 970 m, N 36 54 E 31 49, 11.06.2007, 2 specimens; İbradı, 908 m, N 37 04 E 31 36, 11.06.2007, 5 specimens, 1008 m, N 37 05 E 31 36, 09.06.2008, 3 specimens; Hatay prov.: Samandağı, Kapısuyu village, N 36 07 E 35 57, 323 m, 04.06.2007, 1 specimen; Konya prov.: Hadim, Korualan env., 1648 m, N 36 58 E 32 24, 12.06.2008, 3 specimens; Osmaniye prov.: Zorkun road, Çiftmazı Gölyeri, N 37 01 E 36 17, 751 m, 24.06.2006, 1 specimen; Cebel road, Çürükarmut plateau, N 37 04 E 36 21, 911 m, 26.06.2006, 3 specimens; Yarpuz road, Yukarı Haraz plateau, N 37 04 E 36 22, 856 m, 26.06.2006, 30 specimens; Yarpuz road, 8th km, N 37 04 E 36 20, 718 m, 26.05.2006, 3 specimens; Zorkun road, Karacalar village, N 37 02 E 36 16, 381 m, 24.06.2006, 1 specimen; Zorkun road, Ürün plateau, N 37 01 E 36 16, 785 m, 24.06.2006, 2 specimens; Yarpuz road, Forest store env., N 37 05 E 36 19, 273 m, 18.05.2006, 1 specimen; Düziçi, Gökçay, N 37 20 E 36 27, 600 m, 02.06.2007, 6 specimens; Düziçi, Yarbaş, N 37 11 E 36 25, 376 m, 02.06.2007, 1 specimen; Bahçe, Kabacalı village, N 37 11 E 36 36, 722 m, 02.06.2007, 2 specimens.

Records in Turkey: İstanbul prov.: Alem Mt. (Bodemeyer, 1906); European Turkey as *C. rhamni* v. *ferruginipes* Pic, 1891 (Winkler, 1924-1932); Sinop prov.: Ayancık (Schimitschek, 1944); Amasya prov. (Villiers, 1959); İstanbul prov.: Polonez village / Alem Mountain / Beykoz / Anadoluhisarı / Çengelköy, İzmir prov.: near Central / Kemalpaşa / Efes / Bergama, Antalya prov.: near Central / Belkıs (Aspendos, Cumali) / Antitoros Mountains (Bey Mountains / Korkuteli) / Alanya and near, Isparta prov.: Eğirdir and near (Demelt & Alkan, 1962); Turkey (Demelt, 1963; Danilevsky & Miroshnikov, 1985; Lodos, 1998); Amasya prov., Artvin prov. (Villiers, 1967); Bayburt prov.: Central (Fuchs et Breuning, 1971); Amasya prov., Kocaeli prov., Yalova prov. (Gfeller, 1972); İçel prov.: Silifke (Tuatay et al., 1972); Gaziantep prov.: Fevzipaşa as *C. rhamni temesiensis* (Sama, 1982); Hatay prov.: Amanos Mountains (near Dörtyol) (Öymen, 1987); İzmir prov.: Efes, Antalya prov.: Central / Kemer / Alanya (Güzelbağ) / Manavgat / Patara / Termessos / Yeni Karaman, İçel prov.: Anamur / Silifke (Central / Gülnar) / Kuzucubelen / Tarsus (Çamlıyayla) / Kanlıdivane, Çanakkale prov.: Ayvacık, Osmaniye prov.: Nurdağı pass, Kahramanmaraş prov.: Andırın, Adana prov.: Kozan as *C. rhamni temesiensis* (Adlbauer, 1988); European Turkey as *C. rhamni temesiensis* (Althoff & Danilevsky, 1997); Adıyaman prov.: Karadut village env. as *C. rhamni temesiensis* (Rejzek & Hoskovec, 1999); Antalya prov.: Arapsuyu, Artvin prov.: Yusufeli, Bilecik prov.: Central, Hatay prov.: Erzin, Gümüşhane prov.: Kale, Tokat prov.: Central (Tozlu et al., 2002); Asia Minor as *C. rhamni temesiensis* (Sama, 2002); Antalya prov.: Alanya (Mahmutlar) / Kemer (Olimpos Mt.), Konya prov.: Akşehir (Cankurtaran village, Sultan Mts.), Sivas prov.: Yıldızeli (Cumhuriyet village), Yozgat prov.: Çiğdemli (Gökiniş village), Gümüşhane prov.: Kelkit (Günyurdu village) (Özdikmen & Çağlar, 2004); İçel prov.: Silifke, İstanbul prov.: Kadıköy (Özdikmen et al., 2005); Kocaeli prov.: İzmit (Ballıkayalar Natural Park / Beşkayalar Natural Park), Osmaniye prov.: Zorkun plateau / Zorkun plateau road (Ürün plateau / Olukbaşı place) / Yarpuz road (Karataş place) (Özdikmen & Demirel, 2005); Amasya prov.: Aydınca (İnegöl Mt.), Artvin prov.: from Şavşat to Çam pass, Adana prov., Bursa prov.: Uludağ, Çanakkale prov.: Kirazlı, Çankırı prov.: Çerkeş, Kırklareli prov.: Demirköy, İçel prov.: Erdemli- Güzeloluk / Güzeloluk / from Tarsus to Çamlıyayla / from Ortagören to Mut, Malatya prov.: Reşadiye pass, Rize prov.: Artvin-Şavşat, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Ankara prov.: Kızılcahamam (Işık Mountain, Yukarı Çanlı) (Özdikmen & Demir, 2006); Ankara prov.: Kızılcahamam (S of Dam / Güvem / Yasin village / Yukarı Çanlı, İçel prov.: Uzuncaburç / Mersin-Gözne road (entry of Yeniköy), Kayseri prov.: Yahyalı (Büyükçayır-Yeşilköy, Kapuzbaşı place) (Özdikmen, 2006).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Sardinia, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slovakia, Poland, Latvia, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), Caucasus, Transcaucasia, Turkey, Iran, Syria, Cyprus.

Chorotype: European

Remarks: It distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. rhamni temesiensis* Germar, 1824 occurs in West and South Turkey and the nominative *C. rhamni rhamni* Germar, 1817 occurs in other parts of Turkey. The other known subspecies, *C. rhamni bellieri* Gautier, 1862, occurs in W Mediterranean, C Europe, Sicily and Italy.

schneideri **Kiesenwetter, 1879**

ssp. ***schneideri*** Kiesenwetter, 1879
ssp. ***inapicalis*** Pic, 1895

Original combination: *Clytus schneideri* Kiesenwetter, 1879

Other names: *robertae* Mineau & Teocchi.

Body length 6-12 mm. Antennae brownish completely. Pronotum with clear yellow borders, both borders not interrupted. Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra rounded in the apex. Elytra with four transverse bands and spots, without band of elytral apex. 1st band (humeral band or spot) clear, transverse, more or less smooth, not reaching to the suture at the end but run to the half of elytronal wideness; 2nd band so clear, oblique transverse (very concave undulating), reaching to the suture at the end, begins near the middle of elytron and run obliquely to one fourth of elytron, begins and finishes in second quarter of elytron; 3rd band clear, oblique transverse, more or less smooth, reaching to the suture, just on tree fourth of elytron at the beginning (on the elytral margin lower than the suture); 4th band clear, transverse, more or less smooth or slightly concave, reaching to the suture and the elytral margin, in apical quarter of elytron but distinctly apart from the elytral apex. So, 3 elytral bands reaching to the suture and 1 elytral band or spot (humeral band or spot) not reaching to the suture. Elytral bands with yellow hairs. Legs brownish.

In ssp. *inapicalis*, elytral bands broader and more distinct; 1st elytral band (humeral band or spot) clear, transverse, more or less smooth, not reaching to the suture at the end but run slightly beyond the half of elytronal wideness; 2nd elytral band more distinct, oblique transverse (concave undulating), reaching to the suture at the end, the lowest part near the middle of elytron and run obliquely to basal quarter of elytron, begins in second quarter of elytron and finishes in first quarter of elytron; 4th band clear, oblique transverse, more or less smooth, reaching to the suture, setting on apical quarter of elytron but distinctly apart from the elytral apex.

Records in Turkey: Turkey: Erzurum prov. as type loc. of *C. schneideri inapicalis* Pic, 1895; Turkey (Winkler, 1924-1932; Danilevsky & Miroshnikov, 1985); Turkey as *C. inapicalis* Pic, 1895 (Winkler, 1924-1932; Lodos, 1998); Artvin prov.: Ardanuç (Sama, 1982); Artvin prov.: Ardanuç / 10 km SE Borçka / Şavşat (Central / Çam pass) / Yalnızçam pass (Sama, 1996); Erzurum prov.: İspir, Artvin prov.: NW Yusufeli (Altıparmak) as *C. schneideri inapicalis* Pic, 1895 (Sama, 1996); Erzurum prov.: İspir (Tauzin, 2000); Artvin prov.: Yusufeli (Yesiltepe env. / Barhal road / Central (Özdikmen & Demirel, 2005); Artvin prov.: Şavşat, Rize prov.: Artvin-Şavşat / Cankurtaran pass (Malmusi & Saltini, 2005); Artvin prov.: Yusufeli as *C. inapicalis* Pic, 1895 (Malmusi & Saltini, 2005).

Range: Caucasus, Iran, Turkey.

Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian). According to Sama (1996 and 2002), *C. robertae* Mineau & Teocchi is nomen nudum and collecting label is wrong fairly probable.

Remarks: The species distributes only in NE Turkey. It is represented by two subspecies in Turkey. According to Sama (1996), *C. schneideri inapicalis* Pic, 1895 occurs only in NE Turkey (eastwards Tokat prov. to Artvin prov.) and the nominative *C. schneideri schneideri* Kiesenwetter, 1879 occurs in Artvin prov. of NE Turkey. The nominative subspecies is distributed mainly in Caucasus, Iran and Near East. Some old records from Turkey of this species belong to the species *C. schurmanni* Sama, 1996. These records are given below. Sama (1996) recognized *Clytus schneideri inapicalis* Pic, 1895 (stat. n.) as a subspecies.

schurmanni Sama, 1996

Original combination: *Clytus schurmanni* Sama, 1996

Body length 6-12 mm. This species so close to *C. schneideri* Kiesenwetter, 1879. Sama (1996) originally stated that "*Cette espèce qu'on a jusqu'ici rapportée à C. schneideri, s'en sépare à premiére vue par ses bandes élytrales bien plus réduites et minces, presque linéaires, son écusson non flanqué d'une tache de poils jaunes de chaque côte, la ponctuation du pronotum et des élytres plus fine, la pubescence somber qui couvre les élytres plus courte, plus raide et clairsemée, l'apex élytral atténué, anguleux en dehors, tandis qu'il est arrondi chez schneideri et inapicalis*".

Chiefly, elytra attenuated in the apex but rounded in *C. schneideri schneideri* and *C. schneideri inapicalis*. Elytral bands are more reduced and slim, almost linear. Elytral bands with yellow hairs.

Records in Turkey: There are two types of the records from Turkey for this species. As *C. schurmanni* Sama, 1996: Holotype: Ankara prov.: Kızılcahamam, Paratypes: Ankara prov.: Kızılcahamam / Işık Mountain, Çankırı prov.: Çerkeş / Ilgaz, Çorum prov.: Boğazkale, Amasya prov., Tokat prov.: Central / Almus, Yozgat prov. (Sama, 1996a); Turkey (Johanides, 2001); Bolu prov.: Köroğlu Beli (Özdikmen et al., 2005); Kırşehir prov.: Boztepe road (Özdikmen & Demirel, 2005); Amasya prov.: Aydınca, Çankırı prov.: Çerkeş / Korgun, Çorum prov.: Boğazkale (Malmusi & Saltini, 2005); Ankara prov.: Kızılcahamam (Soğuksu National Park) / Sincan (Mülk, Ayaş Mountain) (Özdikmen & Demir, 2006); Karabük prov.: Safranbolu (Bulak village), between Azdavay–Pınarbaşı, Hanönü env., Çorum prov.: Tosya–Kargı road (Özdikmen, 2007); Ankara prov.: Bağlum (Özdikmen et al., 2009).As *C. schneideri* Kiesenwetter, 1879: Amasya prov. (Villiers, 1967); Ankara prov.: Işık Mountain (Demelt, 1967); Amasya prov. – Heyden, 1890 (Ex. Gül-Zümreoğlu, 1975); Ankara prov.: Çubuk dam, İzmir prov.: Kemalpaşa (Gül-Zümreoğlu, 1975); Tokat prov.: Almus (Sama, 1982); Ankara prov.: Kızılcahamam, Tokat prov.: Central / Akbelen / Mezra / Yakacık (Gökdere), Amasya prov.: Merzifon, Kastamonu prov.: Akaya / Central (Adlbauer, 1992); İzmir prov., Ankara prov., Amasya prov. (Lodos, 1998).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey and distributes mostly in central parts of North Turkey.

taurusiensis Pic, 1903

Original combination: *Clytus* (*Clytantus*) *taurusiensis* Pic, 1903

Other names: *bytinskii* Heyrovsky.

Body length 6-10 mm. Antennae brownish completely. Pronotum without borders. Scutellum covered with white hairs. Scutellum rounded in the apex. Elytra truncated in the apex. Elytra with two transverse bands, without humeral band and band of elytral apex. 1st band reduced, fine but clear, very oblique transverse (very concave undulating), not reaching to the suture and elytral margin but in the most length at the end run more or less parallel along the suture, the lowest part in just middle of elytron and run obliquely to one fourth of elytron (run along the whole length of second quarter of elytron); 2nd band clear, oblique transverse, smooth, almost reaching to the suture at the end (at the beginning level very lower than the end). So, elytral bands not reaching to the suture or 1 elytral band (2nd band) almost reaching to the suture. Elytral bands with white hairs. Legs blackish dark brown.

Records in Turkey: Osmaniye prov.: Bahçe (Adlbauer, 1992); Turkey (Lodos, 1998); Hatay prov.: Antakya (Teknepınar) (Özdikmen & Demirel, 2005); İçel prov.: Uzuncaburç road (Özdikmen, 2006).

Range: Turkey, Israel.

Chorotype: E-Mediterranean (Palestino-Taurian)

Remarks: It probably distributes only in S Anatolia for Turkey. *Clytus bytinskii* Heyrovsky, 1954 was proposed by Holzschuh (1975) as a synonym.

tropicus Panzer, 1795

Original combination: *Callidium tropicum* Panzer, 1795

Other names: *mucronatus* Castelnau & Gory; *kelchi* Bach; *prescutellaris* Pic; *interruptus* Pic; *reclinatus* Pic; *inbasalis* Plavilstshikov; *posticedivisus* Plavilstshikov; *posticeabruptus* Plavilstshikov; *posticereductus* Plavilstshikov; *posticeconjunctus* Plavilstshikov; *maculatus* Sekera; *bimaculaticollis* Sekera; *nigricollis* Sekera; *tripunctatus* Sekera; *kudlai* Sekera; *tippmanni* Sekera; *anticereductus* Schmidt; *incertus* Niedl; *klinzigi* Podany; *georgii* Podany; *palaseki* Podany; *reductesignatus* Heyrovsky; *circumactus* Slama; *terinterruptus* Slama.

Body length 10-20 mm. Antennae brownish completely. Pronotum with 4 spots of yellow hairs (2 spots near anterior margin and 2 spots near posterior margin). Scutellum covered with yellow hairs. Scutellum rounded in the apex. Elytra rounded in the apex. Elytra with four transverse bands and spots, without band of elytral apex. 1st band or spot (humeral band or spot) clear, oblique, more or less circular, not reaching to the suture, setting just in one fourth of the elytron centrally; 2nd band so clear, oblique transverse (very concave undulating), reaching to the suture at the end, in the most length at the end run more or less parallel along the suture, the lowest part in just middle of elytron and run obliquely to basal quarter of elytron, begins in second quarter of elytron and finishes in first quarter of elytron; 3rd band so clear, oblique transverse, slightly convex or more or less smooth, reaching to the suture and near the elytral margin but not reaching, setting just on tree fourth of elytron; 4th band clear, oblique transverse, concave, reaching to the suture but not reaching the elytral margin. So, 3 elytral bands reaching to the suture and 1 elytral band or spot (humeral band or spot) not reaching to the suture. Elytral bands with yellow hairs. Legs brownish generally, all femora black with brownish basal and apical parts.

Records in Turkey: European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998).

Range: Europe (Spain, France, Corsica, Croatia and Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slowakia, Poland, Belorussiya, Ukraine, Moldovia, European Russia).

Chorotype: European or S-European

Remarks: It probably distributes only in NW Turkey.

Genus *SPHEGOCLYTUS* Sama, 2005

Type species: *Clytus vesparum stepanovi* Danilevsky & Miroshnikov, 1985 [=*Clytus stepanovi* Danilevsky & Miroshnikov, 1985]

The generic characters were given by Sama (2005). "*Head with front subvertical, without carinae or distinct longitudinal lines; the posterior part of head, concealed under the anterior part of pronotum, simple, not extended behind. Antennae short (in both sexes hardly extending to the middle of elytra), all segments not spinose. Pronotum subhexagonal, slightly rounded at sides, the disc distinctly elevated on the anterior and posterior margins, transversally depressed on the middle between these two elevations and with one longitudinal depressed area on each side. Legs slender, 2nd segment of hind tarsi not longer than 3rd. Besides the basal falcate sclerite, the internal sac of aedeagus only with a single apical sclerite*".

The genus *Sphegoclytus* was recently described by Sama (2005) on the base of the only one species, *Clytus stepanovi* (Danilevsky & Miroshnikov, 1985) with a note that "*Clytus vesparum Reitter, 1889 (described from "Talisch", currently Azerbaijan) possibly belongs to the new genus*". *Clytus stepanovi* was described by Danilevsky & Miroshnikov (1985) from Krasnodar in north-western Caucasus as a subspecies of *C. vesparum* Reitter, 1889. Miroshnikov (1990) proposed to regard *C. stepanovi* as a distinct species. Although, the genus *Sphegoclytus* Sama, 2005 was regarded by Danilevsky (2009b) as a subgenus of *Clytus* Laicharting, 1784. He stated that "*Sphegoclytus Sama, 2005 was described for Clytus* *stepanovi only with a remark: "Clytus vesparum Reitter, 1889 possibly belongs to a new genus". The current composition of the genus Clytus is so heterogeneous, that now Sphegoclytus must be accepted as a subgenus, which sure includes Clytus vesparum*". However, we accept that *Sphegoclytus* Sama, 2005 is a separate genus, not a subgenus of *Clytus*. Since, Sama (2005) stated taht "*the new genus appears more closely related to Clytus from which it differs in the shape and number of sclerites of the internal sac of aedeagus (which in Clytus has two rows of spines) (Figs 9-10), the shape of pronotum, the 2nd segment of hind tarsi not longer than 3rd (distincly longer in Clytus)*". So we also take into consideration the form of head and we agree with the approach of Sama (2005). And now we have evaluated *C. vesparum* Reitter, 1889 in the genus *Sphegoclytus* Sama, 2005 in the present text.

The presence of the genus in Turkey is not clear. Until now, it has not been recorded from any exact locality in Turkey. If present, it probably distributes only in NE Anatolia for Turkey.

Turkish *Sphegoclytus* Sama, 2005 taxa are presented as follows:

stepanovi Danilevsky & Miroshnikov, 1985

Original combination: *Clytus vesparum stepanovi* Danilevsky & Miroshnikov, 1985

Body length 8-12 mm. Antennae brownish completely. Pronotum with yellow borders; in female, anterior border interrupted in the middle and posterior border complete; in male both borders interrupted in the middle. Scutellum covered with yellow hairs. Scutellum pointed in the apex. Elytra truncated in the apex. Elytra with four transverse bands and spots. 1st band or spot (humeral band or spot) clear, oblique, not reaching to the suture at the end but run at least the half of elytronal wideness; 2nd band clear, oblique transverse (very concave undulating), reaching to the suture at the end, beginning just in one third of elytron and run obliquely to basal quarter of elytron (almost to level of humeral spot); 3rd band so clear, transverse, more tickened in the suture, reaching to the suture but not reaching the elytral margin, just on two third of elytron; 4th band (band of elytral apex) clear, more or less smooth, reaching to the suture. So, 3 elytral bands reaching to the suture. Elytral bands with yellow hairs. Legs brownish generally, all femora black in the apical half.

Records in Turkey: N Turkey (Danilevsky & Miroshnikov, 1985; Johanides, 2001).

Range: Caucasus, Turkey.

Chorotype: SW-Asiatic (Anatolo-Caucasian)

Remarks: Its status in Turkey is not clear. It has not any record of exact locality in Turkey. If present, it probably distributes only in NE Anatolia for Turkey.

vesparum Reitter, 1889

Original combination: *Clytus vesparum* Reitter, 1889

Body length 10-18 mm. In general, this species is close to *S. stepanovi*. Pronotum with yellow borders; anterior border usually interrupted in the middle and posterior border complete. Yellow borders of pronotum are very narrow in *S. stepanovi*. Scutellum covered with yellow hairs. Background coloration of elytra brownish, but blackish in *S. stepanovi* at least on the elytral disc. This species is a little larger size than *S. stepanovi*.

Records in Turkey: N Turkey (Danilevsky & Miroshnikov, 1985; Danilevsky, 2009b).

Range: Caucasus, Iran, Turkey.

Chorotype: SW-Asiatic (Irano-Caucasian + Anatolo-Caucasian + Irano-Anatolian)

Remarks: Its status in Turkey is not clear. It has not any record of exact locality in Turkey. If present, it probably distributes only in NE Anatolia for Turkey.

A short key for Turkish *Clytus* and *Sphegoclytus* species

1 Pronotum transverse or slightly oblong, laterally rounded..................**2 (*Clytus*)**
- Pronotum subhexagonal, slightly rounded at sides................**11 (*Sphegoclytus*)**

2 Elytral apex with a band of hairs...**8**
- Elytral apex without a band of hairs...**3**

3 Elytra with a band of hairs in the apical quarter..**4**
- Elytra without a band of hairs in the apical quarter......................................**6**

4 Elytral band in the apical quarter near the elytral apex but clearly separating from apex...***tropicus*** Panzer, 1795
- Elytral band in the apical quarter distinctly apart from the elytral apex.............**5**

5 Elytra rounded in the apex..................................***schneideri*** Kiesenwetter, 1879
- Elytra attenuated in the apex.......................................***schurmanni*** Sama, 1996

6 Elytra with bands of yellow hairs..............................***ciliciensis*** Chevrolat, 1863
- Elytra with bands of white hairs...**7**

7 The first elytral band of white hairs so clear, almost reaching the elytral margin and not run parallelly along the suture.....................................***madoni*** Pic, 1890
- The first elytral band of white hairs fine, not reaching the elytral margin and run more or less parallel along the suture................................***taurusiensis*** Pic, 1903

8 Scutellum more or less pointed in the apex........................***gulekanus*** Pic, 1904
- Scutellum rounded in the apex...**9**

9 Antennae brownish completely.......................***kumalariensis*** Johanides, 2001
- Antennae not brownish completely; antennae brownish, blackish or dark brown towards to distal end...**10**

10 Humeral bands or spots on the elytra clear, transverse, more or less smooth or slightly convex, not reaching to the suture at the end but run beyond the half of elytronal wideness..***arietis*** Linnaeus, 1758
- Humeral bands or spots on the elytra clear, more or less oblique or more or less circular, not reaching to the suture, only in humeral part....***rhamni*** Germar, 1817

11 Pronotum with clear yellow borders; background coloration of elytra mostly brownish; body length 10-18 mm....................................***vesparum*** Reitter, 1889
- Yellow borders of pronotum very narrow; background coloration of elytra mostly black or blackish; smaller..................***stepanovi*** Danilevsky & Miroshnikov, 1985

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THE EFFECTIVENESS OF THE TRAP TYPES AND LURES USED FOR MASS TRAPPING TO CONTROL CHERRY FRUIT FLY [*RHAGOLETIS CERASI* (L., 1758)] (DIPTERA: TEPHRITIDAE)

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[**Özdem, A. & Kılınçer, N.** 2009. The effectiveness of the trap types and lures used for mass trapping to control cherry fruit fly [*Rhagoletis cerasi* (L., 1758)] (Diptera: Tephritidae). Munis Entomology & Zoology, 4 (2): 371-377]

ABSTRACT: Trapping experiments were carried out in Ankara and Çankırı Provinces, Turkey during 1998-2000. Several traps and trap combinations with different food attractants were used in mass trapping to control *Rhagoletis cerasi* L. The most effective trap combination was found to be the visual yellow sticky Rebell trap and slowly released ammonia capsule. It was concluded that for a successful mass trapping, hanging four of these trap combination per tree was sufficient. It was found that the effectiveness of mass trapping was 95.99-97.41% in cherry orchards.

KEYWORDS: *Rhagoletis cerasi*, cherry, lures, traps, mass trapping

Cherry [(*Prunus avium*) (Rosales: Rosaceae)] is one of the important fruit crops of Turkey. It has an important position in the Turkish economy so that it matures in early seasons and its production for domestic market and especially as an export product. According to 1999 statistics there are 12.550.000 cherry trees in Turkey (Anonymous, 2003).

Cherry fruit fly [*Rhagoletis cerasi* L. (Diptera: Tephritidae)] is a most serious pest of cherries in Europe and our country, because of its direct harm on the fruit. The larvae of the cherry fruit fly feed inside the fruit and causes severe economic losses. Pesticide is used to control adult cherry fruit fly in Turkey, and to protect cherry fruit spraying is carried out on adults. But since the farmer cannot establish adult emergence time or when to spray or because cherries mature after the rains pesticide spraying has to be done over and over again. Due to the existence of different varieties of cherry trees in orchards, pesticide remaining on the cherries cause a problem when spraying isn't properly timed. Thus this research was found necessary. Zümreoğlu and associates first tried out trapping activities against cherry fruit fly in 1987 in our country. Between 1988 and 1991 regions in Greece cherry fruit fly populations were found to follow Rebell yellow visual sticky traps (Katsoyannos et al., 1994). In 1993-94 in Italy various trap types and food types were researched against *R. cerasi*. (Casagrande et al., 1995) In Italy yellow visual sticky trap and ammonium carbonate combination traps were used to find out *R. cerasi* flying patterns. (Romani, 1999). Rebell traps were not used as monitors only but were successful in mass trapping studies. (Katsoyannos et al.,2000 a). In the fight against cherry fruit fly effective traps and trap combinations were researched for mass trapping, as an aid in the cherry fruit fly problem.

MATERIALS AND METHODS

Main material in the research is the cherry fruit fly (*Rhagoletis cerasi* L.). Aiding materials were a orchard with early, mid season and late cherry varieties, 15x20cm dimensioned Rebell yellow visual sticky trap (Swiss Federal Research Station for Arboriculture, Horticulture and Viticulture, Waedenswil, Switzerland) + ammonia salt lure capsules, fiberglass yellow visual sticky trap in 15x20cm dimensions + ammonia salt lure capsules, glass McPhail trap, 2% DiAmonnium sulphate luquid, Ammonia salt lure capsule, Tanglefoot adhesive (Tanglefoot Company, Grand Rapids, MI) and Formothion 336 g/l insecticide. Studies were done in orchard in the town of Çankırı. Varieties of cherries in the orchard that were used were Early Burlat early, 0900 agriculture, Vista and Blackcherry midseason, Yarımca, Napoleon, Van, Sapıkısa, Karabodur and Boing were used as late varieties. During the study here mass trapping was being done no spraying as done in the orchard. Traps were hung 1.5-2m high on thick branches that were mid center and outside the trees crown. In order to establish adult cherry flies 2 Rebell traps were hung around the orchard on 1st May. Monitor / Control traps were checked twice a day until the first mature fly was trapped and then they were checked once a week. Mass trapping techniques were done in accordance to Zümreoğlu and associates (1987) explanations, distance between traps being 15-20m, and 50m between blocks. After the trapping of the first adult the traps were checked once a week and numbers of male and female flies were noted down and the traps then were cleaned. New ones replaced yellow visual sticky traps that were very dirty. Ammonia salt lure capsules were changed once a month. Adults were sieved from the McPhail liquid traps, DiAmmonium phosphate liquid was changed after each weeks count. Traps were checked 3 more weeks after the last adult's appearance and then were collected. Finally the effective traps and trap combinations used in the control against *R.cerasi* were tried out in Eldivan district of Çankırı in 1998 in a orchard that was infected cherry fruit fly with 120 cherry trees. Traps and trap combinations used in this orchard are given as follows; Rebell yellow visual sticky trap, Rebell yellow visual sticky trap + ammonia salt lure capsule, Rebell cross trap, Fiberglass yellow visual sticky trap, Fiberglass yellow visual sticky trap+ammonia salt lure capsule, McPhail trap + 2% Di Ammonium phosphate (DAP).

Random trial blocks and ordered blocks were planned in 6 symbol and 3 repetitive. Results obtained from traps on mature flies were evaluated using ordered factorial variance analysis, different groups were evaluated using the "Duncan Test". To determine the best combination/tree number in the mass trapping of *R. cerasi* the most effective Rebell + ammonia salt lure capsule trap combination were used in Haymana district of Ankara in 1999. After the first adult was observed 3 traps/tree and 4 traps/tree was used in accordance to the "repetitive measurement" and Rebell trap+ammonia salt lure capsules combinations were placed in the orchard. Mass trapping studies were carried out in 3 orchard (mass trapping, pesticide spraying and control) which were infected with this pest, and each at least 100m from the other in Eldivan district of Çankırı in 1999-2000. Mass trapping, pesticides spraying were used in these control orchards. 4 Rebell traps + ammonia salt lure capsules combinations/tree were place after the observation of the first adult. Spraying in the orchard was applied in a week using insecticide according to plant protection technical instructions as first adult was spotted. Control orchard was kept in check using Rebell trap+ ammonia salt lure capsules combinations. Harvesting 500 random cherries from the counted trees form the 3 orchards did evaluations. The cherries were opened and checked with binocular microscope and then put into 10% NaCl and the percentage of cherries with larvae were counted, and the data was used with Abbott to find percentile effect, variance analysis and Duncan test for different groups were used and the 3 characters were used in evaluations of larvae in the fruits.

RESULTS AND DISCUSSION

Table 1 contains effective trap and trap combinations for mass trappings of *R cerasi* used in the Eldivan district of Çankırı in 1988. As seen in the table Rebell type traps and trap combinations showed a good performance as of first adult captured to the last adult captured. Rebell trap + ammonia salt lure capsule trap combinations aced all the traps always had more flies comparatively (Table 1). Especially during the critical egg laying weeks of the fly (28 May, 4, 11 and 18 June) adults captured in Rebell trap+ ammonia salt lure capsule trap combinations and Rebell traps topped the trap lists, excluding Fiberglass yellow visual sticky trap+ ammonia salt lure capsule trap combination the other two were way back in the listings. As stressed by Katsoyannos (1996), he showed that Rebell type yellow visual sticky traps were more effective than yellow visual sticky traps when it came to mass trapping and control of *R. cerasi* populations. According to Katsoyannos (2000) more countries use the yellow visual sticky traps but none is as effective as the Rebell traps. Fiberglass yellow visual sticky traps + ammonium capsule trap combinations showed improved performance after 18 June cherry fly last egg laying period. But after this date it was noted that the fruits were sweet and the majority had darkened in color. It is inevitable that the use of these traps closed to and after harvesting cherry fruit will be infested with cherry fruit fly. As a fact Boller at al. (1998) showed that when the fruits were green or red they didn’t require protection, *R cerasi* only laid eggs in cherries that were yellow or yellow with a pinkish tint. Glass McPhail trap + DAP trap combination didn’t do well because visual aids played an important role in the trappings. Katsoyannos (2000 a) visual sensory information is an important factor in the laying of eggs of the *R. cerasi* on its host tree or fruit. Again the same researcher showed that Rebell traps and developed McPhail trap + ammonium acetate combinations were even more effective. It was noted that the difference in numbers of mature flies trapped using the Rebell traps and fiberglass yellow visual sticky traps was because of the wavelength of the yellow color on the traps. More flies were trapped using the Rebell cross traps because of their larger surface area. The addition of ammonium capsules showed increased effectiveness of the traps on either the Rebell traps or the Fiberglass yellow visual sticky traps. As a fact Nizamlıoğlu (1954), Katsoyannos et al. 2000 showed that ammonium compounds positively affected the cherry fruit fly. With all the data and statistics in mind Rebell + ammonium capsule trap combinations would be the best options for usage in mass trappings in the Central Anatolia region. Katsoyannos (2000) pointed out that Rebell trap +ammonium acetate combination against *R. cerasi* was the most effective. Katsoyannos (2000) pointed out that traps and trap combinations against *R cerasi* showed increased effects when ammonium acetate was used in the Rebell traps. Again Zümreoğlu et all. (1999) used traps and trap combinations against cherry fruit fly in İzmir and found that Rebell + ammonium phosphate combinations were most effective. Figure 1 shows the number of adult trapped during the all weeks. The differences between traps and number of flies trapped were found to be important, more adults were trapped with the Rebell + ammonia salt lure capsule trap combination and this has been shown on the figure. In 1999 this trap was used using the 3 Rebell + ammonia salt lure capsule /tree and 4 Rebell + ammonia salt lure capsule/tree method in Haymana district in Ankara and the results are given in Table 2. From the table we can see that twice the number of *R cerasi* was caught using the 4 Rebell traps + ammonia salt lure capsule /tree method compared to the 3 Rebell traps + ammonia salt lure capsule /tree method and statistically this is an important difference. As a result in mass trapping technique of *R.cerasi* 4 Rebell + ammonia salt lure capsule trap combination as found to be the best option. According to Boller and Remund (1983) have suggested that depending on the *R.cerasi* population and tree size 2-7 units of visual traps would be sufficient and pesticide spraying wouldn't be necessary. Tezcan and Gülperçin (2000) used 15x20cm fiberglass yellow visual sticky trap in İzmir and Manisa districts ecologic orchard against *R. cerasi*, and when required they used 4 (2-7) trap units per tree for mass trappings. Orchards where mass trapping techniques were used showed larvae infested cherries at 0.26% sprayed orchard showed 0.20% and control orchard showed at 5.46%. After statistic evaluations it was noted that the difference was not important between mass trapping and spraying in orchard (Table 3). Çankırı and Eldivan districts *R cerasi* mass trapping results are given in table fifth orchards using mass trapping techniques had a 0.20% infestation and pesticide sprayed orchards had a 0.33% infestation where as control orchards had a 10.20% infestation rate (Table 3). Again infestation rates in mass trapping and pesticide sprayed orchards didn't have an important statistical value. When results from 1999 and 2000 were compared for the same garden 2 years consecutive mass trapping in the orchards showed a drop in infestation but the control orchards showed an increase in infestation percentages during that period. Boller (1980) used 3000 Rebell traps against *R cerasi* in a 850 cherry tree orchard in Switzerland for mass trapping studies, with this technique only 0.24% of the harvested fruits were infested. As a result the success of mass trapping in orchards depends on the timing of traps being hung and the number of traps, and the density of adult population being half or small.

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Table 1. Weekly data of adult *Rhagoletis cerasi* L. trapped using different traps and trap combinations Çankırı, Eldivan in 1998

Traps and Trap combinations	Weeks										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Reball+ASL	0*A**c	11Abc	72.3 Aa	84.0 Aa	106.3Aa	120.3Aa	98.0 Aa	71 Aa	12.3 Ab	3.0 Abc	0.3 Ac
Rebell	0 Ab	12 Aab	31.7 Ba	25.0 Bca	35.7 Ca	34.7 Ba	28.0 Ba	23.6 Ba	2.0 Abb	0.6 Ab	0 Ab
Rebell cross	0.3Aa	12.3 Ac	40.0Abb	34.0 Bb	58.7BCb	113.7Aa	36.0 Bb	37.0 Bb	6.3 Abc	0.6 Ac	0.3 Ac
Fiberglass+ASL	0 A c	0.3 Ac	26.0 Bb	25.3BCb	90.3ABa	75.7 Aa	108.0aA	76.3Aa	10.0ABbc	2.0 Ac	1.0 Ac
Fiberglass	0 A a	2.3 Aa	6.0 Ca	5.3 Cda	7.6 Da	3.6 Ca	4.3 Ca	0.6 Ca	0.3 Ba	0.3 Aa	0 Aa
Mcphail+DAP	0 A a	0 Aa	0.3 Ca	2.3 Da	1.0 Da	1.3 Ca	1.0 Ca	2.0 Ca	0 Ba	0 Aa	0 Aa

* Means within columns (capital) followed by the same latter are not significantly different (P<0.05; Duncan's multiple range test).

** Means within rows (small) followed by the same latter are not significantly different (P<0.05; Duncan's multiple range test).

Table 2. Trapping parameters Rebell traps + ammonia salt lure capsule trap combinations tested and number of mature *Rhagoletis cerasi* L. trapped Ankara, Haymana in 1999

Parameters of Rebell+ASL combinations	Adults trapped with trap combinations	
	Mean± St.Error	Min-Max
4 Rebell+ASL/tree	86.7±14.0 **a**	4-306
3 Rebell+ASL/tree	43.4±13.2 **b**	5-232

Means within columns followed by the same latter are not significantly different (P<0.05; Duncan's multiple range test).

Table 3. Effects found in mass trapping techniques used against *Rhagoletis cerasi* L. in Çankırı town Eldivan district in 1999 and 2000

Years	1999		2000	
Characters	Infected fruits (%) Mean± St.Error	Effect (%)	Infected fruits (%) Mean± St.Error	Effect (%)
Mass trapping orchard	0.26±0.11 **a**	95.99	0.20±0.10 **a**	97.38
Spraying orchard	0.20±0.60 **a**	96.11	0.33±0.12 **a**	94.81
Control orchard	5.46±0.60 **b**		10.20±0.13 **b**	

Means within columns followed by the same latter are not significantly different (P<0.05; Duncan's multiple range test).

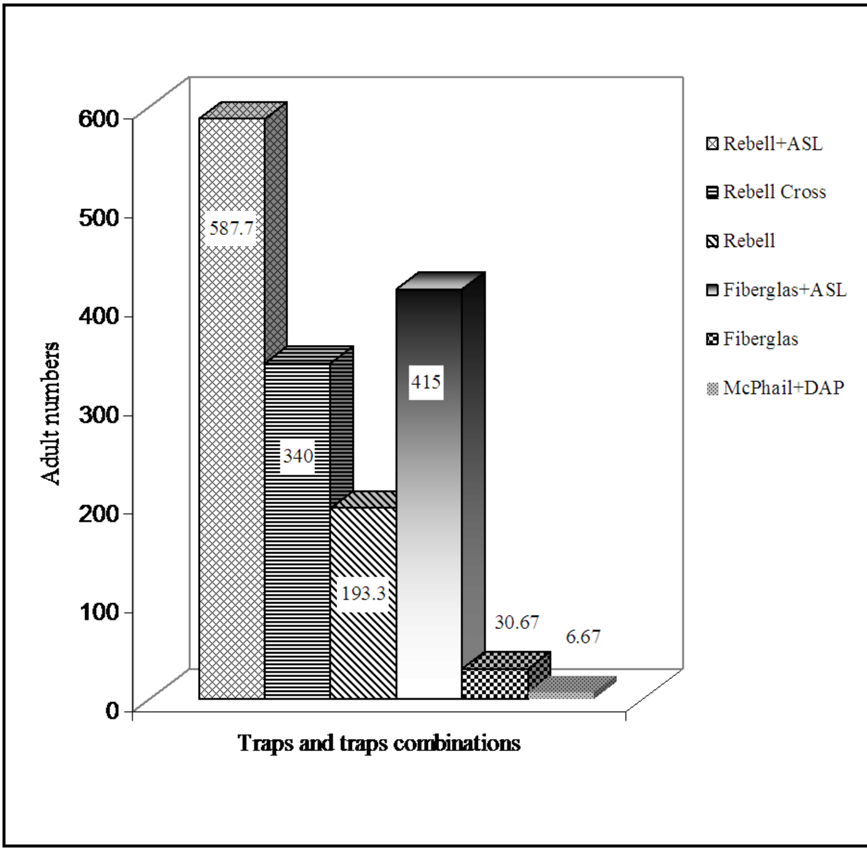

Figure 1. Number of adult *Rhagoletis cerasi* L. trapped using different traps and trap combinations in Çankırı Eldivan in 1998

BIONOMICS OF *CENOPALPUS IRANI*, *BRYOBIA RUBRIOCULUS* AND THEIR EGG PREDATOR *ZETZELLIA MALI* (ACARI:TENUIPALPIDAE, TETRANYCHIDAE, STIGMAEIDAE) IN NATURAL CONDITIONS

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ABSTRACT: Bionomics of *Cenopalpus irani* Dosse and *Bryobia rubrioculus* Scheuten and their egg predator *Zetzellia mali* (Ewing) was studied in Kermanshah (west of Iran) from 31st May till 7th November 2007 on apple leaves and interaction (density dependence) between phytophagous mites and their predator were determined. The reliable sample size (number of leaves) with maximum variation of 5.33% was about 130. Index of dispersion, regression models (Taylor and Iwao), Morisita's index and Lloyd's mean crowding to mean were used to estimate spatial distribution pattern of these mites. The results indicated that the highest population density of *C. irani*, *B. rubrioculus* and *Z. mali* was in 19th August (13.45 per leaf), 9th August (0.615 per leaf) and 9th August (1.161 per leaf), respectively. Index of dispersion, regression models (Taylor and Iwao), Morisita's index and Lloyd's mean crowding to mean showed an aggregated distribution for all species. The linear regression between predator and preys population densities showed a density-dependant predation by *Z. mali* on *C. irani* and *B. rubrioculus*. Spatial distribution parameters of tetranychoid mites and their predator can be used to outline a sampling program, estimate population density of these mites and efficiency of the predator for using in orchards IPM.

KEYWORDS: *Bryobia rubrioculus, Zetzellia mali, Cenopalpus irani,* population density, spatial distribution, density dependence interaction, optimum sample size

Mites of the superfamily Tetranychoidea are cosmopolitan and commonly distributed in all continents and climatic zones all over the world. They reach to high population levels in some perennial agro-ecosystems (Duso et al., 2004). By ingesting leaf cell contents, they can reduce plant photosynthesis and potentially decrease fruit quality (Prischmann et al., 2005). In case of no control measures, these mites may cause severe damage to a yield's quantity and quality (Kasap, 2005). Difficulties in spider mite management could be in part due to short a generation time, high reproductive potential, and rapidly acquired resistance or tolerance to acaricides (Tanigoshi et al., 1983; Beers et al., 1993). Orchard management practices usually cause outbreaks of spider mites followed by disrupted population of a natural enemy or induce mite migration from the ground cover into trees (Alston, 1994).

Cenopalpus irani Dosse is one of the false spider mites from Tenuipalpidae that is widely distributed in apple orchards located in Western part of Iran. It is one of the most important tenuipalpid pests on apple that completes 3 generations in Iran (Rashki et al., 2002). *Bryobia* mites (brown spider mite) feed on the upper surfaces of leaves by piercing cells and sucking out their contents. Attacks on newly emerged leaves can result in discolored leaves which failed to grow. They complete three generations per year in Iran (Sepasgozarian, 1971). Nevertheless, the number of yearly completed generations by *Bryobia* differs geographically in response to climatic differences.

There are different control methods for tetranychoid mites such as resistant varieties (Sedaratian et al., 2008), chemical or biological control. A current control method for these pests is using acaricides on calendar base programs (Greco et al., 2005), with the result of problems such as pest resistance and residue on the harvested and consumed products (Escudero and Ferragut, 2004). Biological control is a useful alternative to pesticides for managing various arthropod pests (Opit et al., 2005) and the predaceous mites are one of the most important factors in reducing tetranychoids and other mite pest populations.

The main predatory mites in apple orchards belong to the families Phytoseiidae and Stigmaeidae. The role of phytoseiid mites has been widely investigated; however, the influence of stigmaeids in commercial agricultural systems is not well known and is usually considered to be minor (Villanueva and Harmsen, 1998). Stigmaeids living on plants or in the soil feed on tetranychids, tenuipalpids or eriophyids (Kheradmand et al., 2007). *Zetzellia mali* (Ewing), one of the most important predator members of Stigmaeidae, has wide distribution in apple orchards (Croft and Slone, 1997). It can feed on *B. rubrioculus* (Croft & Slone, 1997) and *C. irani* eggs and their immature stages. A good characteristic for *Z. mali* is ability of surviving for long period of time with low density of prey (Villanueva and Harmsen, 1998). The importance of this predator for pest control in apple orchards is not well described.

Having information about spatial distribution of prey and predator is critical to evaluate natural enemy potential to reduce its prey density and system's persistence (Slone and Croft, 1998). Determining spatial distribution is a prerequisite for ecological and behavioral studies (Faleiro et al., 2002), study of population dynamics (Jarosik et al*.,* 2003), binomial sampling (Binns and Bostanian, 1990) and population growth evaluation (Jarosik et al*.,* 2003). It also can be used to investigate population dispersion behavior, establish a precise sampling scheme and sequential sampling (Margolis et al*.,* 1984), detect pest levels for justifying control measures (Arnaldo and Torres, 2005) and assess crop loss (Haughes, 1996). Since sampling is time-consuming and expensive, the goal is gathering information about pest abundance to reach the correct decisions without paying excessive costs. Meanwhile, using information of sample mean, variance and size, the variance-mean relationships of Taylor (1961) and Iwao (1968) have been effectively used for many sampling procedures (Beers and Jones, 2004; Hamilton and Hepworth, 2004).

Interactions between a predator and its prey are expected to be mixed and the varieties of observed responses are not a great surprise. An appropriate expected characteristic of an efficient specialist predator is high searching capacity for its preferred food item (Slone and Croft, 2001). Field and laboratory studies of prey-predator systems show remarkable density fluctuations of both populations (Greco et al., 1999). Villanueva and Harmsen (1998) evaluated the role of predatory mite *Zetzellia mali* (Ewing) in an experimental apple orchard primarily to improve a new IPM program for the combined control of the spotted tentiform leaf miner and spider mites. Responses of two predaceous mites, *Typhlodromus pyri* Scheuten and *Z. mali* to different prey densities were studied by Lawson and Walde (1993). Quantitative knowledge of spatial distribution patterns of phytophagous mites and their natural enemies is essential to understand their interactions and develop reliable sampling plans for monitoring pest and natural enemy abundance (Onzo et al., 2005).

Since there are few studies about the spatial distribution of tenuipalpids and stigmaeids and no study about C. *irani* and *Z. mali*, the result of this study can be used as a basis to develop and optimize reliable sampling plans, monitor methods and control of mites for establishing IPM strategies in apple orchards. Using generic, common parameters saves a tremendous amount of time and energy, decreases the cost of experiments and IPM, and also allows researchers to focus on the biology of the system instead of its statistics. Moreover, the calculated common coefficients of this study could be used in various apple cultivars and also some similar orchards.

MATERIALS AND METHODS

Sampling protocol

A basic rule for any sampling method is random collecting so that every sampling unit has an equal chance to be selected (Pedigo and Buntin, 1994).In this study, one apple leaf was selected as a sample unit. Leaves were selected randomly and from all parts of canopy avoiding biased estimate of the population mean. Samples were taken at 9-12 A.M. from May 31st till November 7th ^{2007} in 10-day intervals.

Each leaf was put in a separated zip-kip nylon pocket and kept in portable flask in 4°C. In laboratory, the number of motile stages of *C. irani, B. rubrioculus* and their predator, *Z. mali*, per leaf was counted using a stereomicroscope.

Since variation of primary sampling data is important to determine sample size, a primary sampling with 130 sample unites was conducted. The relative variation (*RV*) was calculated according to Hillhouse and Pitre (1974) to evaluate the efficiency of the primary sampling data:

$$RV = (SE/m)100$$

SE is standard error of mean and *m* is mean of primary sampling data. Reliable sample size was determined using the following equation:

$$N = [ts/dm]^2$$

Where *N* = sample size, *t* = t-student, s = standard deviation, *d* = desired fixed proportion of the mean and *m* = the mean of primary data.

Spatial distribution

The spatial distribution of *Z. mali* and its prey was determined by the following five methods: index of dispersion, Morisita's coefficient of dispersion, Lloyd's mean crowding and regression techniques including: Taylor's power law and Iwao's patchiness.

Index of dispersion

Variance (S^2) to mean (m) ratio indicates that mean and variance would be equal in a randomly distributed population. Dispersion of a population can be classified by calculating the variance to mean ratio as follows:

$S^2/m > 1$ Aggregated
$S^2/m = 1$ Random
$S^2/m < 1$ Regular

Departure from a random distribution can be tested by calculating the index of dispersion, I_D, in which n is the number of samples:

$$I_D = (n-1)S^2/m$$

In next stage, *Z* coefficient must be calculated to test the goodness-of-fit:

$$Z = \sqrt{2I_D} - \sqrt{(2\nu - 1)}$$

where ν is degree of freedom (*n-1*).

If 1.96 ≥ Z ≥ -1.96, the spatial distribution will be random, but in case of z >1.96 and z < -1.96 this parameter will be aggregative and uniform, respectively (Patil and Stiteler, 1974).

Regression techniques

Two experimental formulae based on variance-mean relationships, Taylor's power law and Iwao's patchiness regression, have been widely used in spatial distribution estimates and sampling program establishment (Davis, 1994; Young and Young, 1998).

According to Taylor's power law, population variance (S^2) is proportional of a fractional power of the arithmetic mean (*m)*:

$$S^2 = am^b \quad \text{or} \quad \log S^2 = \log a + b \log m$$

In which *a* is sample size-related scaling factor and slope *b* is index of aggregation which in turn recalls uniform (*b<1*), random (*b=1*) and aggregated (*b>1*) dispersion of a population (Taylor, 1961).

Iwao's patchiness regression method quantifies relationship between mean crowding index (*m**) and mean (*m*) using the following equation:

$$m^* = \alpha + \beta m$$

where α indicates the tendency to crowding (positive) or repulsion (negative) and β reflects the distribution of population on space and is interpreted in the same manner as *b* of Taylor's power law (Iwao, 1968). Student t-test can be used to determine whether the colonies are randomly dispersed.

$$\text{Test } b = 1 \quad t = (b-1)/s_b \quad \text{and} \quad \text{Test } \beta = 1 \quad t = (\beta - 1)/s_\beta$$

Where s_b and s_β are the standard error of slop for mean crowding regression. Calculated values are compared with tabulated t-values with *n-2* degrees of freedom**.**

Morisita's coefficient of dispersion I_δ

Morisita (1962) proposed a hypothesis for testing the uneven distribution coefficient of I_δ which is calculated by the following equation:

$$I_\delta = \frac{n \sum x_i (x_i - 1)}{N(N-1)}$$

n = the number of sample unites, x_i = the number of individuals in each sample unit and *N* = total number of individuals in *n* samples.

The following large sample test of significance can be used to determine whether the sampled population significantly differs from random:

$$z = \frac{(I_\delta - 1)}{\left(\frac{2}{nm^2}\right)^{\frac{1}{2}}}$$

Random spatial distribution will be in case of 1.96 ≥ z ≥ -1.96, but z < -1.96, z > 1.96 indicate regular and aggregated distribution, respectively (Pedigo and Buntin, 1994).

Lloyd's mean crowding x^*

Mean crowding (x^*) was suggested by Lloyd to indicate the possible effect of mutual interference or competition among individuals. Theoretically mean crowding is the mean number of other individuals per individual in the same quadrate:

$$x^* = m + \frac{s^2}{m} - 1$$

As an index, mean crowding is highly dependent upon both the clumping degree and population density. To remove the effect of density changes, Lloyd introduced a patchiness index which is expressed as ratio of mean crowding to mean. Similar to variance to mean ratio, index of patchiness is dependent upon quadrate size, x^* / m =1: random, <1: regular and >1: aggregated (Lloyd, 1967).

Optimum number of sample units (sample size)

The optimum sample size, smallest number of sample units would safely achieved the desired precision of estimates.

Coefficients *a* and *b* within Taylor's power law describe relationship between variance and mean ($s^2 = am^b$) for individuals distributed in a natural population. Mean and variance of sampled specimens was determined for each sampling date. Taylor coefficient of *a* and *b* calculated by log-log linear transformation of mean-variance data, where *b* is the slope of transformed data and *a* calculated as antilog of transformed intercept. An equation for estimating pest sample size was developed by Karandinos (1976). Ruesink (1980), Wilson and Room (1982) and Wilson (1985) incorporated Taylor's power law into Karandinos' equation to form the sample size model used in this study:

$$\mathrm{N}_{opt} = a \left(\frac{t_{\alpha/2}}{D} \right)^2 \left(\mu^{b-2} \right)$$

Where N_{opt} = sample size, $t_{\alpha/2}$ = t- student of table, μ= mean density, *a* and *b* = Taylor's coefficients and *D* = the range of accuracy.

The optimum sample size derived from formula $\mathrm{N}_{opt} = \left(\frac{t_{\alpha/2}}{D} \right)^2 \left(\frac{1}{\mu} + \frac{1}{k} \right)$, by using k in negative binomial distribution equation $\frac{1}{k} = \frac{\sigma^2 - \mu}{\mu^2}$ and this estimation can also be done by Iwao's patchiness regression method coefficients (α and β) in formula

$$\mathrm{N}_{opt} = \left(\frac{t_{\alpha/2}}{D} \right)^2 \left(\frac{\alpha + 1}{\mu} + (\beta - 1) \right)$$

The *D* represents the desired fix proportion of the mean. In case of *D* = 0.20, sample mean may be 20% higher or lower than actual mean 95% of the time.

Density dependence in prey-predator interaction

To determine the type of interaction between prey and predator, analysis of simple linear regression was carried out between prey and predator population densities. Predator would be density independent in case of *P-value* > 0.05 (b = 0), but if *P-value* ≤ 0.05 and $b > 0$ or $b < 0$, predator would act as density dependent and inverse density dependent in its predation activity, respectively. Correlation between population changes can also show relations with high values of r and *P-value* ≤ 0.05.

RESULTS

Sampling protocol

Data set from primary sampling was used to calculate *RV*. The biggest calculated *RV* and reliable sample size were 5.33% and 130, respectively.

Population fluctuation

Population fluctuation of *C. irani, B. rubrioculus* and *Z. mali* are shown in Figure 1. The population of *C. irani* and *B. rubrioculus* was observed from the beginning of the sampling period (31st May), but no *Z. mali* was recorded until 10th June. The results indicated that the highest population density of *C. irani, B. rubrioculus* and *Z. mali* was in 19th August (13.45 per leaf), 9th August (0. 615 per leaf) and 9th August (1.161 per leaf), respectively. During the sampling season, populations of *C. irani* had greater and irregular fluctuations compared to the other species (Fig. 1).

Spatial distribution

Iwao's α and β and Taylor's a and b coefficients for each species are shown in Table1. Both of the regression methods fit the data well for all examined species. The results of Taylor and Iwao regression methods showed that the spatial distribution pattern of false spider mite, brown spider mite and their predator were aggregated. The determination coefficients of Taylor's power law ranged from 0.93 to 0.97, whereas for Iowa's patchiness regression they ranged from 0.74 to 0.94 (Tab.1). The index of dispersion (I_D) showed that the spatial distribution of all species on apple was aggregated. The I_D values for all populations were significantly greater than 1 (Tab.2), which means this species exhibited aggregated behavior in the habitat.

There were some differences in Morisita's index values of each species but in most sampling dates, the index was significantly greater than 1.96 (Tab.3), suggesting that the spatial distribution of all species was aggregated. For *C. irani*, changes in Morisita's index results from aggregated to random distribution(Tab.3) indicates that spatial distribution can change in different dates. The m^*/m value for each population in all sampling dates was significantly greater than 1 (Tab.2) indicated aggregated pattern in all examined species.

Optimum number of sample units

The sample size was re-calculated using k in negative binomial distribution and Taylor's and Iwao's coefficient (a, b, α and β) (Tab.5). The lowest estimate of sample size calculated with Taylor's equation for *Z. mali* and *C. irani*, but for *B. rubrioculus* this value recalled with Iwao's model. Calculated aggregation coefficients for all species are shown in Table2.

Density dependence in prey-predator interaction

The correlation coefficient between population densities of *C. irani* and *Z. mali* was statistically significant ($r = 0.921$, $P < 0.001$) and for *B. rubrioculus* and *Z. mali* was statistically significant too ($r = 0.827$, $P < 0.001$) suggesting high relation between species fluctuations. Statistically significant linear regression was observed between each of two preys and stigmaeid (Tab.4) showing that *Z. mali* in interaction with *C. irani* and *B. rubrioculus* does have density-dependent activity.

DISCUSSION

The first population of *C. irani* observed by the end of May and reached to peak till 19th August, 2007 (13.45 per leaf). The population density of this false spider mite increased in late July and early August as a result of increase in weather temperature and dryness. Furthermore, the sharp decline in *C. irani* population was observed from mid August till mid September that could have been mainly due to the predator's activity. Meanwhile, the peak of *Z. mali* population was observed on 9th August. Since the predator feeds on eggs, resulted decrease in prey population trough next generation which in turn would be the probable reason for the gap between two observed peaks. The next decrease in population of *Z. mali* may be in part due to sever decrease in *C. irani* population at the end of summer. The population of *C. irani* could not surely increase again in lack or scarcity of predator due to the cold weather after September (Fig. 1). Population density of *C. irani* per sample unit was higher than *B. rubrioculus* and also remained in longer duration, suggesting that *C. irani* might be the most abundant and serious acari pest in apple orchards of the region.

The population of *B. rubrioculus* is much more sensitive to predation compared to *C. irani* and could be controlled readily because of the bigger size of adults and less capacity for population increase. It seems that more predator species can affect the population of *B. rubrioculus*. So in low density of this pest the egg predator can easily control its population under the damage boundary.

Spatial distribution, the distribution of individuals in habitat, is one of the most important ecological characters of a population that can be used in protracted sampling programs for pest managements (Kuno, 1991). In a protracted sampling which is a quick and exact method for estimating mean population or decision of control time, spatial distribution data is essential in determination of equations and necessary sample size for the decision (Young and Young, 1998). In this study, aggregated spatial distribution pattern was found for *C. irani*, *B. rubrioculus* and their predator by using regression methods (Taylor and Iwao). High values of Taylor model, suggests that this model can be properly fitted for these mites. The data had a good equivalence with both Taylor's (r^2 = 0.979) and Iwao's model (r^2 =0.94) for *C. irani*, and also better equivalence with Taylor's model compared to Iwao's model for *B. rubrioculus* (r^2 = 0.938) and *Z. mali* (r^2 = 0.972). The α value was significantly greater than 0 for the predator, indicating that colonies or clumps were the basic component of these populations and the patch size decreased throughout the whole developmental period. Taylor's power law as well as Iowa's patchiness regression has been widely used for dispersion evaluating, data normalizing for statistical analysis and sampling protocols for many insects (Davis, 1994). Taylor's power law should be estimated beforehand using in practice. This is done by fitting the model to data that includes set of estimated means and variances (Ifoulis and Savopoulou-Soultani, 2006).

Observed aggregation in spatial distribution for all examined species with the index of dispersion and Lloyd mean crowding suggests that the presence of an individual mite at one point may cause an increase in the probability of being another individual nearby. In addition, probability of habitat occupation by individuals would not be the same. Based on these results population distribution of the predator is tightly linked to the prey distribution, a characteristic which would create refuges for the prey and consequently increase the persistence of the system.

The spatial distribution of population individuals in an ecosystem can be a result of behavioral characters or environment. Despite parameters such as rate of population increase and reproduction that will change from one generation to another, spatial distribution is partially constant and is a character of species (Taylor, 1984). Clump laying behavior and slow movement of *C. irani*, *B. rubrioculus* and *Z. mali* could be accounted as a possible reason for their aggregated spatial distribution. Furthermore, the tolerance of a species to the environmental factors such as temperature, relative humidity and low food density which in turn refers to population genetic can determine the spatial distribution being used as a distinguishing factor of near species.

Since Morisita's coefficient estimates spatial distribution using the mean and variance of each sampling date separately, this index is more accurate than the dispersion index. Showing one distribution per each date it can be used to understand details of dispersion in different sampling dates that would be useful for research strategies more than management programs. Changes in distribution of *C. irani* in late Jun, early July and all August from aggregated to random can be partly due to increase in population density or movement of nymphs from clumped egg location. It seems that distribution pattern in most of the sampling dates could be used as basis for management decisions. Although Taylor's indices have been widely used by many researchers; others suggest Morisita's index because of its higher determination coefficient as well as better dispersion interpretation for the species. Spatial distribution of the studied mites using different analytical methods showed aggregated or random pattern, suggesting that the different statistical methods have various accuracies in calculating spatial distribution of an organism.

Comparing $1/k$ values among three species showed that the aggregation of *B. rubrioculus* was more than the other species because of the high value of $1/k$ index in *B. rubrioculus*. This might be due to higher differences between the variance and mean of this mite sampling data. All of the $1/k$ values approved aggregation pattern of dispersion for these three species. Aggregated distribution of spider mites has been exploited in many studies (Nuchman, 1984; Strong et al., 1997). Spatial distribution of prey can determine its natural enemy's ditribution especially the predators. Searching rate of phytoseiids in aggregated populations of spider mites is more than populations with random distribution (Kim and Lee, 1993).

Many biological and statistical factors affect the precision of Taylor's coefficients; so that a large data set of at least several hundred samples are usually required to generate robust estimates of these coefficients (Jones, 1990). It has been reported by other researchers that finding out the generic coefficients eliminate experimental needs for large sample size. Furthermore, Taylor's power law can be appropriately estimated just in case of data availability from a wide range of pest densities and also when the estimated means and variances are reasonably precise. The range of means must cover the critical density and the densities that might occur in practical management (Binns *et al.*, 2000).

In this study, absolute counts of *Cenopalpus irani*, *Bryobia rubrioculus* and *Zetzellia mali* motile stages were used to develop generic coefficients of regression techniques based on large amount of data. For the majority of mean population densities, Taylor's power law coefficients showed lower well-defined number of sample units to achieve a desired precision of estimates. Basically, Taylor's method results in almost half the necessary sample size compared to common k or Iwao's method. Iwao's method was originally derived with close reference to theoretical distribution models (Davis, 1994). This may count as a good reason for observed similarity with the calculated amounts using the common k and Iwao's method. In contrast, as a purely empirical model, Taylor's power law doesn't have such definite theoretical bases (Kuno, 1991). However, Taylor's power law has been widely used because of its statistical stability. In this study to achieve greater precision, we adopted the 20% level, whereas in IPM programs, 25 or 30% level is acceptable. Optimal sample size suggested by Taylor's model is typically higher at low population levels.

The non-linear response of *Z. mali* to *Tetranychus turkestani* density has been previously revealed (Khodayari, 2007); however, population fluctuation curves showed delayed-density dependent response of predator to its prey density. Lawson and Walde (1993) reported that *Z. mali*, which has been thought to be less important in control of *P. ulmi*, have a stronger response than *T. pyri* to the prey density. The significant linear regression model between prey and predator densities in our study suggestes density dependent predation by *Z. mali* due to its oligophagous behavior and existence of alternative prey mites on apple. According to Villanueva and Harmsen (1998) studies, *Z. mali* was more abundant in the pyrethroid sprayed plots than control plots. Therefore it seems that *Z. mali* can act as an effective predator for controlling spider mites in IPM programs via using pyrethroids to reduce other pest densities in apple orchards.

The predation activity of *Z. mali* on tetranychoid eggs and sessile forms suggests the usage of pesticides with less effects on this predator in orchard management. Spatial distribution parameters of the *Z. mali* and its two preys can be used as a foundation for sampling programs. It can also be used in estimates of these mites' population density using in integrated pest management programs through the implementation of conservation and/or augmentation techniques for apple orchards.

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Table 1. Estimated values of intercept and slope for *Cenopalpus irani, Bryobia rubrioculus* and *Zetzellia mali* in 2007 by regression analysis of Taylor's power law and Iwao's patchiness regression

Species	Taylor's power law				Iwao's patchiness regression			
	a	b	r^2	P_{value}	α	β	r^2	P_{value}
Cenopalpus irani	0.529	1.290	0.979	0.000	0.636	1.900	0.945	0.000
Zetzellia mali	0.448	1.140	0.972	0.000	0.551	2.730	0.738	0.000
Bryobia rubrioculus	0.639	1.391	0.938	0.000	-0.063	7.159	0.760	0.000

Table 2. Estimated parameters by Lloyd mean crowding, index of dispersion, Lloyd mean crowding to mean and common *k* for *Cenopalpus irani, Bryobia rubrioculus* and *Zetzellia mali* in 2007

Species	m	S^2	m^*	I_D	Z	m^*/m	$1/k$
Cenopalpus irani	4.017	48.104	14.991	17122.33	131.593	3.731	2.731
Bryobia rubrioculus	0.289	0.953	8.962	4718.217	43.681	8.961	7.961
Zetzellia mali	0.691	2.278	4.316	4709.713	43.593	4.316	3.316

Table 3. Morisita's index and *Z* values for *Cenopalpus irani, Bryobia rubrioculus* and *Zetzellia mali* in different sampling dates of 2007

	C.irani		***Z. mali***		***B.rubrioculus***	
	I_δ	Z	I_δ	Z	I_δ	Z
31-May-07	3.355	79.616	-	-	6.190	362.674
10-Jun-07	6.753	78.311	8.667	803.538	13.788	1116.908
20-Jun-07	2.502	9.371	3.709	76.729	8.598	284.403
30-Jun-07	1.566	1.510	1.464	7.726	3.573	56.175
10-Jul-07	1.718	1.921	1.714	7.130	2.631	43.847
20-Jul-07	1.796	2.287	2.319	11.920	5.312	145.781
30-Jul-07	2.860	3.727	3.188	18.796	9.335	182.000
9-Aug-07	2.366	1.269	3.719	18.874	8.187	94.154
19-Aug-07	1.843	0.505	3.672	19.183	7.851	128.216
29-Aug-07	1.519	0.731	3.733	23.103	6.734	127.879
8-Sep-07	2.280	7.665	4.303	30.108	10.833	1145.139
18-Sep-07	4.489	98.846	7.894	185.290	13.000	2515.424
28-Sep-07	-	-	-	-	-	-
8-Oct-07	-	-	-	-	-	-
18-Oct-07	43.333	14789.76	130.000	67602.03	-	-
28-Oct-07	7.222	724.608	130.000	67602.03	-	-
7-Nov-07	-	-	130.000	67602.03	-	-

Table 4. Statistics of the linear regression between the mean population density of *Cenopalpus irani, Bryobia rubrioculus* and *Zetzellia mali* on apple leaves in 2007

Species	***a***	***b***	***r^2***	***P_{value}***
C. irani-Z. mali	-0.434	6.527	0.647	0.000
B.rubrioculus-Z. mali	0.025	0.349	0.698	0.000

Table 5. Calculated sample size of for *Cenopalpus irani, Bryobia rubrioculus* and *Zetzellia mali* populations on apple leaves based on, *k* in negative binomial distribution and Taylor's power law and Iwao's patchiness coefficients in 2007

Species	n_{opt}		
	K	***Taylor***	***Iwao***
Cenopalpus irani	404.50	26.14	177.42
Bryobia rubrioculus	1550.52	184.77	34.727
Zetzellia mali	646.32	126. 78	539.26

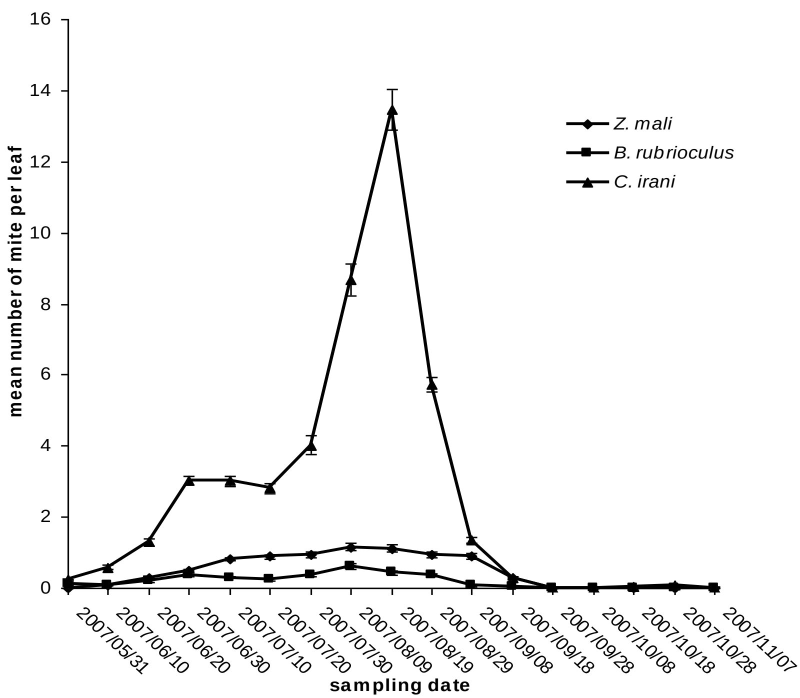

Fig . 1. Population fluctuation of *Cenopalpus irani*, *Zetzellia mali* and *Bryobia rubrioculus* on apple leaves in 2007

CONTRIBUTION TO THE KNOWLEDGE OF STAPHYLINIDAE FAUNA OF TURKEY (COLEOPTERA)

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ABSTRACT: This study is based upon material collected from different localities in Turkey between 1968 and 2005. As a result, totally 46 species belonging to Staphylinidae are recorded in Turkey. *Phloenomus pusillus* (Gravenhorst, 1806) and also the genus are new records for Turkish fauna. In addition, new localities have been found for some species which have already been reported in Turkey.

KEY WORDS: Coleoptera, Staphylinidae, new records, fauna, Turkey.

The Staphylinidae is a widespread and rather large family of Coleoptera, with about 50.000 species worldwide in 32 subfamilies. The first distributional checklist of the Staphylinidae of Turkey was made by Anlaş (2009), who reported 1595 species and subspecies occuring in Turkey. Despite many contributions there are still some parts of the country, especially in central, eastern and northern Anatolia which have not been studied thoroughly.

The aim of this paper is to present the complete records of preserved material to researchers and relevant parties.

MATERIAL AND METHOD

The material of the family Staphilinidae was collected from different localities of Turkey in 1968-2005. Provinces of the collected specimens are given in alphabetical order in the following list. The material is deposited in the Entomology Museum, Erzurum, Turkey (EMET). Subfamilies and tribes were given in phylogenetic order and species were listed alphabetically within each tribus.

Material have been determined by S. Anlas, V. Assing (Germany) and A. Bordoni (Italy). Classification and nomenclature of the Staphylinidae suggested by Herman (2001) and Löbl & Smetana (2004) have been followed in this study.

RESULTS

In this study, 46 species belonging to eight subfamilies of Staphylinidae were reported in Turkey.

Staphylinidae Latreille, 1802

Omaliinae MacLeay, 1825
Tribe Omaliini MacLeay, 1825
***Phloenomus pusillus* (Gravenhorst, 1806)**

Material examined examined: Erzurum: 1900 m, 11.VI.1980, 21 exs., **Kars:** Sarıkamış, 1600 m, 20.V.1996, 1 ex.

Distribution in Turkey: *P. pusillus* was previously known from Europe, North Africa and Russia (Löbl & Smetana, 2004).

The species and also genus are here reported from Turkey for the first time.

Tachyporinae MacLeay, 1825
Tribe Tachyporini MacLeay, 1825
Tachinus fimetarius Gravenhorst, 1802

Material examined: Erzurum: University field, 1850 m, 11.V.2000, 1 ex.

Distribution in Turkey: Konya (Horion, 1967).

Tachyporus chrysomelinus (Linnaeus, 1758)

Material examined: Ardahan: Göle, Türkeşli, 1915 m, 15.X.2005, 1 ex., Posof, Ilgar Pass, 2340 m, 18.VIII.2004, 1 ex; Bayburt: 11.VIII.1992, 1 ex., Kop Mountain, 2450 m, 10.VII.1992, 1 ex., Oruçbey, 17.VIII.1996, 1 ex., Aydıntepe, 3.VI.1992, 1 ex., Demirözü, 23.VI.1992, 1 ex; Erzurum: University field, 1850 m, 28.VII.1997, 1 ex., 23.VIII.1996, 1 ex., Pasinler, Hamamderesi, 1850 m, 26.X.2005, 1 ex., Şenkaya, Çakırbaba Pass, 2450 m, 4.IX.2004, 2 exs.; Kars: Sarıkamış, Çatak, 1940 m, 16.X.2005, 3 exs., Güneyli, 1775 m, 7.X.2005, 1 ex., Soğukçeşme, 2150 m, 7.X.2005, 2 exs.

Distribution in Turkey: Turkey (No locality) (Löbl & Smetana 2004).

Tachyporus hypnorum (Fabricius, 1775)

Material examined: Bayburt: 11.VII.1992, 1 ex., Kop Mountain, 10.VII.1992, 1 ex., Demirözü, 23.VII.1992, 1 ex.; **Erzincan:** Mercan, Altunkent, 1250 m, 4.X.2005, 1 ex.; **Erzurum:** Dadaşköy, 1800 m, 17.VI.2004, 2 exs., Esendere, 14.V.2001, 1 ex., University field, 1850 m, 11.V.2000, 4 exs., 15.VI.1998, 9 exs., 26.VII.1997, 3 exs., Köprüköy, 1600 m, 18.V.2005, 1 ex., Oltu, 1300 m, 8.VII.1988, 1 ex.; **Kars:** Sarıkamış, Çatak, 1940 m, 16.X.2005, 2 exs.

Distribution in Turkey: Adıyaman, Ankara, Aydın, Bilecik, İzmir, Kahramanmaraş, Manisa, Malatya, Mersin, Muğla, Tunceli (Anlaş, 2009).

Tachyporus nitidulus (Fabricius, 1781)

Material examined: Ardahan: Posof, Ilgar Pass, 2450 m, 25.VII.2005, 1 ex; **Bayburt:** Aydıntepe, 3.VI.1992, 1 ex.; **Erzurum**: University field, 1850 m, 11.V.2000, 1 ex., Aşkale, 1900 m, 25.VIII.1998, 1 ex., Pasinler, 1600 m, 18.VII.1974, 1 ex.; **Kars:** Sarıkamış, Karakurt, 1650 m, 16.V.2005, 1 ex.

Distribution in Turkey: Ankara, Aydın, Bursa, Istanbul, İzmir, Kayseri, Manisa, Mersin (Anlaş, 2009).

Tachyporus pusillus Gravenhorst, 1806

Material examined: Erzurum: Esendere, 14.V.2001, 1 ex., University field, 1850 m, 27.VII.2005, 1 ex.

Distribution in Turkey: İzmir (Anlaş, 2009).

Tachyporus scitulus Erichson, 1839

Material examined: Erzurum: Ilıca, Eğreti, 1750 m, 2.X.2004, 1 ex.; Kars: 1810 m, 3.VIII.2005, 1 ex.

Distribution in Turkey: Mersin (Peyron, 1858).

Aleocharinae Fleming, 1821

Tribe Aleocharini Fleming, 1821

Aleochara bilineata Gyllenhal, 1810

Material examined: Erzurum: 1850 m, 11.VI.1980, 1 ex., 15.VII.1988, 1 ex., 30.VIII.1988, 5 exs., Kombina, 1800 m, 5.IX.1988, 2 exs.

Distribution in Turkey: Artvin, Gümüşhane (Anlaş, 2009).

Aleochara laevigata Gyllenhal, 1810

Material examined: Erzurum: Dadaşköy, 1800 m, 17.VI.2004, 1 ex., Güngörmez, 2400 m, 28.VII.1998, 1 ex.

Distribution in Turkey: Bitlis, Gümüşhane, Istanbul, İzmir, Mersin, Şanlıurfa, Van (Anlaş, 2009).

Aleochara tristis Gravenhorst, 1806

Material examined: Artvin: Genya Mountain, 1575 m, 2.VII.2004, 1 ex.; **Erzurum:** Nenehatun, 1900 m, 21.IV.2002, 1 ex., Tekederesi, 1950 m, 2.VII.2004, 1 ex., Şenkaya, Çakırbaba Pass, 2450 m, 9.VIII.2003, 1 ex.

Distribution in Turkey: Artvin, Bingöl, Bitlis, Bursa, Erzurum, Gaziantep, Hatay, Kahramanmaraş, Konya, Malatya, Manisa, Mardin, Mersin, Osmaniye (Anlaş, 2009).

Tribe Athetini Casey, 1910

Nehemitropia lividipennis (Mannerheim, 1830)

Material examined: Erzurum: Pasinler, 1750 m, 16.X.2004, 1 ex.

Distribution in Turkey: Istanbul, Manisa, Tunceli (Anlaş, 2009).

Oxytelinae Fleming, 1821

Tribe Deleasterini Reitter, 1909

Deleaster dichrous (Gravenhorst, 1802)

Material examined: Erzurum: Kombina, 1800 m, 30.VIII.1988, 1 ex., University field, 1850 m, 29.VI.1996, 1 ex., 8.VII.1996, 1 ex., 18.VII.1996, 1 ex., 22.VII.1997, 1 ex., 26.VII.1996, 2 exs., 26.VII.1997, 1 ex., 28.VII.1997, 1 ex., 26.VIII.1997, 1 ex.

Distribution in Turkey: Adana (Smetana, 1967a).

Tribe Oxytelini Thomson, 1858

***Anotylus inustus* (Gravenhorst, 1806)**

Material examined: Artvin: Genya Mountain, Kafkasör, 1655 m, 10.VII.2005, 1 ex.; **Erzurum:** University field, 1850 m, 11.V.2000, 1 ex., Şenkaya, Çakırbaba Pass, 2450 m, 9.VIII.2003, 1 ex.

Distribution in Turkey: Bursa, Istanbul, Kilis, Konya, Mersin (Anlaş, 2009).

***Anotylus speculifrons* (Kraatz, 1857)**

Material examined: Erzurum: 11.VI.1980, 1 ex., İspir, 1100 m, 15.V.1982, 1 ex.

Distribution in Turkey: Ankara, Balıkesir (Anlaş, 2009).

***Oxytelus piceus* (Linnaeus, 1767)**

Material examined: Erzurum: 1850 m, 11.VI.1980, 1 ex., Güzelyayla, 2200 m, 4.X.2005, 2 exs., University field, 1850 m, 26.VI.1996, 1 ex., 29.VI.1996, 2 exs., 14.VII.1997, 1 ex., 22.VII.1997, 1 ex., 26.VII.1997, 3 exs., Oltu, 1300 m, 8.VI.1988, 1 ex.

Distribution in Turkey: Adana, Mersin (Anlaş, 2009).

Oxyporinae Fleming, 1821

***Oxyporus rufus* (Linnaeus, 1758)**

Material examined: Erzurum: 1900 m, 7.VI.1972, 1 ex.

Distribution in Turkey: Turkey (No locality) (Löbl & Smetana 2004).

Steninae MacLeay, 1825

***Stenus pallitarsis* Stephens, 1833**

Material examined examined: Erzurum: Aşkale, 1900 m, 25.VIII.1988, 2 exs.

Distribution in Turkey: Istanbul, Mersin? (Anlaş, 2009).

Stenus similis (Herbst, 1784)

Material examined examined: Kars: Sarıkamış, 1700 m, 26.VII.1996, 1 ex.

Distribution in Turkey: Mersin? (Peyron, 1858).

Paederinae Fleming, 1821

Tribe Paederini Fleming, 1821

***Leptobium gracile* (Gravenhorst, 1802)**

Material examined: Ardahan: Posof, Ilgar Mountain, 2450 m, 25.VII.2005, 1 ex.; **Erzincan:** Tercan, Demirkapı, 1330 m, 25.V.2005, 1 ex., Yaylacık, 1650 m, 25.V.2005, 1 ex.; **Erzurum:** 1900 m, 20.VI.1968, 1 ex., Aşkale, Ortabahçe, 1965 m, 4.VII.2005, 1 ex., Köprüköy, Örentaş, 1870 m, 9.VIII.2004, 3 exs., Pasinler, Hamamderesi, 1750 m, 7.V.2006, 1 ex.

Distribution in Turkey: Adana, Adıyaman, Ankara, Antalya, Balıkesir, Bilecik, Burdur, Bursa, Çankırı, Diyarbakır, Erzurum, Eskişehir, Giresun, Gümüşhane, Hakkari, Isparta, Istanbul, İzmir, Kayseri, Konya, Malatya, Manisa, Muğla, Samsun, Sivas, Tunceli, Van (Anlaş, 2009).

Paederus fuscipes Curtis, 1826

Material examined: Erzurum: 1850 m, 11.VI.1980, 1 ex., Esendere, 14.V.2001, 1 ex., Tekederesi, 1900 m, 13.VI.2005, 1 ex., University field, 1850 m, 29.V.1996, 1 ex., 12.VIII.1996, 1 ex., 23.VIII.1996, 1 ex., 28.VII.1997, 1 ex.; **Muğla:** Köyceğiz, 10.VIII.1996, 1 ex.

Distribution in Turkey: Ankara, Diyarbakır, Gaziantep, Istanbul, İzmir, Manisa, Mardin, Trabzon (Anlaş, 2009).

Paederus littoralis Gravenhorst, 1802

Material examined: Ardahan: Hanak, 1820 m, 15.X.2005, 3 exs., Göle, 1900 m, 11.VI.2005, 1 ex., Posof, Aşıkzülali, 1960 m, 26.VII.2005, 4 exs., Ilgar Mountain, 2450 m, 18.IV.2004, 1 ex.; Artvin: Genya Mountain, Kafkasör, 1575, 2.VII.2004, 1 ex., Şavşat, Düzenli1700 m, 11.VI.2000, 1 ex.; **Erzurum:** Börekli, 2125 m, 7.VII.2005, 1 ex., Esendere, 14.V.2002, 1 ex., Kombina, 5.IX.1988, 1 ex., Tekederesi, 1950 m, 2.VII.2004, 1 ex., University field, 1850 m, 11.VI.1990, 1 ex., 28.VII.1997, 1 ex., Aşkale, Ortabahçe, 1890 m, 19.IX.2005, 3 exs., Pırnakapan, 1990 m, 15.IX.2005, 1 ex., Ilıca, Rizekent, 1930 m, 14.X.2004, 1 ex., Karayazı, Karaağıl, 1875 m, 26. X.2005, 3 exs., Köprüköy, Güzelhisar, 1825 m, 26.X.2005, 1 ex., Örentaş, 1870 m, 9.VIII.2004, 2 exs., Oltu, 1383 m, 12.VII.2004, 1 ex., Subatık, 1300 m, 28.III.2002, 2 exs., Yayla Pass, 2450 m, 18.VII.2004, 1 ex., Olur, Yeşilbağlar, 1300 m, 24.X.2002, 1 ex., Pasinler, Hamamderesi, 1800 m, 20.IV.2005, 1 ex., Şenkaya, Çatalelma, 24.IX.2000, 2 exs., Uzundere, 1100 m, 18.X.2002, 1 ex.; **Kars:** Kağızman, Aydınkavak, 1350 m, 17.V.2005, 1 ex., Sarıkamış, Çatak, 1940 m, 16.X.2205, 1 ex., Karakurt, 1650 m, 18.V.2005, 2 exs., Soğukçeşme, 2150 m, 7.X.2005, 2 exs.; **Samsun:** Çarşamba, 20.VIII.1995, 1 ex.; **Trabzon:** Arsin, Gölcük, 25.IV.1997, 1 ex.

Distribution in Turkey: Bilecik, Mardin, Sakarya, Şanlıurfa (Anlaş, 2009).

Rugilus orbiculatus (Paykull, 1789)

Material examined: Erzurum: Ilıca, Yoncalık, 1730 m, 21.X.2004, 1 ex.

Distribution in Turkey: Istanbul, İzmir, Manisa (Anlaş, 2009).

Staphylininae Latreille, 1802
Tribe Staphylinini Latreille, 1802
Creophilus maxillosus (Linnaeus, 1758)

Material examined: Erzurum: University field, 1850 m, 7.VI.1972, 1 ex., 20.VII.1971, 2 exs., 20.VIII.1990, 1 ex.; **Iğdır**: 850 m, 5.VI.1969, 1 ex..

Distribution in Turkey: Adana, Gaziantep, Hatay, İzmir, Kayseri, Manisa, Mersin (Anlaş, 2009).

Emus hirtus (Linnaeus, 1758)

Material examined: Ankara: Çamlıdere, 5.VII.1994, 1 ex.; **Artvin:** 26.VI.1996, 2 exs.

Distribution in Turkey: Ankara, Manisa (Anlaş, 2009).

Ocypus curtipenis Motschulsky, 1849

Material examined: Hatay: İskenderun, Karayılan, 12.V.2004, 1 ex.

Distribution in Turkey: Bursa, Istanbul, İzmir (Anlaş, 2009).

Ocypus helleni G. Müller, 1926

Material examined: Ardahan: Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex.; **Erzurum:** 1850 m, 30.VII.1973, 1 ex., 28.IX.1993, 1 ex., Konaklı, 2400 m, 22.VII.2000, 1 ex., Palandöken, 2200 m, 27.VII.2003, 1 ex., University field, 1850 m, 17.V.2003, 1 ex., Oltu, Yayla Pass, 2450 m, 8.IX.2004, 1 ex., Şenkaya, Sındıran, 2100 m, 26.IX.2000, 1 ex.

Distribution in Turkey: Kayseri (Coiffait, 1974).

Ocypus sericeicollis (Ménétriés, 1832)

Material examined: Erzurum. Aşkale, Ortabahçe, 1890 m, 19.IV.2005, 1 ex.

Distribution in Turkey: Ankara, İzmir, Manisa, Şanlıurfa (Anlaş, 2009).

Ontholestus murinus (Linnaeus, 1758)

Material examined: Erzurum: 18.VII.1971, 1 ex.

Distribution in Turkey: İzmir, Kütahya (Anlaş, 2009).

Philonthus atratus (Gravenhorst, 1802)

Material examined: Erzurum: Şenkaya, Çakırbaba Pass, 2450 m, 23.VIII.2004, 1 ex.

Distribution in Turkey: Ankara, Konya Mersin, Niğde (Anlaş, 2009).

Philonthus carbonarius (Gravenhorst, 1802)

Material examined: Ardahan: Çamlıçatak, 1915 m, 15.X.2005, 1 ex., Göle, Türkeşin, 1970 m, 25.VII.2005, 1 ex.; **Erzurum:** Tekederesi, 2100 m, 19.IX.2005, 1 ex., Aşkale, Ortabahçe, 1890 m, 19.IX.2005, 1 ex., Karayazı, Yeniköy, 1820 m, 26.10.2005, 1 ex.; **Kars:** Sarıkamış, Çatak, 1940 m, 16.X.2005, 1 ex.

Distribution in Turkey: No locality cited (Herman, 2001; Löbl & Smetana, 2004).

Philonthus caucasicus Nordmann, 1837

Material examined: Erzurum: 20.VI.1973, 1 ex., Dadaşköy, 1850 m, 7.VII.2005, 2 exs., Kombina, 5.IX.1988, 1 ex.

Distribution in Turkey: Kırşehir, Mersin (Anlaş, 2009).

Philonthus cognatus Stephens, 1832

Material examined: Ardahan: Çamlıçatak, 1915 m, 4.VIII.2005, 1 ex., Göle, 2010 m, 18.VIII.2004, 1 ex., Türkeşin, 1970 m, 25.VII.2005, 1 ex.; **Artvin:** Yusufeli, Zeytinlik, 279 m, 10.VI.2005, 1 ex.; **Erzurum:** Börekli, 2125 m, 7.VII.2005, 3 exs., Tekederesi, 2100 m, 2.VII.2004 1 ex., Tepeköy, 1905 m, 19.IX.2005, 1 ex., Aşkale, Ortabahçe, 1890 m, 19.IX.2005, 3 exs., Çat, Taşlıgüney, 1950 m, 13.X.2005, 2 exs., Pasinler, Hamamderesi, 1800 m, 7.X.2004, 1 ex., Şenkaya, Çakırbaba Pass, 2450 m, 23.VIII.2004, 1 ex.; **Kars:** Sarıkamış, Çatak, 1940 m, 16.X.2005, 1 ex., Mescitli, 7.X.2005, 1 ex., Yağbasan, 1950 m, 16.X.2005, 2 exs.

Distribution in Turkey: Mersin, Trabzon (Anlaş, 2009).

Philonthus concinnus Gravenhorst, 1802

Material examined: Ardahan: Göle, Tahtakıran, 2080 m, 26.VII.2005, 1 ex., Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex., Ilgar Pass, 2450 m, 15.X.2005, 2 exs.; **Erzincan:** Mercan, Yollarüstü, 1650 m, 26.V.2005, 1 ex.; **Erzurum:** Dadaşköy, 1800 m, 30.V.2005; 3 exs., Esendere, 14.V.2001; 3 exs., Kombina, 5.IX.1988, 1 ex., University field, 1850 m, 9.IV.2005, 1 ex., Aşkale, Kop Pass, 2128 m, 19.VII.2005, 2 exs., Çat, Taşlıköy, 1950 m, 13.X.2005, 1 ex., Köprüköy, Güzelhisar, 1825 m, 26.X.2005, 1 ex., Ilıcasu, 2340 m, 5.VIII.2004, 1 ex., Örentaş, 9.VIII.2004, 4 exs., Oltu, 30.VI.1991, 1 ex., Yayla Pass, 2350 m, 13.VI.2005, 2 exs., Umudum Yaylası, 2100 m, 26.VI.2003, 1 ex., Pasinler, 2400 m, 15.VI.1996, 1 ex., Hamamderesi, 1800 m, 16.V.2005, 3 exs., Şenkaya, 2.VI.1989, 1 ex.; **Iğdır:** Tuzluca, Gaziler, 1020 m, 16.V.2005, 1 ex., Pirli 1100 m, 3.VI.2004, 1 ex., **Konya:** Güneysınır, Gürağaç, 1020 m, 28.VIII.2005, 1 ex.

Distribution in Turkey: Adana, Ankara, Bolu, Kayseri, Konya, Manisa, Mersin, Tunceli (Anlaş, 2009).

Philonthus laminatus (Creutzer 1799)

Material examined: Erzurum: 1850 m, 1.VII.1972, 1 ex.

Distribution in Turkey: Ankara, Balıkesir, Muğla, Tunceli (Anlaş, 2009).

Philonthus rectangulus Sharp 1874

Material examined: Erzurum: University field, 1850 m, 16.VII.1996, 1 ex., 28.VII.1997, 2 exs., 6.VIII.1996, 1 ex., 23.VIII.1996, 1 ex.; **Trabzon:** Maçka, 18.VIII.1991, 1 ex.

Distribution in Turkey: Ankara, Şanlıurfa, Tunceli (Anlaş, 2009).

Philonthus rubripennis Stephens, 1832

Material examined: Erzurum: 11.VI.1980, 1 ex.

Distribution in Turkey: Mersin, Tunceli (Anlaş, 2009).

Philonthus turbidus Erichson, 1839

Material examined: Ardahan: Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex.; **Erzurum:** Esendere, 14.V.2001, 1 ex., Kombina, 1800 m, 30.VIII.1988, 2 exs., 5.IX:1988, 2 exs., Palandöken, 2200 m, 6.IX.1988, 1 ex., University field, 1850 m, 26.VII.1995, 1 ex., 27.VIII.1996, 1 ex, 28.VIII.1997, 4 exs.

Distribution in Turkey: Turkey (No locality) (Löbl & Smetana 2004).

Platydracus stercorarius (Olivier, 1795)

Material examined: Ardahan: Damal, 1910 m, 15.X.2005, 1 ex., Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex; **Artvin:** Genya Dağı, 1575 m, 2.VII.2004, 3 exs.; **Erzurum**: Tekederesi, 1900 m, 1.X.2004, 1 ex., Aşkale, Pırnakapan, 1920 m, 14.X.2004, 1 ex., Pasinler, Hamamderesi, 1800 m, 20.IV.2005, 1 ex.; **Kars**: 1810 m, 3.VIII.2005, 3 exs.; **Konya:** Çumra, 1020 m, 23.VIII.2003, 1 ex.

Distribution in Turkey: Rize, Trabzon (Anlaş, 2009).

Quedius levicollis (Brullé, 1832)

Material examined: Erzurum: Aşkale, 1800 m, 14.X.2004, 1 ex.

Distribution in Turkey: Adana, Ankara, Manisa (Anlaş, 2009).

Quedius nitipennis (Stephens, 1833)

Material examined: Ardahan: Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex, Ilgar Pass, 2340 m, 18.VIII.2004, 1 ex.; **Artvin:** Genya Dağı, 1575 m, 2.VII.2004, 1 ex.; **Erzurum:** Börekli, 2125, 7.VII.2005, 1 ex., Tekederesi, 2100 m, 19.IX.2005, 1 ex., Aşkale, Ortabahçe, 1790 m, 1.IX.2005, 5 exs., Karayazı, Yeniköy, 1820 m, 26.X.2005, 5 exs., Pasinler, Hamamderesi, 1800 m, 16.V.2005, 1 ex.

Distribution in Turkey: Adana, Kayseri, Mersin, Niğde (Smetana, 1967b).

Staphylinus caesareus Cederhjelm, 1798

Material examined: Ardahan: Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex, Ilgar Pass, 2340 m, 18.VIII.2004, 1 ex.; **Artvin:** Şavşat, Yavuzköy, 1680, 11.VI.2005, 1 ex., **Erzincan:** Mercan, Topdurağı, 1340 m, 4.VIII.2003, 1 ex.; **Erzurum:** Tekederesi, 1900 m, 1.X.2004, 1 ex., Nenehatun, 1900 m, 21.IV.2002, 1 ex., Ilıca, Rizekent, 1930 m, 14.X.2004, 1 ex., İspir, Madenköprübaşı, 1100 m, 17.VII.1992, 1 ex., Oltu, Çamlıbel, 1750 m, 17.V.2004, 2 exs., Pasinler, Hamamderesi, 1800 m, 20.IV.2005, 1 ex., Şenkaya, Sındıran, 1950 m, 24.V.2005, 4 exs.; **Kars**: Kağızman, Değirmendere, 1150 m, 17.V.2005, 1 ex., Sarıkamış, Karakurt, 1650 m, 17.IV.2002, 1 ex.; **Konya**: Güneysınır, Örenboyalı, 1020 m, 28.XI.2002, 1 ex.

Distribution in Turkey: Adıyaman, Ankara, Erzurum, Giresun, Kayseri, Malatya, Mersin, Niğde, Trabzon, Tunceli (Anlaş, 2009).

Tribe Xantholinini Erichson, 1839
Gauropterus sanguinipennis (Kolenati, 1846)

Material examined: Erzincan: Üzümlü, Yalnızbağ, 1525 m, 26.V.2005, 1 ex.; **Erzurum:** Nenehatun, 1900 m, 21.IV.2002, 1 ex., Aşkale, Pırnakapan, 1920 m, 14.X.2004, 1 ex., Horasan, 1650 m, 26.IX.2000, 3 exs., Köprüköy, 1600 m, 27.V.2004, 1 ex., 18.VI.2005, 1 ex., Pasinler, Hamamderesi, 1800 m, 16.V.2005, 1 ex., Şenkaya, Çatalelma, 2200 m, 26.IX.2000, 1 ex.; **Iğdır:** Tuzluca, Cincevat, 1050 m, 17.V.2005, 1 ex.; **Kars:** Sarıkamış, Akkurt, 1550 m, 16.V.2005, 1 ex.

Distribution in Turkey: Adana, Amasya, Ankara, Antalya, Batman, Bayburt, Bilecik, Bingöl, Bitlis, Bursa, Erzurum, Eskişehir, Gaziantep, Hakkari, Hatay, Isparta, İzmir, Kars, Kastamonu, Konya, Malatya, Manisa, Mersin, Muğla, Niğde, Sakarya, Siirt, Şırnak, Tunceli, Van, Zonguldak (Anlaş, 2009).

Gyrohypnus angustatus Stephens, 1833

Material examined: Ardahan: Posof, Ilgar Pass, 2450 m, 1 ex., **Erzurum:** Kombina, 1800 m, 5.IX.1988, 1 ex., Dadaşköy, 1800 m, 7.VII.2005, 1 ex.

Distribution in Turkey: Amasya, Ankara, Artvin, Aydın, Bayburt, Bitlis, Bolu, Bursa, Erzurum, Giresun, Isparta, Istanbul,İzmir, Kastamonu, Konya, Kütahya, Manisa, Mersin, Ordu, Osmaniye, Rize, Sinop, Zonguldak (Anlaş, 2009).

Gyrohypnus yiderimi Bordoni, 2003

Material examined: Erzurum: Kombina, 1800 m, 30.VIII.1988, 1 ex., 5.IX.1988, 1 ex.

Distribution in Turkey: Erzurum (Bordoni, 2003).

Megalinus scutellaris (Fauvel, 1900)

Material examined: Antalya: Kumluca, 8.V.1998, 1 ex.

Distribution in Turkey: Adana, Ankara, Antalya, Çanakkale, Denizli, İzmir, Manisa, Mersin (Anlaş, 2009).

Xantholinus audrasi Coiffait, 1956

Material examined: Ardahan: Posof, Aşıkzülali, 1960 m, 26.VII.2005, 1 ex.; **Erzurum:** Esendere, 14.V.2001, 1 ex., Şenkaya, Çakırbaba Pass, 2450 m, 12.X.2005, 3 exs.; **Kars:** Sarıkamış, Karakurt, 1650 m, 7.X.2005, 1 ex., Soğuksu, 2100 m, 9.X.1998, 1 ex.

Distribution in Turkey: Ankara, Antalya, Ardahan, Artvin, Bolu, Burdur, Çankırı, Erzincan, Erzurum, Giresun, İzmir, Manisa, Mersin, Muğla (Anlaş, 2009).

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A SYNOPSIS OF TURKISH VESPERINAE MULSANT, 1839 AND PRIONINAE LATREILLE, 1802 (COLEOPTERA: CERAMBYCIDAE)

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ABSTRACT: All taxa of the subfamilies Vesperinae Mulsant, 1839 and Prioninae Latreille, 1802 in Turkey are evaluated with zoogeographical remarks. The main aim of this work is to clarify current status of these subfamilies in Turkey. This work is the first attempt for this purpose. Some new faunistical data are given in the text. A key for Turkish Prioninae species is also given.

KEY WORDS: Vesperinae, Prioninae, Cerambycidae, Coleoptera, Turkey.

Turkish Vesperinae and Prioninae

Subfamily VESPERINAE Mulsant, 1839
Tribe VESPERINI Mulsant, 1839
    Genus *VESPERUS* Dejean, 1821
        Vesperus ocularis Mulsant & Rey, 1863

Subfamily PRIONINAE Latreille, 1802
Tribe ERGATINI Fairmaire, 1864
    Genus *ERGATES* Serville, 1832
        Ergates faber (Linnaeus, 1761)
    Genus *CALLERGATES* Lameere, 1906
        Callergates akbesianus (Pic, 1900)
        Callergates gaillardoti (Chevrolat, 1854)
Tribe MACROTOMINI Thomson, 1860
    Genus *PRINOBIUS* Mulsant, 1842
        Prinobius myardi Mulsant, 1842
Tribe RHAPHIPODINI Lameere, 1912
    Genus *RHAESUS* Motschulsky, 1875
        Rhaesus serricollis (Motschulsky, 1838)
Tribe AEGOSOMATINI Thomson, 1860
    Genus *AEGOSOMA* Serville, 1832
        Aegosoma scabricorne (Scopoli, 1763)
Tribe PRIONINI Latreille, 1804
    Genus *PRIONUS* Geoffroy, 1762
        Prionus coriarius (Linnaeus, 1758)
        Prionus komiyai Lorenc, 1999
    Genus *MESOPRIONUS* Jakovlev, 1887
        Mesoprionus batelkai (Sláma, 1996)
        Mesoprionus besicanus (Fairmaire, 1855)
        Mesoprionus lefebvrei (Marseul, 1856)
        Mesoprionus schaufussi (Jakovlev, 1887)

The main aim of this work is to clarify current status of the subfamilies Vesperinae Mulsant, 1839 and Prioninae Latreille, 1802 in Turkey with zoogeographical remarks. The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al. (1999). As far as possible one chorotype description can be determined for each taxon in the text.

Subfamily VESPERINAE Mulsant, 1839

This taxon was regarded as a subfamily by Vives (2004). According to some authors, however, it is a separate family (e.g. Svacha & Danilevsky, 1986).

Tribe VESPERINI Mulsant, 1839

Genus *VESPERUS* Dejean, 1821

[Type sp.: *Stenocorus strepens* Fabricius 1792 (subsequent designation by Thomson, 1860)]

The Mediterranean genus *Vesperus* Dejean, 1821 has seventeen species as *Vesperus aragonicus* Baraud, 1964 [Spain, France]; *V. bolivari* Oliveira, 1893 [Portugal, Spain]; *V. brevicollis* Graells, 1858 [Portugal, Spain]; *V. conicicollis* Fairmaire & Coquerel, 1866 (*V. conicicollis conicicollis* Fairmaire & Coquerel, 1866 [Portugal, Spain, Morocco, Sardinia]; *V. conicicollis hispalensis* Fuente, 1901 [Spain]; *V. conicicollis macropterus* Sama, 1999 [Sardinia]); *V. creticus* Ganglbauer, 1886 [Greece]; *V. flaveolus* Mulsant & Rey, 1863 [Tunisia, Algeria]; *V. fuentei* Pic, 1905 [Spain, Balearic Islands, Morocco]; *V. jertensis* Bercedo & Bahillo, 1999 [Spain]; *V. joanivivesi* Vives, 1998 [Spain]; *V. ligusticus* Vitali, 2001 that was regarded as a subspecies of *V. Strepens* by Vives (2004) [Italy]; *V. luridus* (Rossi, 1794) [France, Italy, Corsica, Sardinia, Sicily, Serbia, Croatia, Bosnia-Herzegovina]; *V. nigellus* Compte, 1963 [Spain, Balearic Islands]; *V. ocularis* Mulsant & Rey, 1863 [Turkey]; *V. sanzi* Reitter, 1895 [Portugal, Spain]; *V. serranoi* Zuzarte, 1985 [Portugal, Spain]; *V. strepens* (Fabricius, 1792) (*V. strepens litigiosus* Mulsant, 1863 [France]; *V. strepens strepens* (Fabricius, 1792) [France, Italy]) and *V. xatarti* Mulsant, 1839 [Spain, France].

Until now, 4 species of this genus as *V. luridus* (Rossi, 1794); *V. ocularis* Mulsant & Rey, 1863; *V. strepens* (Fabricius, 1792) and *V. xatarti* Mulsant, 1839 has been reported by some authors from Turkey without any exact locality label except the species *V. ocularis* Mulsant & Rey, 1863.

V. luridus (Rossi, 1794) and *V. strepens* (Fabricius, 1792) have been reported only by Lodos (1998) for Turkey in his mostly unrealistic list. However these species have been recorded only from Europe [*V. luridus* (Rossi, 1794) from France, Italy, Corsica, Sardinia, Sicily, Serbia, Croatia, Bosnia-Herzegovina and *V. strepens* (Fabricius, 1792) from France, Italy] until now. So, the doubtfull records of Lodos (1998) are not confirmed. They are impossible for Turkey.

V. xatarti Mulsant, 1839 has been reported by Heyden et al., (1906), Winkler (1924-1932), İyriboz (1938), Alkan (1946), Nizamlıoğlu (1957), Bodenheimer (1958), İren & Ahmed (1973) and Lodos (1998) for Turkey. However this species has been recorded only from Europe (France, Italy) until now. So, these doubtful records are not confirmed. It is impossible for Turkey.

In Turkey, the genus is represented only by the species *V. ocularis* Mulsant & Rey, 1863 in real.

Vesperus ocularis Mulsant & Rey, 1863

Records in Turkey: Type loc.: "Smyrne" = İzmir prov. (Mulsant & Rey, 1863); Anatolia (Winkler, 1924-1932); Turkey (Lodos, 1998). As *V. xatarti* Mulsant, 1839: Turkey (Heyden et al., 1906; Winkler, 1924-1932; İyriboz, 1938; Alkan, 1946; Nizamlıoğlu, 1957; Bodenheimer, 1958; İren & Ahmed, 1973; Lodos, 1998).

Range: Turkey.

Chorotype: Anatolian

Remarks: The species is endemic to Turkey. It distributes in W Anatolia. It described on the base of male specimen (16-18 mm). According to Vives (2004), the habitus of this species reminds *V. xatarti* Mulsant, 1839. It differs chiefly from *V. xatarti* Mulsant, 1839 by the round edge of the fifth sternite. Therefore, probably old records of *V. xatarti* Mulsant, 1839 for Turkey should belong to this species.

In addition to this, Vives (2004) mentioned that "the habitus of this species is so close to *V. creticus* Ganglbauer, 1886 (from Greece). They could think that *V. ocularis* Mulsant & Rey, 1863 is an extreme form of *V. creticus* Ganglbauer, 1886. It would therefore be necessary for more study of the material of the Eastern Mediterranean Basin, notably of Anatolia, and to discover the female, to clarify the question. Since, the morphological characters of female are more stable than the male". However, the male genitalia of *V. ocularis* Mulsant & Rey, 1863 is more close to *V. xatarti* Mulsant, 1839 than that of *V. creticus* Ganglbauer, 1886 on the base of the figures of Vives (2004) (Figures 1-6).

Subfamily PRIONINAE Latreille, 1802

The family is represented by 5 tribes, 7 genera and 12 species in Turkey as follows:

Tribe ERGATINI Fairmaire, 1864

Genus *ERGATES* Serville, 1832

[Type sp.: *Prionus serrarius* Panzer, 1793 = *Cerambyx faber* Linnaeus, 1761]

The genus *Ergates* Serville, 1832 has two subgenera as *Trichocnemis* LeConte, 1851 which includes 2 species from Nearctic region as *E. papuer* Linsley, 1957 [America] and *E. spiculatus* (LeConte, 1851) [America and Mexico] and the nominotypical subgenus *Ergates* Serville, 1832 that includes only one species, *E. faber* (Linnaeus, 1761) from Palaearctic region. So, the genus has Holarctic chorotype.

It is represented by the species, *E. faber* (Linnaeus, 1761), in Turkey.

Subgenus *ERGATES* Serville, 1832

[Type sp.: *Prionus serrarius* Panzer, 1793 = *Cerambyx faber* Linnaeus, 1761]

Ergates faber (Linnaeus, 1761)

ssp. ***faber*** Linnaeus, 1761
ssp. ***opifex*** Mulsant, 1851

Original combination: *Cerambyx faber* Linnaeus, 1761

Other names: *ferox* Voet, 1778; *portior* Schrank, 1781; *bulzanensis* Laicharting, 1784; *serrarius* Panzer, 1793; *obscurus* Olivier, 1795; *crenatus* Fabricius, 1801; *grandiceps* Tournier, 1872; *hartigi* Demelt, 1952; *alkani* Demelt, 1968.

Records in Turkey: Turkey (Bodenheimer, 1958; Acatay, 1948, 1961, 1963, 1968; Danilevsky & Miroshnikov, 1985; Svacha & Danilevsky, 1986; Önder et al., 1987); Düzce prov.: Çiçekli plateau, Sinop prov.: Ayancık (Kepez forests), Bolu prov.: Abant (Sakarca plateau), Bursa prov., Western Black Sea Region (Defne, 1954); Bursa prov.: Orhaneli (Karıncalı forest) (Çanakçıoğlu, 1956); Bursa prov., Western Black Sea Region, Antalya prov.: Sarısu Forest / Kaş (Sütleğen) / Central (Tosun, 1975); Western Black Sea Region, Mediterranean Region, Bursa prov. (Erdem & Çanakçıoğlu, 1977); Bursa prov., Western Black Sea Region, Mediterranean region (Çanakçıoğlu, 1983, 1993); Kocaeli prov.: İzmit (Işıktepe) (Öymen, 1987); Kastamonu prov.: Yaralıgöz pass as *Ergates faber alkani* Demelt, 1968 (Adlbauer, 1992); Trabzon prov.: Maçka (Meryemana, Aksu), Artvin prov.: Şavşat (Veliköy, Karagöl Forests) (Yüksel, 1996); European Turkey (Althoff & Danilevsky, 1997); Western Black Sea Region, Mediterranean Region, Bursa prov., Kahramanmaraş prov.: Başkonuş (Kanat, 1998); Artvin prov.: Şavşat / Ardanuç (Tosunlu), Trabzon prov.: Maçka, Sinop prov.: Ayancık, Bolu prov.: Abant, Düzce prov.: Central, Bursa prov.: Orhaneli, Antalya prov.: Central / Kaş, Kocaeli prov.: İzmit (Alkan, 2000); Sinop prov. (Malmusi & Saltini, 2005); Ankara prov.: Kızılcahamam (Çamkoru) (Özdikmen & Şahin, 2006).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Greece, Bulgaria, ?European Turkey, Hungary, Austria, Switzerland, Netherlands, Germany, Czechia, Slovakia, Poland, Sweden, Latvia, Lithuania, Belorussia, Ukraine, Crimea, European Russia), North Africa (Algeria, Morocco), Caucasus, Transcaucasia, Near East, Turkey, Syria.

Chorotype: W-Palaearctic or Turano-Europeo-Mediterranean

Remarks: The species distributes mostly in North Turkey. It is represented by the nominative subspecies in Turkey. The other known subspecies, *E. faber opifex* Mulsant, 1851 occurs in North Africa (Morocco and Algeria), Italy and Sicily. *Ergates faber hartigi* Demelt, 1952 and *Ergates faber alkani* Demelt, 1968 were regarded by Villiers (1978) as aberrations of females. Also according to Sama (2002), *Ergates faber alkani* Demelt, 1968 is synonym of *Ergates faber faber* (Linnaeus, 1761).

Genus *CALLERGATES* Lameere, 1906

[Type sp.: *Ergates gaillardoti* Chevrolat, 1854]

The genus *Callergates* Lameere, 1906 regarded as a subgenus of *Ergates* Serville, 1832 by some authors. It has two species from Palaearctic region in the world fauna as *C. gaillardoti* (Chevrolat, 1854) and *C. akbesianus* (Pic, 1900). So, the genus has W-Palaearctic chorotype.

It is represented by both species in Turkey.

Callergates akbesianus (Pic, 1900)

Original combination: *Ergates akbesianus* Pic, 1900

Material examined: Konya prov.: Beyreli, 1467 m, N 36 50 E 32 23, 17.07.2006, 1 female; Antalya prov.: Çayarası-Alanya Sarımut bridge env., 1114 m, N 36 38 E 32 23, 24.08.2006, 1 female.

Records in Turkey: Type loc.: Hatay prov.: Akbez (Pic, 1897 and 1900).

Range: Turkey.

Chorotype: Anatolian

Remarks: The species distributes only in S Turkey. Pic (1897) gave the species with a description as the first attempt under the name *Ergates* (*Rhesus*) *gaillardoti* Chevr.? from Akbez env. (Turkey: Hatay prov.). According to some authors, it is a synonym of *C. gaillardoti* (Chevrolat, 1854). The present materials are the first record for Antalya and Konya provinces and Central Anatolian Region of Turkey.

Callergates gaillardoti (Chevrolat, 1854)

Original combination: *Ergates gaillardoti* Chevrolat, 1854

Material examined: Osmaniye prov.: Zorkun, Mitisin plateau, 07.07.2007, 1 female.

Records in Turkey: Antalya prov.: Bey Dağları, Kumköy, Adana prov.: Karataş (Demelt, 1963); İçel prov.: Namrun (Svacha & Danilevsky, 1986); Antalya prov., Adana prov. (Öymen, 1987); Antalya prov.: Alanya (Güzelbağ), Adana prov.: Kozan (Feke) (Adlbauer, 1988); Turkey (Lodos, 1998; Sama & Rapuzzi, 2000); Antalya prov.: Alanya (Cırlasun bridge, Çayarası plateau-Sarımut bridge) (Özdikmen & Çağlar, 2004); Aydın prov.: Yenihisar, Adana prov.: (Çukurova Üniv. Campus of Balcalı), Muğla prov.: Köyceğiz (Özdikmen, 2006); Antalya prov.: Manavgat (Demirciler village) (Özdikmen & Demir, 2006).

Range: Europe (Rhodes and Samos islands), Turkey, Syria, Cyprus, Lebanon.

Chorotype: E-Mediterranean (Palestino-Taurian)

Remarks: The species distributes only in S and SW Turkey. This species was recently recorded as the first time for Europe by Welnicki & Przewozny (2007) from Greek islands (Rhodes and Samos) in the genus *Ergates*. The present material is the first record for Osmaniye province.

Tribe MACROTOMINI Thomson, 1860

Genus *PRINOBIUS* Mulsant, 1842

[Type sp.: *Prinobius myardi* Mulsant, 1842]

The genus *Prinobius* Mulsant, 1842 is monotypic. It has W-Palaearctic chorotype. It is represented in Turkey too.

Prinobius myardi Mulsant, 1842

ssp. ***myardi*** Mulsant, 1842
ssp. ***proksi*** Slama, 1982

Other names: *scutellaris* Germar, 1817 (? type missing); *germari* Dejean, 1837 (nomen nudum); *germari* Chevrolat, 1850; *atropos* Chevrolat, 1854; *cedri* Marseul, 1856; *lethifer* Fairmaire, 1859; *goudoti* Chevrolat, 1859; *gaubili* Chevrolat, 1859; *abscisa* Gilmour, 1954.

Records in Turkey: Adana prov.: Dörtyol as *Macrotoma scutellaris* (Bodenheimer, 1958); İstanbul prov.: Polonez village as *Macrotoma scutellaris* (Demelt & Alkan, 1962); İzmir prov.: Kuşadası, İstanbul prov.: Polonez village as *Macrotoma scutellaris* (Demelt, 1963); Turkey (Villiers, 1967; Danilevsky & Miroshnikov, 1985; Sama & Rapuzzi, 2000; Sama, 2002); İzmir prov.: Bornova, Aydın prov.: Kuşadası as *Macrotoma scutellaris* (Gül-Zümreoğlu, 1972); İzmir prov.: Kuşadası / Bornova as *Macrotoma scutellaris* (Gül-Zümreoğlu, 1975); Adana prov., İstanbul prov., İzmir prov., Aegean Region (Gül-Zümreoğlu, 1975); Kastamonu as *Macrotoma scutellaris* (Sama, 1982); ? Çanakkale prov.: İn-Dağı (Sama, 1982); İstanbul prov.: Alem Mountain / Şile (Öymen, 1987); Adana prov., İzmir prov., İstanbul prov. As *Macrotoma scutellaris* (Öymen, 1987); Muğla prov.: Marmaris, Adana prov.: Karataş as *Prinobius scutelleris* (Adlbauer, 1992); İstanbul prov., Adana prov., İzmir prov. (Lodos, 1998); Artvin prov.: Şavşat, Trabzon prov.: Maçka, Burdur prov.: Bucak, Antalya prov.: Kemer / Kaş-Gürsu / Çakırlar, Aydın prov.: Dilek - Ekici, 1971; Öymen, 1987; Tosun, 1975; Yüksel, 1996 (Ex. Alkan, 2000); Antalya prov.: Beldibi / Manavgat / Serik, İçel prov.: Erdemli, Muğla prov.: Central, Tokat prov.: Central (Tozlu et al., 2002); Antalya prov.: Alanya (Çayarası plateau-Sarımut bridge) (Özdikmen & Çağlar, 2004); Muğla prov.: Marmaris / Aktur, Kahramanmaraş prov.: Türkoğlu (Malmusi & Saltini, 2005); Çanakkale prov.: Gökçeada (Özdikmen & Demir, 2006).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sardinia, Sicily, Croatia, Bosnia-Herzegovina, Serbia, Greece, Crete, Crimea), North Africa (Algeria, Morocco, Libya, Tunisia), Caucasus, Near East, Turkey, Iran, Syria, Lebanon, Jordan.

Chorotype: W-Palaearctic or Turano-Europeo-Mediterranean.

Remarks: The species distributes rather widely in Turkey. It is represented by the nominative subspecies in Turkey. The other known subspecies, *P. myardi proksi* (Slama, 1982) occurs only in Crete. It was described as *Prinobius scutellaris myardi* originally. According to Slama & Slamova (1996), *Macrotoma scutellaris* Germar, 1817 has 5 subspecies: first *M. scutellaris myardi* (Mulsant,

1842) for Spain and France, second *M. scutellaris scutellaris* Germar, 1817 for Italy and Balcans, third for north Africa [according to Danilevsky (2009) it probably must be named *P. myardi gaubili* Chevrolat, 1959], forth *M. scutellaris proksi* (Slama, 1982) for Crete and fifth *M. scutellaris atropos* Chevrolat, 1854 for Near East. In addition to this system, Danilevsky (2009) rightly mentioned *P. myardi germari* (Chevrolat, 1850) must be occur in Crimea and Caucasus. Also in Turkey, according to this system, this species is represented by two subspecies as *P. myardi atropos* (Chevrolat, 1854) in S Turkey and the nominative subspecies in other parts of Turkey. However, Sama (2002) does not accept any subspecies of *Prinobius myardi*. He accepted all taxa related with *P. myardi* within the variability of this species. As more commonly accepted that *P. myardi proksi* (Slama, 1982) is a subspecies of this species now (e.g. Komiya & Lorenc, 2006).

Tribe RHAPHIPODINI Lameere, 1912

Genus *RHAESUS* Motschulsky, 1875

[Type sp.: *Rhaesus persicus* Motschulsky, 1875 = *Prionus serricollis* Motschulsky, 1838]

According to some authors, the genus is in the tribe Prionini. *Rhaesus* Motschulsky, 1875 has only 2 species as *R. serricollis* (Motschulsky, 1838) [Serbia to Caucasus] and *R. caesariensis* (Pic, 1918) [from Syria]. It has W-Palaearctic chorotype. It is represented only by the species *R. serricollis* (Motschulsky, 1838) in Turkey.

Rhaesus serricollis (Motschulsky, 1838)

Original combination: *Prionus serricollis* Motschulsky, 1838

Other names: *serraticollis* Motschulsky, 1838 (unjustified emendation); *robustus* Heyden, 1844; *persicus* Motschulsky, 1875.

Material examined: Osmaniye prov.: Bahçe road, Çona village, N 37 07 E 36 19, 126 m, 28.06.2006, 1 male, 3 females.

Records in Turkey: Bilecik prov. (Bodemeyer, 1906); İstanbul prov.: Polonez village, Antalya prov. : Alanya (Demelt, 1963); Antalya prov.: Toros Mountains (Elmalı) (Villiers, 1967); Muğla prov.: Fethiye (Acatay, 1971); İzmir prov.: Bornova (Gül-Zümreoğlu, 1972); İzmir prov.: Bornova / Kemalpaşa, Denizli prov.: Tavas (Gül-Zümreoğlu, 1975); Bilecik prov., İstanbul prov., Antalya prov.: Alanya, İzmir prov., Denizli prov., Muğla prov. (Erdem & Çanakçıoğlu, 1977; Çanakçıoğlu, 1983; Çanakçıoğlu & Mol, 1998); Turkey (Danilevsky & Miroshnikov, 1985; Önder et al., 1987; Miroshnikov, 1998a); Antalya prov.: Alanya (Svacha & Danilevsky, 1986); Muğla prov.: Marmaris (Öymen, 1987); Antalya prov.: Alanya / Bambus Camp (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Kahramanmaraş prov. (Kanat, 1998); İstanbul prov.: Polonez village, Muğla prov., Antalya prov.: Alanya (Lodos, 1998); Adana prov.: Balcalı / Karataş, Antalya prov.: Central / Çaltıcak / Finike (Turunçova) / Serik, Burdur prov.: Central, Hatay prov.: Central / İskenderun (Cırtıman), İçel prov.: Erdemli / Tarsus, Konya prov.: Akşehir, Osmaniye prov.: Kadirli (Kabayar) (Tozlu et al., 2002); İçel prov.: Erdemli (Karahasanlı village) (Özdikmen, 2006); Düzce prov., Antalya prov.: Manavgat (Özdikmen, 2007).

Range: Europe (Albania, Serbia, Macedonia, Greece, Bulgaria, European Turkey), Caucasus, Georgia, Transcaucasia, Near East, Turkey, Iran, Syria.

Chorotype: Turano-Mediterranean (Irano-Mediterranean + Balkano-Anatolian).

Remarks: The species distributes rather widely in Turkey.

Tribe AEGOSOMATINI Thomson, 1860

Genus *AEGOSOMA* Serville, 1832

[Type sp.: *Cerambyx scabricornis* Scopoli, 1763]

The genus *Aegosoma* Serville, 1832 has two subgenera as *Spinimegopis* Matsushita, 1933 which includes 5 species from E-Palaearctic and Oriental regions as *A. buckleyi* Gahan, 1894 [India]; *A. flavipenne* (Demelt, 1989) [Malaysia]; *A. formosanum* Matsushita, 1933 [Formosa, Japan]; *A. nepalense* Hayashi, 1979 [Nepal, Sikkim, Tibet] and *A. tibiale* White, 1853 [Nepal, India] and the nominotypical subgenus *Aegosoma* Serville, 1832 that includes 15 species from Palaearctic region and Oriental regions as *A. annamense* (Pic, 1930) [Vietnam]; *A. annulicorne* (Komiya, 2001) [Malaysia, Borneo]; *A. cuneicorne* (Komiya, 2000) [Thailand]; *A. giganteum* Lansberge, 1884 [Borneo, Indonesia, Malaysia, Sumatra]; *A. guerryi* (Lameere, 1915) [China]; *A. hainanense* Gahan, 1900 [China]; *A. katsurai* (Komiya, 2000) [Vietnam, Thailand]; *A. kusamai* (Komiya, 1999) [Myanmar, Thailand]; *A. lividipenne* (Lameere, 1920) [China]; *A. ornaticolle* (White, 1853) [Tibet, Nepal, India, Taiwan, SE Asia]; *A. ossea* Aurivillius, 1897 [Malaysia, Borneo]; *A. perroti* (Fuchs, 1966) [Vietnam]; *A. pici* (Lameere, 1915) [China]; *A. scabricorne* (Scopoli, 1763) [Spain to Near East] and *A. sinica* White, 1853 [China, Taiwan, Myanmar, Japan, Laos, Vietnam, Asian Russia, Korea, India]. So, the genus has Palaearctic and Oeriental chorotypes.

In Turkey, it is represented only by the species *A. scabricorne* (Scopoli, 1763) which is the widest spread species of the genus.

Aegosoma scabricorne (Scopoli, 1763)

Original combination: *Cerambyx scabricornis* Scopoli, 1763

Other names: *eques* Voet, 1778.

Material examined: Antalya prov.: Taşkent-Alanya road, exit of Karapınar, 1210 m, N 36 35 E 32 22, 18-20. 07. 2006, 1 female; Konya prov.: Taşkent-Alanya road, 80 km to Alanya, 1482 m, N 36 46 E 32 27, 19-28.07.2006, 2 females; Taşkent, Afşar, Kayadibi Akçapınar place, 1680 m, N 37 28 E 31 38, 25.07.2006, 1 male; Osmaniye prov.: Zorkun road, Fenk plateau, N 36 59 E 36 20, 05.08.2007, 1 male, 1015 m, 10.07.2007, 1 female, 1049 m, 22.07.2006, 2 males and 1 female, 1049 m, 11.08.2006, 3 females.

Records in Turkey: Turkey (Winkler, 1924-1932; Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985; Svacha & Danilevsky, 1986; Althoff & Danilevsky, 1997; Lodos, 1998; Sama, 2002; Özdikmen, 2006); Konya prov.: Beyşehir (Sekendiz, 1974); İstanbul prov.: Belgrad Forest (Öymen, 1987); Kahramanmaraş prov.: Andırın as *Megopis scabricornis* (Adlbauer, 1992); Antalya prov.: Central, Gümüşhane prov.: Torul, Isparta prov.: Eğirdir (Ağıl) (Tozlu et al., 2002); Antalya prov.: Alanya (Çayarası plateau-Sarımut bridge) (Özdikmen & Çağlar, 2004); Balıkesir prov.: Manyas Kuş Cenneti (Özdikmen & Şahin, 2006); Samsun prov.: Çarşamba, Turkey (Özdikmen & Demir, 2006); Van prov.: Tatvan, Bartın prov.: İnkum, Antalya prov.: Termessos National Park, Karabük prov.: Safranbolu (Bulak village) (Özdikmen, 2007); Ankara prov.: Kayaş (Bayındır dam env.) (Özdikmen et al., 2009).

Range: Europe (Spain, France, Corsica, Italy, Sardinia, Sicily, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Albania, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slovakia, Belorussia, Ukraine, Crimea, ?Moldavia, European Russia), ?China, Caucasus, Transcaucasia, Near East, Turkey, Iran.

Chorotype: Turano-European.

Remarks: According to the distribution in Turkey of host plants, probably the species distributes widely in Turkey. The present materials are the first record of Osmaniye province.

Tribe PRIONINI Latreille, 1804

Genus *PRIONUS* Geoffroy, 1762

[Type sp.: *Cerambyx coriarius* Linnaeus, 1758]

The genus *Prionus* Geoffroy, 1762 has five subgenera as subgenus *Antennalia* Casey, 1912 which includes only one species from Nearctic region as *P. fissicornis* Haldeman, 1848 [America]; subgenus *Homaesthesis* LeConte, 1873 which includes 8 species from Nearctic region [all from America] as *P. arenarius* Hovore, 1981; *P. emarginatus* Say, 1824; *P. integer* LeConte, 1851; *P. linsleyi* Hovore, 1981; *P. palparis* Say, 1824; *P. rhodocerus* Linsley, 1957; *P. simplex* (Casey, 1912) and *P. spinipennis* Hovore & Turnbow, 1984; subgenus *Neopolyarthron* Semenov, 1899 which includes 6 species from Nearctic region as *P. aztecus* Casey, 1912 [Mexico]; *P. batesi* Lameere, 1920 [Mexico]; *P. curticollis* Casey, 1912 [Mexico]; *P. debilis* Casey, 1891 [America]; *P. imbricornis* Linnaeus, 1767 [America] and *P. townsendi* Casey, 1912 [Mexico]; subgenus *Trichoprionus* Fragoso & Monné, 1982 which includes only one species from Nearctic region as *P. aureopilosus* Fragoso & Monné, 1982 [Republic of Dominicana] and the nominotypical subgenus *Prionus* Geoffroy, 1762 that includes 37 species from Nearctic, Palaearctic and Oriental regions as *P. boppei* Lameere, 1912 [China]; *P. burdajewiezi* Bodemeyer, 1930 [Iran]; *P. californicus* Motschulsky, 1845 [Canada, Alaska, Mexico, America]; *P. coriarius* (Linnaeus, 1758) [W-Palaearctic species, distributed from Spain to Kazakhstan]; *P. corpulentus* Bates, 1878 [Kashmir, Pakistan]; *P. dacatrai* Pesarini & Sabbadini, 1997 [Pakistan]; *P. delavayi* Fairmaire, 1887 [China]; *P. elegans* Demelt, 1972 [Pakistan]; *P. evae* Demelt, 1972 [Pakistan]; *P. flohri* Bates, 1884 [Mexico]; *P. gahani* Lameere, 1912

[China]; *P. galantiorum* Drumont & Komiya, 2006 [China]; *P. heroicus* Semenov, 1908 [America]; *P. hintoni* Linsley, 1935 [Mexico]; *P. howdeni* Chemsak, 1979 [Mexico]; *P. insularis* Motschulsky, 1857 [Japan, Korea, China, Russia]; *P. komiyai* Lorenc, 1999 [Syria, Turkey]; *P. kucerai* Drumont & Komiya, 2006 [China]; *P. lameerei* Semenov, 1927 [China]; *P. laminicornis* Fairmaire, 1897 [China]; *P. laticollis* (Drury, 1773) [Canada, America]; *P. lecontei* Lameere, 1912 [Canada, America, Mexico]; *P. mexicanus* Bates, 1884 [Mexico]; *P. murzini* Drumont & Komiya, 2006 [China]; *P. nakamurai* Ohbayashi N. & Makihara, 1985 [Taiwan]; *P. plumicornis* Pu, 1987 [China]; *P. pocularis* Dalman, 1817 [Canada, America]; *P. potaninei* Lameere, 1912 [China]; *P. poultoni* Lameere, 1912 [Mexico]; *P. puae* Drumont & Komiya, 2006 [China]; *P. scabripunctatus* Hayashi, 1971 [Taiwan]; *P. sejunctus* Hayashi, 1959 [Japan]; *P. sifanicus* Plavilstshikov, 1934 [China]; *P. siskai* Drumont & Komiya, 2006 [China, Myanmar]; *P. sterbai* Heyrovsky, 1950 [Iran]; *P. tangerianus* Sláma, 1996 [Morocco] and *P. unilamellatus* Pu, 1987 [China]. So, the genus has Holarctic and Oriental chorotypes.

In Turkey, it is represented only by two species as *P. coriarius* (Linnaeus, 1758) and *P. komiyai* Lorenc, 1999.

Prionus coriarius (Linnaeus, 1758)

Original combination: *Cerambyx coriarius* Linnaeus, 1758

Other names: *tridentatus* Linnaeus, 1758; *prionus* DeGeer, 1775; *ballista* Voet, 1778; *germanicus* Voet, 1778; *hussarus* Voet, 1778; *vicinus* Jakovlev, 1887.

Material examined: Antalya prov.: Akseki, Yarpuz env., 1615 m, N 37 13 E 31 55, 10.07.2007, 4 males; Konya prov.: Çayarası-Alanya, Kozarası place, 1133 m, N 36 39 E 32 25, 18.07.2006, 1 male; Osmaniye prov.: Çiftmazı, Kent Forest, N 37 01 E 36 17, 778 m, 24.06.2006, 1 male; Zorkun road, Fenk plateau, N 36 59 E 36 20, 1049 m, 11.08.2006, 1 female, 1015 m, 05.08.2007, 1 male; Mitisin plateau, N 36 58 E 36 21, 1402 m, 08.2006, 3 males and 2 females, 1398 m, 14.07.2007, 1 male, 15.06.2007, 1 female, 07.07.2007, 6 males.

Records in Turkey: Turkey (Semenov, 1900; Acatay, 1948, 1961, 1968; Lobanov et al., 1981; Danilevsky & Miroshnikov, 1985; Svacha & Danilevsky, 1986; Önder et al., 1987; Althoff & Danilevsky, 1997; Lodos, 1998; Sama, 2002); Sinop prov.: Ayancık (Schimitschek, 1944); Burdur prov.: Bucak (Ekici, 1971); Antalya prov.: Kemer (Beldibi) / Kaş (Gürsu) / Çakırlar forest (Tosun, 1975); Sinop prov.: Ayancık, Trabzon prov., Antalya prov. (Erdem & Çanakçıoğlu, 1977; Çanakçıoğlu, 1983); Trabzon prov.: Campus of Karadeniz Technical University (Sekendiz, 1981); Aydın prov.: Dilek Peninsula National Forest (Öymen, 1987); Trabzon prov.: Maçka (Meryemana Forests), Artvin prov.: Şavşat (Yayla, Kocabey place) / Şavşat (Veliköy, Karagöl Forests) (Yüksel, 1996); Kahramanmaraş prov. (Kanat, 1998); Antalya prov., Aydın prov., Trabzon prov., Sinop prov. (Çanakçıoğlu & Mol, 1998); Artvin prov.: Hopa, Rize prov.: Central / Fındıklı / Pazar, Trabzon prov.: Yeşilova (Tozlu et al., 2002); Antalya prov.: Kaş (Sinekçi village, Sinekçi Beli), Turkey, Kırklareli prov.: İğneada-Saka lake (Sivriler village) / Demirköy (Özdikmen & Çağlar, 2004); Hatay prov.: Hassa (Söğütler) (Özdikmen & Demirel, 2005); Artvin prov.: Hopa, Trabzon prov. (Malmusi & Saltini, 2005); Kahramanmaraş prov.: Pazarcık (Bağdınısağır Mahallesi)

(Özdikmen & Okutaner, 2006); Ankara prov.: Kızılcahamam (Çamkoru), Balıkesir prov.: Erdek, Kocaeli prov.: Kerpe / İzmit (Özdikmen & Şahin, 2006); Bolu prov.: Abant, Kırıkkale prov.: Sulakyurt (Özdere) (Özdikmen & Demir, 2006); Kastamonu prov.: Küre–Ağılı road, Artvin prov. (Özdikmen, 2007).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, Great Britain, Czechia, Slovakia, Norway, Poland, Sweden, Finland, Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), North Africa (Tunisia, Algeria), Siberia, Caucasus, Transcaucasia, Near East, Turkey, Iran.

Chorotype: Sibero-European + Turano-Europeo-Mediterranean.

Remarks: According to the distribution in Turkey of host plants, probably the species distributes widely in Turkey. The present materials are the first record for Konya and Osmaniye provinces.

Prionus komiyai Lorenc, 1999

Records in Turkey: Turkey (Lorenc, 2006).

Range: Syria, Turkey.

Chorotype: SW-Asiatic (Syro-Anatolian)

Remarks: The species was recently described from Syria by Lorenc (1999). It distributes only in S Turkey.

Genus *MESOPRIONUS* Jakovlev, 1887

[Type sp.: *Mesoprionus angustatus* Jakovlev, 1887]

The genus *Mesoprionus* Jakovlev, 1887 is a problematic group. Some authors regarded it as a subgenus of *Prionus* Geoffroy, 1762. Also according to some authors, some species of this genus are synonyms or in another genus. We regard it as a separate genus. The genus has twelve species from Palaearctic region as *M. angustatus* (Jakovlev, 1887) [Uzbekistan, Turkestan, Tadjikistan, Turkmenia]; *M. asiaticus* Faldermann, 1837 [Transcaucasia, China, Kazakhstan, Kirgizia, Armenia, Iran, Russia]; *M. batelkai* (Sláma, 1996) [Crete, S Greece, ?SW Turkey]; *M.besicanus* (Fairmaire, 1855) [Serbia and Croatia to Turkey and Middle east]; *M. consimilis* (Holzschuh, 1981) [Iran]; *M. henkei* (Schaufuss, 1879) [N Iraq]; *M. lefebvrei* (Marseul, 1856) [CE Turkey]; *M. lesnei* (Semenov, 1933) [SW Iran]; *M. persicus* (Redtenbacher, 1850) [Iran]; *M. petrovitzi* (Holzschuh, 1981) [SE Iran]; *M. schaufussi* (Jakovlev, 1887) [NW Iran, NE Turkey] and *M. zarudnii* Semenov, 1933 [E Tadjikistan]. So, the genus has Palaearctic chorotype.

In Turkey, it probably is represented by four species as *M. batelkai* (Sláma, 1996); *M.besicanus* (Fairmaire, 1855); *M. lefebvrei* (Marseul, 1856) and *M. schaufussi* (Jakovlev, 1887). Moreover, *M. asiaticus* Faldermann, 1837 (distributes in Transcaucasia, China, Kazakhstan, Kirgizia, Armenia, Iran, Russia) and *M.*

persicus (Redtenbacher, 1850) (distributes only in S and W Iran) have also been reported only by Lodos (1998) for Turkey in his mostly unrealistic list. So, the doubtfull records of Lodos (1998) are not confirmed.

Mesoprionus batelkai (Sláma, 1996)

Original combination: *Prionus batelkai* (Sláma, 1996)

Records in Turkey: ?Turkey (Lorenc, 2006).

Range: Crete, S Greece, ?Turkey.

Chorotype: E-Mediterranean (Aegean)

Remarks: The species has not been recorded from any exact locality in Turkey until now. So the status is not clear. If present, it probably occurs only in SW Anatolia. It was regarded by some authors as a subspecies or a synonym of *M. besicanus*.

Mesoprionus besicanus (Fairmaire, 1855)

Original combination: *Prionus besicanus* Fairmaire, 1855

Material examined: Antalya prov.: Alanya, Sarımut env., 1113 m, N 36 37 E 32 23, 09.07.2007, 3 males; Konya prov.: Taşkent, Afşar, Kayadibi Akçapınar place, 1680 m, N 37 28 E 31 38, 25.07.2006, 1 male; Osmaniye prov.: Hasanbeyli, Kalecik, 05.08.2007, 1 male.

Records in Turkey: Hatay prov.: Akbez as *Prionus besicanus* (Pic, 1897); Asia Minor as *Prionus besicanus* (Semenov, 1900); European Turkey and Asia Minor (Winkler, 1924-1932); Turkey (İyriboz, 1938, 1940; Bodenheimer, 1958; Svacha & Danilevsky, 1986; Sama & Rapuzzi, 2000); İstanbul prov.: Polonez village, İzmir prov.: Dikili, Makaron, Uşak prov., Antalya prov.: Kaş (Demelt, 1963); İzmir prov.: Ödemiş (Bozdağ), Bornova, Dikili (Gül-Zümreoğlu, 1972); Western Anatolia (İren & Ahmed, 1973); İzmir prov.: Bergama, Dikili, Makaron, Urla, Bornova, Çeşme, Denizli prov.: Çal, Hançalar (Gül-Zümreoğlu, 1975); Kütahya prov.: Simav, Çanakkale prov.: İntepe (Sama, 1982); Nevşehir prov.: Göreme as *Prionus besicanus* (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); İstanbul prov.: Polonez village, Aegean Region (Lodos, 1998); Adana prov., Antalya prov., Bilecik prov., Burdur prov., Çanakkale prov., Erzurum prov., İçel prov., Kayseri prov., Kilis prov., Konya prov., Muğla prov., İstanbul prov., İzmir prov., Kütahya prov., Nevşehir prov. (Tozlu et al., 2002); Burdur prov.: Bucak (Özdikmen & Şahin, 2005); Bursa prov. : Uludağ (Malmusi & Saltini, 2005); Erzincan prov.: Kemaliye, Bursa prov.: Çalı village (Özdikmen, 2006); Kırıkkale prov.: Sulakyurt (Özdere), Antalya prov.: Manavgat (Demirciler village), Ankara prov.: Kalecik (Yeşildere) (Özdikmen & Demir, 2006).

Range: Europe (Albania, ?Croatia and Bosnia and Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey), Cyprus, Middle east (Syria, Lebanon, Jordan), Turkey.

Chorotype: Turano-Mediterranean (Balkano-Anatolian) or E-Mediterranean (NE-Mediterranean + Palestino-Taurian).

Remarks: The species distributes mostly in West half of Turkey. The present material is the first record for Osmaniye province.

Mesoprionus lefebvrei (Marseul, 1856)

Original combination: *Prionus lefebvrei* Marseul, 1856

Material examined: Kahramanmaraş prov.: Pazarcık, Bağdınısağır district, 2005, 1 male.

Records in Turkey: Anatolia (Lorenc, 2006).

Range: Turkey.

Chorotype: Anatolian

Remarks: The species is endemic to Turkey. It probably occurs mostly in CE Anatolia. It was regarded by some authors as a synonym of *M. besicanus*.

Mesoprionus schaufussi (Jakovlev, 1887)

Original combination: *Prionus schaufussi* (Jakovlev, 1887)

Records in Turkey: ?SW Turkey (Lorenc, 2006).

Range: NW Iran, ?E Turkey, ?N Iraq.

Chorotype: SW-Asiatic (Irano-Anatolian)

Remarks: The species has not been recorded from any exact locality in Turkey until now. So the status is not clear. If present, it probably occurs only in NE or E Anatolia. It was regarded by some authors as a synonym of *M. besicanus*.

An important note:

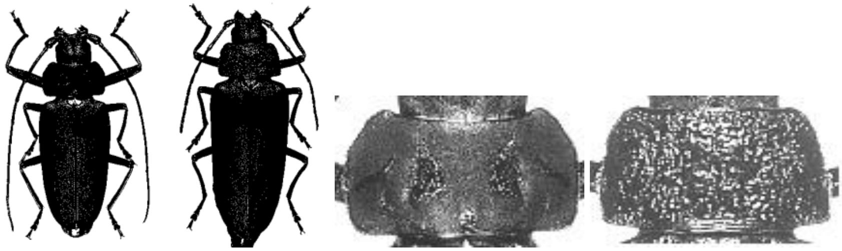
For the subfamily Prioninae Latreille, 1802, *Pogonarthron semenovi* (Lameere, 1912) [Iraq]; *Monocladum aegyptiacum* (Guérin-Méneville, 1844) [Libya, Egypt, Saudi Arabia, Yemen, Jordan, Israel] and *Tragosoma depsarium* (Linnaeus, 1767) [N America (America), Europe (incl. Balcans), N Asia] have been reported only by Lodos (1998) for Turkey in his mostly unrealistic list until now. So, the doubtful records of Lodos (1998) are not confirmed.

Furthermore, **the subfamily Parandrinae Blanchard, 1845** is not represented in Turkey. However, *Archandra caspia* (Ménétriés, 1832) which occurs in Caucasus, Iran, Turkmenia has also been reported by Lodos (1998) for Turkey in his mostly unrealistic list without any exact locality. So, the doubtful record of Lodos (1998) is not confirmed.

A key of Turkish Prioninae species on the base of pronotal and antennal characters

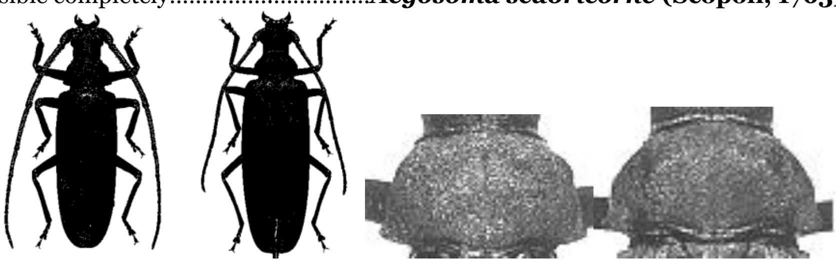
1 Pronotum with spines or spinules on lateral margins..**3**
- Pronotum without spines or spinules on lateral margins....................................**2**

2 Pronotum like a plate, flat, lateral margins visible completely.............................. ....***Ergates faber*** **(Linnaeus, 1761)**



Male Female Male Female

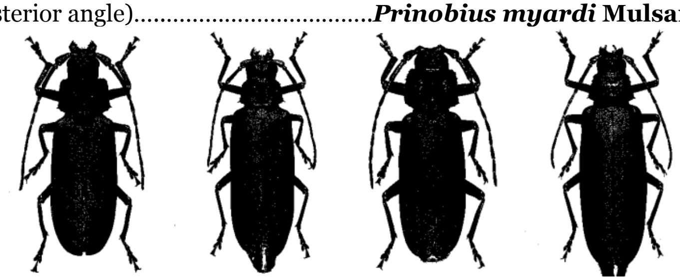
- Pronotum not like a plate, not flat, more or less convex, lateral margins not visible completely..............................***Aegosoma scabricorne*** **(Scopoli, 1763)**



Male Female Male Female

3 Pronotum with spines or spinules on lateral margins..**4**
- Pronotum with thorn like spines on lateral margins...**7**

4 Pronotum with spinules on lateral margins (at least as one apiece almost in the each posterior angle)...................................***Prinobius myardi*** **Mulsant, 1842**

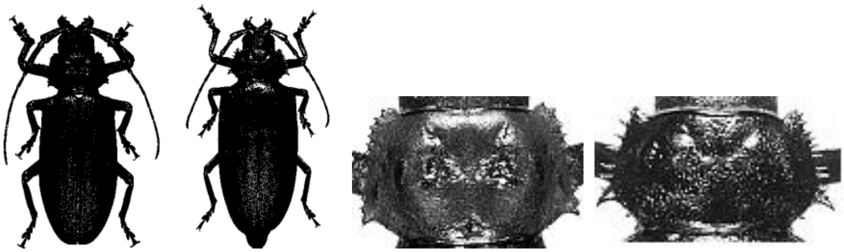


Male Female Male Female

Male Female Male Female

- Pronotum with spines on lateral margins..**5**

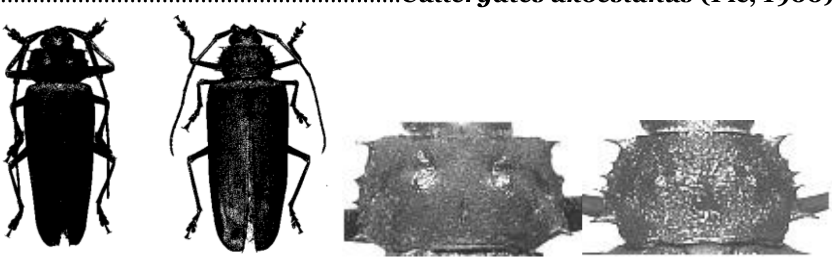
5 Pronotum with over 10 spines on each lateral margin, spines larger in females.... ....***Rhaesus serricollis* (Motschulsky, 1838)**



Male Female Male Female

- Pronotum with 4 or 5 spines on each lateral margin, spines larger in females.....**6**

6 Pronotum with more or less clear spines; 4 spines on each lateral margin in males and 5 spines on each lateral margin in females, spines larger in females....... ....***Callergates akbesianus* (Pic, 1900)**



Male Female Male Female

- Except the spines on angles, spines of pronotum more reduced (especially in males) but spines larger in females.. ....***Callergates gaillardoti* (Chevrolat, 1854)**

Male Female Male Female

7 Pronotum with 2 spines, posterior corner without spine.....................................**8**
- Pronotum with 3 spines, posterior corner with spine...**9**

8 Pronotum with 2 distinct spines, someone just at the anterior corner and the other one on anterior half of pronotum (the top of this spine at level of anterior half of pronotum); In males: 3- antennal sements on the outside distinctly serrated at the distal end and antennae reaching beyond the middle of elytra, pronotum transverse, almost rectangular, width on the posterior margin of pronotum 2 times of median pronotal length...
....***Prionus komiyai*** **Lorenc, 1999**

Male

- Pronotum with 2 distinct spines, someone just at the anterior corner and the other one almost on the middle of pronotum (the top of this spine at level of the middle of pronotum); In males: 3- antennal sements on the outside distinctly serrated at the distal end and antennae reaching just about in the middle of elytra, pronotum less transverse, width on the posterior margin of pronotum less than 2 times of median pronotal length.......***Mesoprionus lefebvrei*** **(Marseul, 1856)**

Male

Female

Male

Female

9 Posterior spine (third spine) of pronotum clear and almost at the posterior corner; In females, antennae with 11 segments, reaching only the basal quarter of elytra; In males, antennae with 12 segment, relatively shorter, almost reaching the middle of elytra..***Prionus coriarius*** **(Linnaeus, 1758)**

Male

Female

Male

Female

- Posterior spine (third spine) of pronotum less clear and just at the posterior corner; In females, antennae with 12 segments, reaching beyond the basal quarter of elytra; In males, antennae with 12 segments, relatively longer, reaching at least the middle of elytra; median length of pronotum relatively longer..........**10**

10 Width on the posterior margin of pronotum 2 times (in both sexes) of median pronotal length.......................................***Mesoprionus batelkai* (Sláma, 1996)**

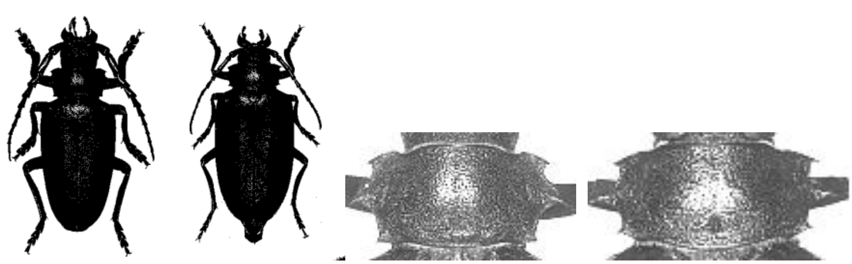
Male Female Male Female

- Width on the posterior margin of pronotum less than 2 times (1.6 in males - 1.8 in females) of median pronotal length..**11**

11 In males, 3- antennal sements on the outside more or less serrated at the distal end..***Mesoprionus schaufussi* (Jakovlev, 1887)**

Male Female Male Female

- In males, antennal sements on the outside not serrated.. ....***Mesoprionus besicanus* (Fairmaire, 1855)**



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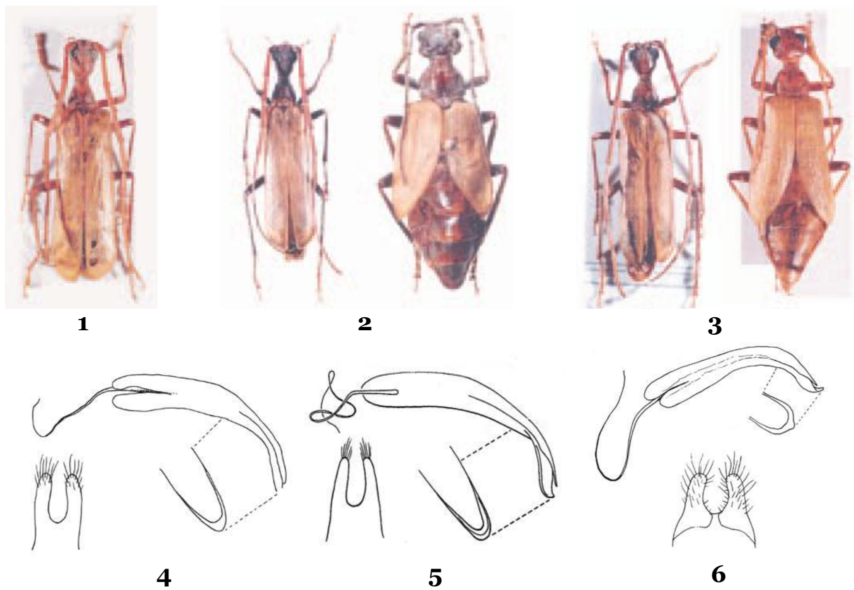

Figure 1-6. 1- *V. ocularis* Mulsant & Rey, 1863 (male) 2- *V. xatarti* Mulsant, 1839 (male and female) 3- *V. creticus* Ganglbauer, 1886 (male and female) 4- Male genitalia of *V. ocularis* Mulsant & Rey, 1863 5- Male genitalia of *V. xatarti* Mulsant, 1839 6- Male genitalia of *V. creticus* Ganglbauer, 1886 [from Vives (2004)].

APHIDICIDIAL ACTIVITY OF SEVEN ESSENTIAL OILS AGAINST THE CABBAGE APHID, *BREVICORYNE BRASSICAE* L. (HEMIPTERA: APHIDIDAE)

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[Işık, M. & Görür, G. 2009. Aphidicidial activity of seven essential oils against the cabbage aphid, *Brevicoryne brassicae* L. (Hemiptera: Aphididae). Munis Entomology & Zoology, 4 (2): 424-431**]**

ABSTRACT: The aphidicidial activities of seven essential oils were investigated against *Brevicoryne brassicae* (Hemiptera: Aphididae) under laboratory conditions. Applications of each tested essential oil significantly reduced the reproduction potential of the cabbage aphid and resulted in higher mortality. Quantity of applied essential oils also had an important effect on daily fecundity. In general, these seven applied essential oils can be considered as an important aphidicide to control aphid population, particularly *J. excelsa, J. oxycedrus, L. nobilis* and *F. vulgare*.

KEYWORDS: Aphid, Aphidicide, Biological control, *Brevicoryne brassicae*, Essential oil.

Essential oils have been used to control pests of the stored products as alternative insecticides in various parts of the worlds (Buchbauer, 2000; Isman, 2000, Ngamo et al., 2007). Recently, botanical insecticides have long been considered as acceptable alternatives to synthetic chemical insecticides for pest management as they have low persistence in the environment, little mammalian toxicity and resulting in good selectivity and wide public acceptance (Bhathal and Singh, 1993; Isman, 2000, 2005; Sampson et al., 2005; Digilio et al., 2008).

Recent studies have indicated how various essential oil efficient against pests on plants. Most of the studies reported great potentials of the essential oils to control pests particularly in the greenhouse and in field (Isman, 2000; Sampson et al., 2005, Sarac and Tunç, 1995; Tunç and Sahinkaya, 1998, Tomova et al., 2005). Choi et al. (2003) showed significant insecticidal activity of 53 plant essential oil against *Trialeurodes vaporariorum* (Westwood) in Korea where it become important pest of various greenhouse vegetables. Pavela (2005) reported the toxic effect of twenty essential oils to the third instar larvae of *Spodoptera littoralis* (Boisduval). Rahman and Talukder (2006) reported bio insecticidal activity of different plant oils and showed that plant oils suppressed the oviposition ability of the *Callosobruchus maculatus* (Fabricius) and reduced their damage significantly. Zapata et al. (2006) demonstrated adverse effects of the selected extractions of *Cestrum parqui* L. on *Ceratitis capitata* (Wiedemann).

In insects, the aphid has a particular importance as a serious pest. In spite of the intense control strategies applied so far, aphid species have invaded new areas and have expanded their damage to crops all over the world. For example, in the United States, despite using the best pest control technology available, pest-caused losses of yield have been estimated to average about 30% annually, whereas in the developing countries to which Turkey belongs, pest-caused losses are even higher, averaging 50% or more (Ruberson, 1999). As natural enemy activity cannot prevent or hinder virus transmission an earlier aphid control and faster knockdown method should be preferred. The essential oils with their novel, highly bioactive compounds can be very well used as effective insecticides (Sampson et al., 2005) and thus should be considered seriously for control of the aphids. Recently which information has been accumulated about the potential of essential oils in control of aphids and several studies reported usefulness applications. Tunç and Şahinkaya (1998) found that essential oils of cumin (*Cuminum cyminum* L.), anise (*Pimpinella anisium* L.), oregano (*Origanum syriacum* var. *bevanii* L.) and eucalyptus (*Eucalyptus camaldulensis* Dehn.) were effective as fumigants against the cotton aphid (*Aphis gossypii* Glover). Green peach aphid, *Myzus persicae* (Sulzer), show both behavioural effects and toxicity in a laboratory bioassay where aphids are placed on mustard cabbage leaf discs dipped in emulsions of an essential oil based insecticide. The frequency of *M. persicae* feeding and the mortality rate were inversely concentration-dependent (Isman, 2000). Tomova et al. (2005) tested the biological activity of essential oil volatiles obtained from *Tagetes minuta* L. against aphid species, *Acyrthosiphon pisum* (Harris), *M. persicae, Aulacorthum solani* (Kaltenbach). They demonstrated that *T. minuta* oil volatiles significantly have reduced the reproduction potential of the tested species. Jaastad (2007) showed that rapeseed oil significantly reduced damage by black cherry aphid, *Myzus cerasi* (Fabricius). Gorur et al. (2008) demonstrated adverse effects of *Thymus*, *Veronica* and *Agrimonia* essential oils on cabbage aphid. Particularly *Thymus* oil application resulted in significant decrease in fecundity and increase in mortality rate. Digilio et al. (2008) showed aphicidial activity of vapours of essential oils extracted from 12 Mediterranean plants against the pea aphid, *A. pisum* and green peach aphid, *M. persicae*.

In this aspect, this study aimed to assess the aphidical activity of seven essential oils against cabbage aphid, *B. brassicae*.

MATERIAL AND METHODS

Essential oil extractions and supply

J. excelsa and *J. oxycedrus* essential oils were obtained from the aerial parts of plant species. The air-dried plants were ground and hydro distilled in a clevenger- like apparatus for 5-6 h. The essential oil was extracted with ether then dried over anhydrous magnesium sulphate. Finnigan DSQ and a HP 60m x 0.32 mm ID x 0.25 mm DB-5 capillary column were used. Column temperature was programmed from 40-280 °C . Column temperature was kept constant at 40 °C for the first 1 min. then was programmed at a rate of six °C / min. The temperature was kept constant again at 280 °C for an other 5 minutes. Injection type was (1:10) and dichloromethane was used as a solvent.

Foeniculum vulgare Miller, *Pimpinella anisum* L., *Rosmarinus officinalis* L., *Juglans regia* L. and *Laurus nobilis* L. pure essential oils were purchased directly from a commercial source. Essential oils were stored in appropriate conditions according to supplier's instruction.

Aphid

Cabbage aphids are an important pests of members of the Cruciferae including, cabbage, collards, cauliflower, swede, mustard, Brussel sprouts and radish. It is a vector of about 20 plant viruses (Blackman and Eastop, 2000). Stock cultures of cabbage aphid, *B. brassicae*, was provided from the Entomology laboratory cultures maintained on cabbage plants in Nigde University. Cabbage, *Brassica oleracea* L., was grown seeds in a glasshouse during experimental process without additional heating or illuminating. Rearing temperature was about 20 °C.

Experimental design

One host plant leaf was set on the surface of water agar (2 %) at the bottom of a Petri dish (9 cm diameter) (Roy et al., 1999) for all essential oil applications and control group. Four apterous adult cabbage aphids of about similar size were carefully transferred onto the leaf with a fine brush. After allowing the aphids to establish, petri dishes were turned upside down and the essential oil was inserted into agar. The petri dishes were placed in plastic bags in an illuminated incubator at about 20 ^{o}C and under a L12:D12 photoperiod. Petri dishes with different volatiles and different concentrations were kept separately to prevent exposure of aphids to other treatments. The daily fecundity in each separate petri dish for each essential oil was recorded. Essential oils were tested at two dose levels; 1 µl and 2 µl per petri dish. For each essential oil, at both doses, three replicates and a control treatment (without essential oil application) were prepared. Mean daily fecundity for each essential oil treatment and control was presented by calculating each replicates mean daily fecundities. Mortality rate for each application was calculated as a daily percentage of the dead offspring to total daily offspring number.

Statistics

Both mean number of the offspring and standard error for the each essential oil treatment were calculated. A one-way ANOVA was performed to show differences between each oil application and each dose for all used essential oils. Following the ANOVA analyses, post-hoc test was performed to determine which mean has differed significantly. The statistical program SPSS 10.01 was used for all analyses.

RESULTS

The effect of *J. oxycedrus*, *J. excelsea*, *F. vulgare*, *P. anisum*, *R. officinalis*, *J. regia* and *L. nobilis* essential oils at 1 µl and 2µl doses were tested on the cabbage aphid, *B. brassicae*. It was clearly shown that the 7 plant's essential oils had adverse effects on the reproduction ability of the cabbage aphid population (Fig. 1). Daily fecundity of the cabbage aphid exposed to various essential oils decreased compared with control treatments.

There were an overall differences between the effect of different plant's essential oil ($F_{[7, 242]}$= 131.46, P<0.000001). Post-hoc analyses showed that these effects are due to significant differences between most of the treatments (i.e.Tukey $HSD_{[26.18]}$=8.07, P<0.00001 between control and *J. oxycedrus* oil treatment, Tukey $HSD_{[26.18]}$=1.25, P<0.00001 between *J. regia* and *L. nobilis* oil treatment). It was shown that *J. excelsa, J. oxycedrus* and *L. nobilis* essential oils had stronger effects than other plants essential oils. Daily fecundity of the cabbage aphid on these 3 plant essential oil applications were significantly different from others (i.e. Tukey $HSD_{[26.18]}$=2.11, P<0.00001 between *J. excelsea* and *P. anisum*, Tukey $HSD_{[26.18]}$=1.25, P<0.00001 between *L. nobilis* and *J. regia*). In order to remove control results experiments effects on an overall implications, similar tests were performed without control results. There were also considerable amount of differences between applications of seven essential oils without including control measurements ($F_{[6, 233]}$= 44.21, P<0.000001).

In addition to overall adverse effects of plant essential oil on reproduction potential of cabbage aphid, there was also dose-dependent significant adverse effects ($F_{[1, 238]}$= 10.42, P=0.001). The increase of the dosage of applied essential oil from 1 µl to 2 µl adversely affected the daily fecundity. *F. vulgare* and *P. anisum* essential oils applications clearly showed this effect (Fig. 2).

Insecticidal effects of the tested essential oils on cabbage aphid were followed for about 5 days for both 1 µl and 2 µl dose applications. It was shown that exposure time did not result in any important changes in daily fecundity (Fig. 4).

Essential oil applications also caused a higher offspring mortality rate compared with control treatments. Particularly application of *F. vulgare*, *J. oxycedrus* and *J. excelsea* resulted in higher mortality rate than others (Fig. 3).

DISCUSSION

The presented results of this study showed strong adverse effects of *J. excelsea*, *J. oxycedrus*, *F. vulgare*, *P. anisum*, *R. officinalis*, *J. regia* and *L. nobilis* essential oils on the reproductive performance of cabbage aphids. However, there were differences in the bio insecticidal effects of seven essential oils despite the fact that they all had significant aphidicial activity on the cabbage aphid. These findings are parallel with the results presented by Tomova et al. (2005), Sampson et al. (2005) and Digilio et al. (2008). Sampson et al. (2005) reported an increase in the mortality rate of turnip aphid, *Lipaphis pseudobrassicae* Davis, when reared on different essential oils. Tomova et al. (2005) demonstrated significant effects of the *T. minuta* oil against three aphid species indicating a potential for aphid control. *T. vulgaris* essential oil application resulted in about 80 % mortality in cabbage aphid. Klingauf et al. (1983) results are parallel with our findings where they reported almost 100 % mortality caused by essential oils of the anise and eucalyptus against rose-grain aphid, *Metopolophium dirhodum* (Walker). Gorur et al. (2008) reported similar effects of *Thymus vulgaris* L., *Veronica officinalis* L. and *Agrimonia eupatoria* L. essential oil against cabbage aphid. *Thymus* oil application resulted in about 85 % mortality in cabbage aphid population. In contrary to Gorur et al. (2008) findings, there were clear dose effects of essential oil on daily fecundity of the cabbage aphid. Cabbage aphid population showed significantly lower performance on 2 µl dose application. These differences might be due to very low performance of cabbage aphid exposed to both 1 µl and 2 µl *Thymus* essential oil. Kanat and Alma (2003) reported that different concentrations of various plants resulted in different insecticidal activity against larvae of pine processionary moth, *Thaumetopoea pityocampa* Schiff. Digilio et al. (2008) also showed that application dose of various essential oils resulted in significant differences in mortality rate for *M. persicae* and *A. pisum*.

Considering other control strategies of pests, both efficiency and being environmental friendly reasons makes essential oils much preferable insecticides against different pest groups, particularly against the aphid. Recent studies showed that compared with the other control strategies, essential oil applications have several advantages. Their applications affect aphids and some other pest in a short time by killing them faster and reducing their reproduction potential. Using essential oil as an aphidicide is also safer for the environment and human health because of their low toxicity and shorter degradation time.

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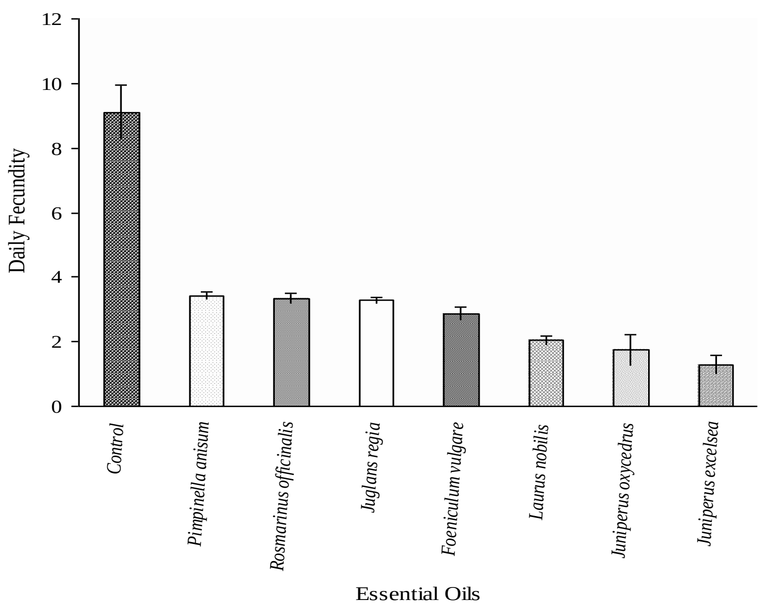


Figure 1. Mean daily fecundity of the cabbage aphid population exposed to three different plant essential oils (Each bar represent the mean±SE).

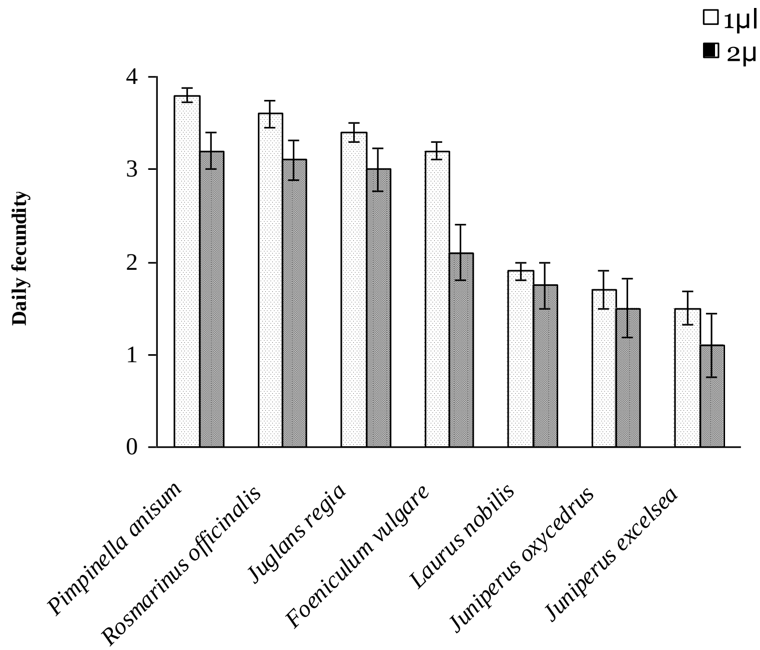


Figure 2. Dose dependent effects of essential oils on daily fecundity of the *Brevicoryne brassicae* (Each bar represent the mean±SE)

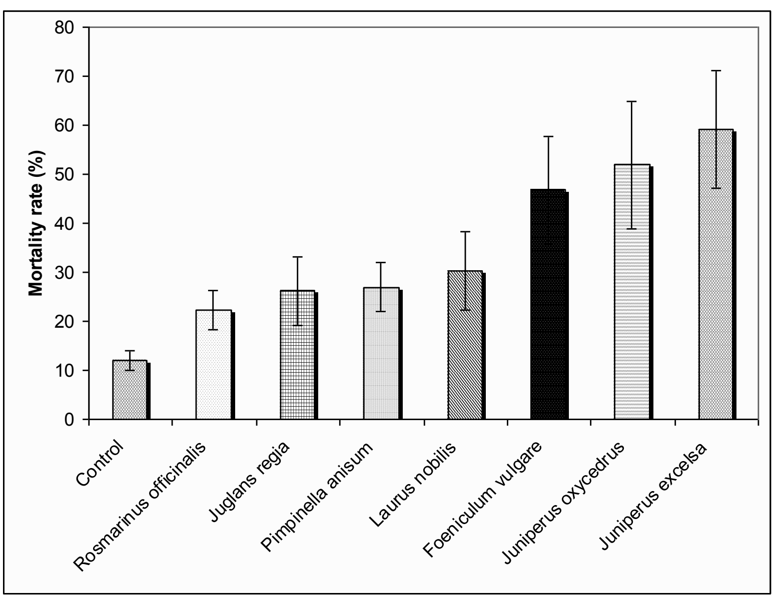
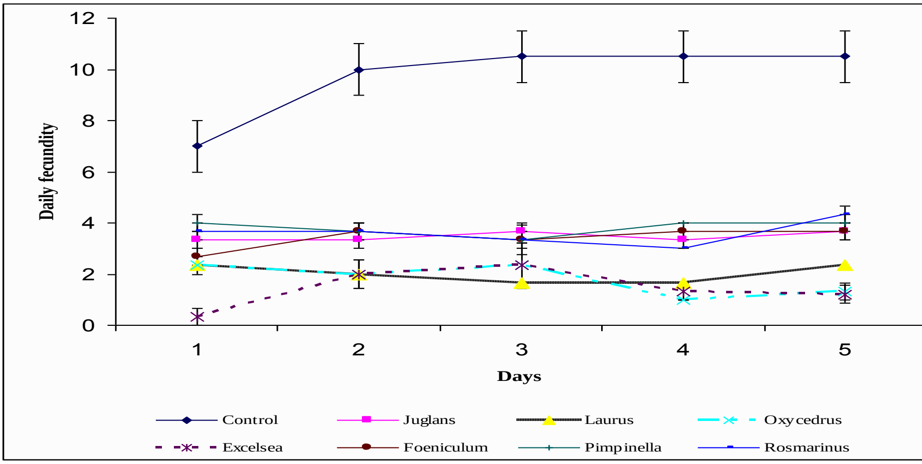
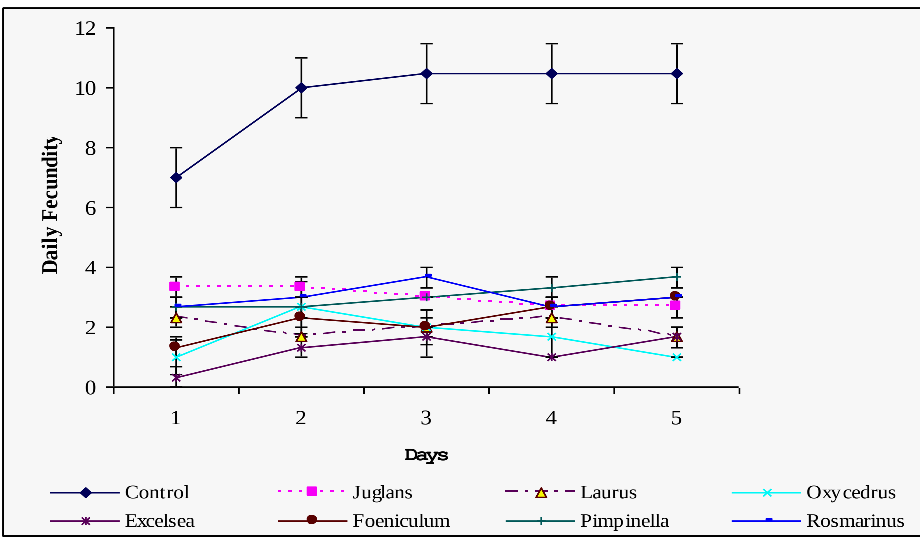


Figure 3. Mortality rate (%) of the cabbage aphid exposed to 7 essential oils.



a)



b)

Figure 4. Exposure period effects on the fecundity of cabbage aphid, a) for the 1 µl dose applications, b) for the 2 µl dose application.

A CONTRIBUTION TO BRACONIDAE (HYMENOPTERA) FROM RICE FIELDS AND SURROUNDING GRASSLANDS OF NORTHERN IRAN

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ABSTRACT: Braconids wasps (Hymenoptera: Ichneumonoidea: Braconidae) are one of the most powerful and important biological control agents in almost all agroecosystems. Braconids' fauna from rice fields of northern Iran is studied in this paper. In a total of 21 species of 12 genera and 8 subfamilies were collected and identified.

KEY WORDS: Braconidae, Rice Fields, Fauna, Iran.

The Braconidae constitute one of the most species-rich families of insects (Quicke et al. 1999). The family appears to date from early Cretaceous (assuming *Eobracon* is properly assigned to family (Rasnitsyn, 1983; Whitfield, 2002), diversifying extensively in the mid to late Cretaceous and early Tertiary, when flowering plants and their associated holometabolous herbivores, the main hosts for braconid parasitoids, radiated (Basibuyuk et al., 1999; Belshaw et al., 2000).

The vast majority of braconids are primary parasitoids of other insects, especially upon the larval stages of Coleoptera, Diptera, and Lepidoptera but also including some hemimetabolus insects (Aphids, Heteroptera, Embiidina). As parasitoids they almost invariably kill their hosts, although a few only cause their hosts to become sterile and less active. Both external and internal parasitoids are common in the family, and the latter forms often display elaborate physiological adaptations for enhancement of larval survival within host insects, including the co-option of endosymbiotic viruses for compromising host immune defenses (Whitfield, 1990; Beckage, 1993, Stoltz and Whitfield, 1992; Whitfield and Asgari, 2003).

The fauna of Iranian Braconidae and especially Iranian rice fields was studied very poorly so far, while Iran is a large country with various geographical regions. The only conducted work on braconids' fauna of Iranian rice fields is Ghahari et al. (2008) with three species including, *Bracon chivensis* Telenga 1936, *Cotesia flavipes* (Cameron 1861) and *Apanteles ruficrus* (Haliday 1834). With attention to the importance of these beneficial insects in biological control of key pests in rice fields, their fauna was studied in rice fields and surrounding grasslands of northern Iran and the results are presented in this paper.

MATERIAL AND METHOD

Specimens were colleted by sweep netting and light traps from various rice fields and surrounding grasslands of four northern provinces including, East Azarbaijan (Arasbaran), Guilan, Golestan and Mazandaran. The samplings were conducted between July 2000 and September 2005, and the collected specimens were killed with ethyl acetate and mounted on triangular labels and were examined with a stereoscopic binocular microscope.

RESULTS

Totally 21 braconid species from 12 genera including, *Disophrys*, *Bracon*, *Glyptomorpha*, *Isomecus*, *Iphiaulax*, *Chelonus*, *Hormius*, *Homolobus*, *Meteorus*, *Zele*, *Macrocentrus* and *Rogas* and 8 subfamilies including, Agathidinae, Braconinae, Cheloninae, Exothecinae, Homolobinae, Meteorinae, Neoneurinae and Rogadinae were collected from rice fields and surrounding grasslands of Northern Iran. The list of species is below:

Subfamily Agathidinae Haliday, 1833

***Disophrys dissors* Kokujev, 1903**

Material: Mazandaran province, Ghaemshahr, 1♀, 2♂♂, July 2000.

Subfamily Braconinae Nees, 1811

***Bracon fulvipes* Nees, 1834**

Material: East Azarbaijan province, Arasbaran, 2♀♀, 1♂, September 2005.

***Bracon leptus* Marshall, 1897**

Material: Guilan province, Roodsar, 1♂, September 2001.

***Bracon sabulosus* Szépligeti, 1896**

Material: East Azarbaijan province, Arasbaran, 1♀, September 2005.

***Glyptomorpha discolor* Thunberg, 1822**

Material: Golestan province, Gorgan, 1♂, September 2001.

***Isomecus mlokossewiczi* Kokujew, 1898**

Material: Mazandaran province, Behshahr, 2♀♀, June 2002.

***Iphiaulax impostor* Scopoli, 1763**

Material: East Azarbaijan province, Arasbaran, 2♀♀, 2♂♂, August 2004.

Subfamily Cheloninae Foerster, 1862

***Chelonus asiaticus* Telenga, 1941**

Material: Golesan province, Gorgan, 1♀, October 2004.

***Chelonus inanitus* (Linnaeus, 1767)**

Material: Mazandaran province, Savadkooh, 2♂♂, April 2005.

***Chelonus scabrator* (Fabricius), 1793**

Material: Guilan province, Roodsar, 1♀, 1♂, September 2001.

***Chelonus canescens* Wesmael, 1835**

Material: East Azarbaijan province, Arasbaran, 3♀♀, June 2005.

Subfamily Exothecinae Foerster, 1862

***Hormius moniliatus* (Nees, 1811)**

Material: Mazandaran province, Amol, 2♀♀, September 2000.

***Hormius tatianae* (Telenga, 1941)**

Material: Guilan province, Chaboksar, 1♀, July 2001.

Subfamily Homolobinae van Achterberg, 1979

***Homolobus* (*Apatia*) *truncator* Say 1829**

Material: East Azarbaijan province, Arasbaran, 1♀, August 2004.

Subfamily Meteorinae Cresson, 1887

***Meteorus pulchricornis* Wesmael, 1835**

Material: Mazandaran province, Galogah, 1♀, Fall 2001.

***Meteorus versicolor* Wesmael, 1835**

Material: Golestan province, Gorgan, 2♂♂, October 2003.

***Zele chlorophthalmus* Spinola, 1808**

Material: Guilan province, Rasht, 3♀♀, August 2001

Subfamily Macrocentrinae, Foerster, 1862

***Macrocentrus* (*Amicroplus*) *collaris* Spinola, 1808**

Material: Mazandaran province, Sari, 1♂, October 2003.

Subfamily Rogadinae Foerster, 1862

***Rogas bicolor* Spinola, 1808**

Material: Mazandaran province, Babol, 4♀♀, 2♂♂, May 2002.

***Rogas circumscriptus* Nees, 1834**

Material: Golestan province, Kordkoy, 1♀, Summer 2000.

***Rogas rossicus* Kokujev, 1898**

Material: East Azarbaijan province, Arasbaran, 2♀♀, August 2004.

DISCUSSION

The results of this survey indicated that there are very diverse fauna of braconid wasps in rice fields of northern Iran. Since there are several important pets in Iranian rice fields including, *Chilo suppressalis* Walker, *C. partellus* (Swinhoe), *Cnaphalocrocis medinalis* Gn. (Lepidoptera: Pyralidae), *Naranga aenescens* Moore, *Pseudaletia unipunctata* Haworth (Lepidoptera: Noctuidae), *Cicadella viridis* L. (Homoptera: Cicadellidae) and several others, these parasitoids can have very important role in pest control.

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GROUND BEETLES (COLEOPTERA: CARABIDAE) OF IRANIAN COTTON FIELDS AND SURROUNDING GRASSLANDS

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ABSTRACT: The family Carabidae (Coleoptera) is among the dominant groups of terrestrial predators and includes more than 40,000 species worldwide, making it one of the largest families of beetles. The fauna of Iranian Carabidae is very diverse, but was not studied perfectly. In the present paper, this group of beneficial predators is studied on the basis of several samples through 2000-2006 in all the cotton fields and surrounding grasslands of Iran. Totally, 115 species and subspecies belonging to 16 subfamilies were collected from 18 different localities. Of these diverse fauna, 8 species are the new records for Iranian fauna.

KEY WORDS: Carabidae, Cotton fields, Grasslands, New Record, Iran.

Cotton is one of the most important crops in Iran with several pests in all regions of Iran (Khanjani, 2006). There are diverse fauna of insect predators in different cotton fields of Iran, while they were poorly studied. Ground beetles (Coleoptera: Carabidae) are one of the powerful and efficient predators in cotton fields. The family Carabidae comprises more than 40,000 species which more than 30% of species are arboreal, though in general temperate species are terrestrial, most are also flightless and predatory (Stork, 1990).

Most carabids are omnivorous (feeding on both plants and animals) and polyphagous (being able to use a wide range of foods), feeding on live prey, carrion and plant material. Some species however are specialist feeders, i.e. *Harpalus rufipes* (the Strawberry Seed Beetle) on seeds, *Loricera pilicornis* (the Springtail Beetle) on Collembola and *Abax parallelopipedus* and *Cychrus caraboides* on slugs and snails. *Ophonus* species feed exclusively on the seeds of Umbellifers, which is known as spermophagy. Ground beetles also are good indicators of habitat types and environmental quality in terms of the effects of pesticides (Frank and Slosser, 1996). The larvae are always carnivorous if the adults are. Many Carabids find their food by random foraging, but specialist feeders tend to use chemical cues. *Poecilus cupreus* has a two dimensional search pattern until it finds an aphid at the base of a plant. Finding the aphid stimulates it to a three dimensional search pattern, i.e. it climbs the plant looking for more aphids. Most species of ground beetles are cannibalistic given the opportunity (Brandmayr et al., 1983).

Different ground beetle species are unofficially classified as either spring or autumn breeders. Spring breeders such as *Poecilus cupreus* over winter as adults while autumn breeders such as *Nebria brevicollis* over winter as larvae. In general the number of eggs produced depends on nutrition, environmental factors such as moisture, temperature, and the age of the beetle. Research indicates that carabids in the wild seldom reach their reproductive capacity. As in most predators egg production is related to food supply. It has been found that the number of eggs produced is inversely related to body mass, hence large species lay less eggs than small species. It has also been found that autumn breeders tend to lay more eggs than spring breeders. Also members of a given species tend to lay more eggs in disturbed conditions than in stable ones. In the first year females will lay 5-10 eggs per female in those species with egg guarding behaviour, but up to several hundred in those that don't. Eggs are laid all in one batch, as several batches per season and in some species over several seasons. Whilst in the second year far fewer or no eggs are produced. Some species lay their eggs individually on the surface of the soil while others dig holes and lay their eggs in these before covering them over with soil. Some Pterostichini make a cocoon for the eggs and a few species dig nests with chambers and provide brood care in the form of guarding the eggs and licking them to remove fungal spores (e.g. *Harpalus* sp.). The eggs normally take about five days to hatch depending on the species and environmental conditions (den Boer et al., 1986; Lovei and Sunderland, 1996).

Larvae only use external digestion i.e. digestive juices are spat/ vomited onto the food and the resulting fluid is then sucked up. There are usually 3 life stages before pupation, however species of *Harpalus* and *Amara* have only 2 larval instars, while other species, particularly those which are ant or termite symbionts, have four larval instars. Generally development takes about a year from being an egg just laid to laying eggs, though it can take up to 4 years in harsh conditions, i.e. *Carabus problematicus* is univoltine up to 800 meters in height but semi-voltine above that. Other species such as *Carabus auronitens* are more flexible and adapt their life history strategy to the prevailing conditions. While *Laemostenus schreibersi* is a cavenicolous species (living in a cave) it can live for 5-6 years. Generally it is the larger species which live the longest. After it has finished growing the larvae constructs a pupal chamber in the soil. Most species normally take 5-10 days to emerge from the pupae (Desender et al. 1994).

Iran is a large country with various geographical regions and climates. The carabids fauna of this part of Palearctic is very diverse but unknown. With attention to the importance of these beneficial insects in biological control, the fauna of Carabidae in Iranian cotton fields is studied in this paper.

MATERIALS AND METHODS

In order to carry out faunistic surveys on Carabidae of Iranian cotton fields, firstly all the major regions which included cotton fields were detected. Totally seven provinces included Golestan, Mazandaran, Tehran, Semnan, Fars, Khorasan and Ardabil, and 18 localities included Kordkoy, Nokandeh, Salikandeh, Gorgan, Gonbad, Ali-Abad, Azadshahr, Ramian, Aghghala, Minoodasht of Golestan province, Ghaemshahr, Behshahr, Galogah of Mazandaran province, Varamin of Tehran province, Garmsar of Semnan province, Darab of Fars province, Kashmar of Khorasan province, Dasht-e-Moghan of Ardabil province and Arasbaran of East Azarbayjan province were sampled. Several plastic pitfall traps, 8.5×10 cm (diameter × depth), were installed at 10 m intervals in different cotton fields and were part-filled with ethanol 75%. The traps were emptied weekly for seven crop seasons (2000-2006) and the fallen beetles were collected and identified. In addition to the pitfall traps, sweepings were conducted randomly in different cotton fields, and also light traps were applied for sampling. On the basis of several samplings in 18 localities contain cotton fields and also their surrounding grasslands, over than 500 carabid specimens were collected and determined.

SPECIES LIST

In a total of 115 carabid species and subspecies belonged to 16 subfamilies were collected from different cotton fields and surrounding grasslands of Iran. Of these 8 species are newly recorded from Iran. The species and subspecies belonged to subfamilies and tribes are given in alphabetical order in the following list.

Subfamily Bembidiinae Stephens, 1827

Tribus Bembidiini Stephens, 1827

Bembidion amnicola Sahlberg, 1900

Material: Golestan province: Aliabad, 1♀, 2♂; August 2001. **New record for Iranian fauna.**

Distribution: Middle and West Siberia, Russia, Transbaikalia.

Bembidion quadrimaculatum (Linnaeus, 1761)

Material: Semnan province: Garmsar, 1♀, 1♂; September 2002. East Azarbayjan province: Arasbaran, 1♂; September 2004.

Distribution: Holarctic Region, North America, Europe, Turkey, Moldova, Russia, Caucasia, Iran to Mongolia, Transbaikalia.

Bembidion* (*Nepha*) *rufimacula (Müller, 1918)

Material: Golestan province: Ramian, 2♂; October 2001.

Distribution: Balkan Peninsula, Turkey, Lebanon.

Subfamily Brachininae Bonelli, 1810

Tribus Brachinini Bonelli, 1810

Brachinus costatulus Quensel, 1806

Material: Golestan province: Aghghala, 1♀; June 2006. Khorasan province: Kashmar, 2♂; October 2004.

Distribution: Middle Asia, Russia, Ukraine, Moldova, Caucasia.

Brachinus cruciatus Quensel, 1806

Material: Ardabil province: Dasht-e-Moghan, 1♀; June 2001.

Distribution: Europe, Mountains of SE Middle Asia, Turkey, Russia, Moldova, Ukraine, Armenia, Kazakhstan, Tajikistan.

Brachinus sclopeta (Fabricius, 1792)

Material: Ardabil province: Dasht-e-Moghan, 3♀, 1♂; June 2001.

Distribution: Czech Republic, Slovakia, Moldova, Russia, Ukraine.

Pheropsophus catoirei Dejean, 1825

Material: Khorasan province: Kashmar, 2♀; April 2001. **New record for Iranian fauna.**

Distribution: Russia, Moldova, Crimea.

Pheropsophus* (*Stenaptinus*) *iranicus Reitter, 1919

Material: Golestan province: Ali-Abad, 1♀; September 2006.

Distribution: Russia, Armenia, Bulgaria.

Subfamily Broscinae Hope, 1838

Tribus Broscini Hope, 1838

Broscus* (*Cephalotes*) *laevigatus Dejean, 1828

Material: Ardabil province: Dasht-e-Moghan, 3♀, 3♂; June 2001. Tehran province: Varamin, 4♀, 1♂; September 2002. Fars province: Darab, 3♀, 2♂; July 2005. East Azarbayjan province: Arasbaran, 1♂; September 2005. Semnan province: Garmsar, 2♂; September 2006.

Distribution: Palearctic Region, Mediterranean Countries.

Subfamily Callistinae Laporte, 1834

Tribus Chlaeniini Brullé, 1834

Chlaenius canariensis persicus Redtenbacher, 1850

Material: Mazandaran province: Galogah, 2♀, 1♂; June 2005. Khorasan province: Kashmar, 1♂; October 2004.

Distribution: Palearctic Region.

Chlaenius dimidiatus Chaudoir, 1842

Material: East Azarbayjan province: Arasbaran, 2♀, 2♂; September 2004. Tehran province: Varamin, 4♂; April 2006.

Distribution: Middle, South and West Asia.

Chlaenius festivus (Panzer, 1796)

Material: Golestan province: Salikandeh, 2♂; July 2003. Khorasan province: Kashmar, 1♀; October 2002.

Distribution: Middle Asia, Central and South Europe, Turkey, Caucasia, Transcaucasia, Iran.

Chlaenius lederi Reitter, 1888

Material: Golestan province: Azadshahr, 1♂; Aug. 2001.

Distribution: Russia, Transcaucasia, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan.

Subfamily Carabinae Latreille, 1802

Tribus Carabini Latreille, 1802

Callisthenes (s. str.) ***ewersmanni persicus*** (Géhin, 1885)

Material: Golestan province: Gonbad, 1♀; July 2004.

Distribution: Europe, Irag, Turkey.

Calosoma (***Campalita***) ***denticolle*** Gebler, 1833

Material: Golestan province: Gonbad, 2♀, 1♂; August 2003.

Distribution: Moldova, Bulgaria, Romania, Ukraine, Russia, Mongolia, Armenia, Lithuania, Crimea, Azerbaijan, Daghestan, Kazakhstan, Siberia, China.

Calosoma inquisitor cupreum Dejean, 1826

Material: Khorasan province: Kashmar, 2♂; October 2002.

Distribution: Europe, Russia, Caucasia.

Calosoma (***Campalita***) ***iranicum*** Mandl, 1953

Material: Golestan province: Salikandeh, 3♀, 2♂; July 2003.

Distribution: West Asia.

Calosoma olivieri Dejean, 1831

Material: Khorasan province: Kashmar, 1♀; October 2002. Mazandaran province: Behshahr, 1♀, 1♂; July 2003. Golestan province: Ramian, 1♀; July 2005.

Distribution: Russia, Tajikistan, Turkey, Turkmenistan, Uzbekistan.

Calosoma sycophanta (Linnaeus, 1758)

Material: Golestan province: Nokandeh, 2♀, 2♂; May 2006.

Distribution: North America, North Africa, West Asia, Europe, Moldova, Czech Republic, Slovakia, Jawa, Turkey, Caucasia, Siberia.

Carabus (***Sphodristocarabus***) ***armeniacus armeniacus*** Mannerheim, 1830

Material: Khorasan province: Kashmar, 2♀; October 2002. **New record for Iranian fauna.**

Distribution: Turkey, Russia, Caucasia.

Carabus (Procrustes) chevrolati De Cristoforis and Jan, 1837

Material: Golestan province: Gonbad, 1♂; September 2001. **New record for Iranian fauna.**

Distribution: Palearctic Region, South and West Asia.

Carabus (***Limnocarabus***) ***clathratus*** Linnaeus, 1761

Material: Mazandaran province: Behshahr, 2♀, 1♂; April 2003. Khorasan province: Kashmar, 1♀, 1♂; October 2004.

Distribution: Asiatic Europe, Turkey, Russia, Caucasia.

Carabus (***Mimocarabus***) ***maurus osculatii*** Osculati, 1844

Material: Golestan province: Gonbad, 2♀, 1♂; May 2006.

Distribution: South and West Asia, Palearctic Region.

Carabus (***M.***) ***maurus paphius*** Redtenbacher, 1843

Material: Mazandaran province: Ghaemshahr, 3♀; July 2006.

Distribution: Turkey, Russia, Caucasia.

Carabus (***M.***) ***roseni*** Reitter, 1897

Material: Tehran province: Varamin, 3♀, 4♂; August 2004.

Distribution: Palearctic Region.

Carabus* (*Pachystus*) *tamsi Ménétriès, 1832
Material: Golestan province: Salikandeh, 2♀, 3♂; July 2003.
Distribution: Russia, Moldova, Ukraine, Crimea, Ciscaucasia.

Carabus* (*Archicarabus*) *victor Fischer von Waldheim, 1836
Material: East Azarbayjan province: Arasbaran, 1♀, 2♂; September 2004. **New record for Iranian fauna.**
Distribution: Palearctic Region.

Subfamily Cicindelinae Latreille, 1802
Tribus Cicindelini Latreille, 1802

Cephalota* (*Taenidia*) *zarudniana vartianorum (Mandl, 1967)
Material: Fars province: Darab, 1♀, 1♂; September 2001.
Distribution: Palearctic Region.

Cephalota* (*T.*) *zarudniana zarudniana Tschitschérine, 1903
Material: Golestan province: Nokandeh, 1♀; July 2003.
Distribution: Palearctic Region.

Cicindela* (s. str.) *asiatica sumbarica Putshkov, 1993
Material: Khorasan province: Kashmar, 1♀, 1♂; October 2002.
Distribution: Russia, Caucasia.

Cicindela* (*Cephalota*) *deserticola Faldermann, 1836
Material: Semnan province: Garmsar, 2♀;
Distribution: Russia, Moldova, Ukraine, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan.

Cicindela* (*Myriochile*) *melancholica Fabricius, 1798
Material: Mazandaran province: Ghaemshahr, 1♀, 1♂; April 2006.
Distribution: Caucasia, Ciscaucasia, Russia.

Cicindela monticola Ménétriès, 1832
Material: Ardabil province: Dasht-e-Moghan, 1♂; September 2004. **New record for Iranian fauna.**
Distribution: Palearctic Region.

Cicindela* (s. str.) *rhodoterena Tschitscherine, 1903
Material: Tehran province: Varamin, 1♀; July 2005. East Azarbayjan province: Arasbaran, 3♀; June 2006.
Distribution: Palearctic Region.

Cylindera* (*Eugrapha*) *pygmaea pygmaea Dejean, 1825
Material: Mazandaran province: Galogah, 1♂; July 2005.
Distribution: Palearctic Region.

Cylindera* (*E.*) *sublacerata balucha Bates, 1878
Material: Ardabil province: Dasht-e-Moghan, 2♂; September 2001.
Distribution: Palearctic Region.

Cylindera* (*E.*) *sublacerata sublacerata Solsky, 1874
Material: Golestan province: Aghghala, 2♂; July 2004.
Distribution: South and West Asia, Transcaucasia.

Lophyra* (*Lophyra*) *persicola Horn, 1934
Material: East Azarbayjan province: Arasbaran, 1♀, 1♂; September 2005.
Distribution: Palearctic Region.

Myriochile* (*Monelica*) *orientalis Dejean, 1825
Material: Fars province: Darab, 2♂; October 2001. Khorasan: Kashmar, 2♀; October 2004.
Distribution: Paleartic Region.

Subfamily Elaphrinae Erichson, 1837
Tribus Elaphrini Erichson, 1837

Elaphrus* (s. str.) *riparius (Linnaeus, 1758)
Material: Semnan province: Garmsar, 2♀, 1♂; April 2006.
Distribution: Central Asia, Europe, Turkey, Caucasia, Siberia, North Mongolia, Far East, Sakhalin, Korean Peninsula, Japan, Alaska, Canada.

Subfamily Harpalinae Bonelli, 1810
Tribus Harpalini Bonelli, 1810

Acinopus ammophilus Dejean, 1829
Material: Golestan province: Gorgan, 1♀; August 2003.
Distribution: Europe, Turkey, Armenia, Daghestan, Azerbaijan, Crimea, Russia, Bulgaria, Moldova.

Acinopus laevigatus Ménétriés, 1832

Material: Golestan province: Gonbad, 5♀; August 2002. Semnan province: Garmsar, 2♂; June 2005. Tehran province: Varamin, 6♀, 4♂; July 2005. Mazandaran province: Galogah, 3♀; April 2006.

Distribution: Mediterranean Countries, Bulgaria, Moldova., Turkey, Armenia, Daghestan, Azerbaijan, Crimea, Russia, Mountains of SE Middle Asia.

Acinopus* (*Oedematicus*) *megacephalus (Rossi, 1794)

Material: Golestan province: Salikandeh, 1♀, 1♂; July 2005.

Distribution: Europe, Bulgaria, Turkey, Russia, Caucasia.

Diachromus germanus (Linnaeus, 1758)

Material: Fars province: Darab, 1♀, 1♂; October 2003. East Azarbayjan province: Arasbaran, 1♀; September 2005.

Distribution: West Asia, Central and South Europe, Turkey, Caucasia, Turkmenistan, Iran.

Ditomus calydonius (Rossi, 1790)

Material: Golestan province: Gorgan, 1♀; July 2005. Khorasan province: Kashmar, 1♀, 2♂; October 2004.

Distribution: Central Asia, South Europe, Caucasia, Turkey, Syria.

Harpalus caspius Steven, 1806

Material: Golestan province: Ali-Abad, 4♀, 6♂; July 2001. Fars province: Darab, 4♂; June 2002.

Distribution: Central Europe, Balkan Peninsula, Russia, Turkey, Caucasia, Kazakhstan.

Harpalus fuscicornis Ménétriès, 1832

Material: Tehran province: Varamin, 2♀; April 2005.

Distribution: Central Asia, North and West Africa, South Europe, Russia, Ukraine, Crimea, Turkey, Caucasia, Iraq.

Harpalus griseus (Panzer, 1797)

Material: Mazandaran province: Ghaemshahr, 3♀, 3♂; April 2006. Khorasan province: Kashmar, 5♀; October 2004.

Distribution: North and West Africa, Europe, Russia, Moldova, Ukraine, Crimea, Azerbaijan, Daghestan, Armenia, Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan.

Harpalus (s. str.) ***froelichi*** Sturm, 1818

Material: Golestan province: Gorgan, 1♀, 1♂; July 2001.

Distribution: Central Asia, South Siberia, Europe, Caucasia, Kazakhstan, Mongolia, Moldova, China, Russia, North Korea.

Harpalus (s. str.) ***honestus*** (Duftschmid, 1812)

Material: Golestan province: Kordkoy, 4♀, 2♂; June 2003. Khorasan province: Kashmar, 1♂; October 2004.

Distribution: Central and South Europe, Turkey, Russia, Caucasia, Siberia.

Harpalus* (*Harpalophonus*) *hospes (Sturm, 1818)

Material: East Azarbayjan province: Arasbaran, 2♀, 1♂; June 2006.

Distribution: Europe, Turkey, Crimea, Iran, Russia, Kazakhstan.

Harpalus* (*Artabas*) *kadleci (Kataev and Wrase, 1995)

Material: Golestan province: Gorgan, 2♀, 3♂; August 2004.

Distribution: Europe, Turkey.

Harpalus (s. str.) ***kazanensis*** Jedlicka, 1958

Material: Ardabil province: Dasht-e-Moghan, 1♀; September 2002. Khorasan province: Kashmar, 2♂; October 2002.

Distribution: Caucasia, Turkey.

Harpalus (s. str.) ***macronotus*** Tschitscherine, 1893

Material: Golestan province: Nokandeh, 1♀, 2♂; July 2002. Fars province: Darab, 1♀; June 2005.

Distribution: Siberia, Kazakhstan, Russia, Transbaikalia.

Harpalus (s. str.) ***metallinus*** Ménétriés, 1836

Material: Golestan province: Ramian, 1♀, 2♂; September 2006.

Distribution: Europe, Balkan Peninsula, Caucasia, Russia, Turkey, Syria, Iraq, Lebanon.

Harpalus rufipes (De Geer, 1774)

Material: Tehran province: Varamin, 3♀, 3♂; June 2003. Ardabil province: Dasht-e-Moghan, 3♀, 1♂; September 2002. Mazandaran province: Ghaemshahr, 6♀, 5♂; April 2004. Fars province: Darab, 1♀, 2♂; August 2004. Khorasan province: Kashmar, 6♀, 2♂; October 2004. Fars province: Darab, 5♀, 2♂; June 2005. Golestan province: Gorgan, 1♀; June 2006. Semnan province: Garmsar, 5♀, 3♂; June 2006.

Distribution: Palearctic Region, North America.

Harpalus smyrnensis Heyden, 1888

Material: Golestan province: Kordkoy, 2♂; July 2004.

Distribution: Europe, Caucasia, Turkey.

Ophonus* (*Metophonus*) *cordatus (Duftschmid, 1812)

Material: Mazandaran province: Behshahr, 1♀, 2♂; August 2004.

Distribution: Europe, Mediterranean Countries, Ukraine, Russia, Moldova, Crimea, Azerbaijan, Daghestan, Armenia, Kazakhstan.

Tribus Panagaeini Bonelli, 1810

Panagaeus bipustulatus (Fabricius, 1775)

Material: Ardabil province: Dasht-e-Moghan, 1♀; September 2003. East Azarbayjan province: Arasbaran, 1♀; September 2005.

Distribution: Central and South Europe, Turkey, Caucasia, Iran.

Subfamily Lebiinae Bonelli, 1810

Tribus Lebinini Bonelli, 1810

Merizomena grandinella Semenov, 1890

Material: Golestan province: Gonbad, 1♀, 1♂; August 2001. **New record for Iranian fauna.**

Distribution: Russia, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan.

Tribus Zuphiini Bonelli, 1810

Parazuphium* (*Neozuphium*) *damascenum damascenum (Fairmaire, 1896)

Material: Mazandaran province: Behshahr, 2♀, 1♂; October 2004.

Distribution: South and West Asia.

Zuphium (s. str.) ***olens*** (Rossi, 1790)

Material: Golestan province: Gorgan, 2♀, 1♂; July 2004. Khorasan province: Kashmar, 1♂; October 2004.

Distribution: Europe, Mediterranean Countries, India, England, Russia, Moldova, Ukraine, Armenia, Turkmenistan, Uzbekistan, Tajikistan.

Subfamily Licininae Bonelli, 1810

Tribus Licinini Bonelli, 1810

Licinus* (*Neorescius*) *astrabadensis Reitter, 1902

Material: Tehran province: Varamin, 1♀, 1♂; June 2005.

Distribution: Paearctic Region.

Subfamily Nebriinae Laporte, 1834

Tribus Nebriini Laporte, 1834

Leistus (s. str.) ***lenkoranus*** Reitter, 1885

Material: Ardabil province: Dasht-e-Moghan, 1♀, 1♂; September 2001.

Distribution: Rüssia, Caucasia.

Leistus* (*Pogonophorus*) *spinibarbis abdominalis Reiche, 1855

Material: Golestan province: Azadshahr, 2♂; July 2001. Fars province: Darab, 3♀; June 2002.

Distribution: Europe, Caucasia.

Nebria* (*Alpeus*) *faldermanni bagrovdaghensis Shilenkov, 1983

Material: Ardabil province: Dasht-e-Moghan, 1♀; September 2005.

Distribution: Syria, Iran.

Nebria* (*A.*) *faldermanni elbursiaca Bodemeyer, 1927

Material: Tehran province: Varamin, 1♂; November 2004.

Distribution: Paleartic Region.

Nebria hemprichi Klug, 1832

Material: Golestan province: Nokandeh, 4♀, 1♂; September 2004. Mazandaran province: Behshahr, 2♀, 2♂; August 2006.

Distribution: Europe, Mediterranean Countries.

Subfamily Odacanthinae Laporte, 1834

Tribus Odacanthini Laporte, 1834

Odacantha (s. str.) ***melanura*** (Linnaeus, 1767)

Material: Mazandaran province: Behshahr, 1♂; August 2004. Fars province: Darab, 1♀; September 2005.

Distribution: Europe, Caucasia, Siberia, Russia.

Subfamily Oodinae LaFerté-Sénectere, 1851

Tribus Oodini LaFerté-Sénectere, 1851

Oodes gracilis Villa and Villa, 1833

Material: Semnan province: Garmsar, 3♀, 2♂; August 2003.

Distribution: Central and South Europe, Turkey, Caucasia, Turkmenistan.

Subfamily Pterostichinae Bonelli, 1810

Tribus Amarini Bonelli, 1810

Amara (s. str.) ***aenea*** (De Geer, 1774)

Material: Golestan province: Gonbad, 3♀, 2♂; June 2005. Khorasan province: Kashmar, 2♀; October 2004.

Distribution: Palearctic Region, North America, Caucasia.

Amara (s. str.) ***anxia*** Tschitscherine, 1828

Material: Khorasan province: Kashmar, 1♀; September 2003.

Distribution: Russia, Caucasia, Transbaikalia.

Amara (***Iranoleiridis***) ***astrabadensis*** Lutshnik, 1935

Material: Mazandaran province: Ghaemshahr, 2♀, 2♂; September 2005.

Distribution: Palearctic Region.

Amara (s. str.) ***bamidunyae*** Bates, 1878

Material: Golestan province: Gonbad, 1♀, 2♂; October 2005.

Distribution: Russia, Ukraine, Moldova, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, Mountains of SE Middle Asia.

Amara (s. str.) ***eurynota*** (Panzer, 1797)

Material: Mazandaran province: Behshahr, 1♀; April 2005.

Distribution: North Africa, North America, Siberia, Bulgaria, Moldova, Turkey, Czech Republic, Slovakia, Syria, China, Ukraine, Russia, Crimea, Armenia, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan.

Amara (s. str.) ***famelica*** Zimmermann, 1832

Material: Semnan province: Garmsar, 1♀, 3♂; April 2006.

Distribution: Europe, Siberia, Afghanistan, Czech Republic, Slovakia, Turkey, Russia, Caucasia.

Amara (s. str.) ***familiaris*** (Duftschmid, 1812)

Material: Golestan province: Gorgan, 2♀, 1♂; May 2006.

Distribution: West and Central Asia, Europe, North America, Moldova, Bulgaria, Russia, Caucasia, Turkey, Siberia, Korean Peninsula, China, Japan, Czech Republic, Slovakia.

Amara (***Harpalodema***) ***isfahanensis*** Hieke, 1993

Material: Khorasan province: Kashmar, 1♀, 2♂; October 2002.

Distribution: Palearctic Region.

Amara (s. str.) ***littorea*** Thomson, 1857

Material: Fars province: Darab, 1♀, 1♂; June 2002. Semnan province: Garmsar, 1♀; July 2005.

Distribution: Middle Asia, Europe, Siberia, Czech Republic, Slovakia, Turkey, Russia, Caucasia, Bulgaria, Moldova.

Amara (s. str.) ***lucida*** (Duftschmid, 1812)

Material: Fars province: Darab, 1♀; October 2003.

Distribution: North Africa, Europe, Moldova, Bulgaria, Slovakia, Turkey, Russia, Caucasia, Iran, Irag.

Amara (***Harpalodema***) ***maindroni*** Bedel, 1907

Material: Semnan province: Garmsar, 3♀; August 2002.

Distribution: Palearctic Region.

Amara (***Curtonotus***) ***propinquus*** Ménétriées, 1832

Material: Semnan province: Garmsar, 3♂; October 2005.

Distribution: Central Asia, West Siberia, Bulgaria, Romania, Crimea, Ukraine, Russia, Caucasia, Iran, Mongolia, China.

Amara* (*C.*) *zagrosensis Morvan, 1973
Material: Golestan province: Gonbad, 2♀; September 2005.
Distribution: Palearctic Region.

Anthia* (*Termophilum*) *duodecimguttata Bonelli, 1813
Material: Semnan province: Garmsar, 3♀, 2♂; September 2005.
Distribution: Palearctic Region.

Asaphidion (s. str.) ***flavicorne*** (Solsky, 1874)
Material: Golestan province: Gonbad, 2♀, 1♂; August 2001.
Distribution: Central Asia, Balkan Peninsula, Bulgaria, Mediterranean Countries, Russia, Caucasia.

Zabrus trinii Fischer von Waldheim, 1817
Material: Khorasan province: Kashmar, 1♂; October 2002. Fars province: Darab, 1♀; August 2004. Semnan province: Garmsar, 6♀, 4♂; August 2004. Golestan province: Gorgan, 2♀, 5♂; July 2003. Mazandaran province: Ghaemshahr, 3♀, 4♂; May 2006.
Distribution: Caucasia, Russia, Iran, Turkey.

Tribus Morionini Brullé, 1835

Morion* (*Neomorion*) *olympicus Redtenbacher, 1843
Material: Mazandaran province: Behshahr, 2♀; July 2006.
Distribution: Russia, Caucasia.

Tribus Platynini Bonelli, 1810

Agonum chotjaii Morvan, 1973
Material: Semnan province: Garmsar, 1♀; October 2004.
Distribution: Palearctic Region.

Anchomenus (s. str.) ***dorsalis*** (Pontoppidan, 1763)
Material: Semnan province: Garmsar, 1♂; October 2001.
Distribution: Central Asia, Siberia, Europe, Turkey, Russia, Caucasia, Moracco, Near East, Czech Republic, Slovakia, Bulgaria, Moldova.

Anchomenus (s. str.) ***turkestanicus*** (Ballion, 1870)
Material: Mazandaran province: Galogah, 1♀, 1♂; June 2003.
Distribution: Russia, Armenia, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan.

Calathus fuscipes (Goeze, 1777)
Material: Golestan province: Nokandeh, 1♀; July 2003.
Distribution: Africa, Middle Asia, Europe, North America, Turkey, Russia, Caucasia, Iran.

Calathus libanensis pluriseriatus Putzeys, 1873
Material: Golestan province: Aghghala, 1♀, 1♂; July 2003. Fars: Darab, 1♂; June 2005.
Distribution: Europe, Mediterranean Countries, Turkey.

Calathus syriacus Chaudoir, 1863
Material: Ardabil province: Dasht-e-Moghan, 2♀, 1♂; June 2001.
Distribution: Turkey, Caucasia, Ciscausia, Mediterranean Countries.

Laemostenus* (*Sphodroides*) *cordicollis (Chodoir, 1854)
Material: Fars province: Darab, 1♀; September 2003.
Distribution: Europe, Mediterranean Countries.

Laemostenus* (*Pristonychus*) *quadrangulus Morvan, 1981
Material: Golestan province: Kordkoy; 1♀, 2♂; October 2004.
Distribution: Palearctic Region.

Olisthopus (s. str.) ***elburzensis*** Morvan, 1977
Material: Golestan province: Ali-Abad, 1♀, 1♂; June 2001. Khorasan province: Kashmar, 1♀; October 2004.
Distribution: Palearctic Region.

Orthotrichus* (*Anchomenus*) *cymindoides Dejean, 1831
Material: Khorasan province: Kashmar, 1♀; October 2002. Tehran province: Varamin, 2♂; June 2006.
Distribution: Palearctic Region.

Orthotrichus* (*Anchomenus*) *eberti Jedlicka, 1865
Material: Golestan province: Gonbad, 3♀, 3♂; April 2003. Ardabil province: Moghan, 2♀, 1♂; August 2004. East Azarebayjan province: Arasbaran, 6♀, 4♂; September 2006.
Distribution: Palearctic Region.

Synuchus elburzensis Morvan, 1977

Material: Golestan province: Kordkoy, 1♀, 3♂; June 2004.
Distribution: Caucasia, Iran.

Tribus Pterostichini Bonelli, 1810

Poecilus cupreus (Linnaeus, 1758)

Material: Mazandaran province: Behshahr, 5♀, 3♂; August 2002. Fars province: Darab, 4♀, 1♂; July 2005. Ardabil province: Dasht-e-Moghan, 1♀, 2♂; September 2002. Tehran province: Varamin, 3♂; July 2005. Semnan province: Garmsar, 2♀; September 2001. Golestan province: Azadshahr, 3♀, 5♂; August 2003.
Distribution: Central Asia, Europe, Turkey, Caucasia, Syria, Siberia.

Polistichus (s. str.) ***connexus*** (Geoffroy, 1785)

Material: Fars province: Darab, 2♂; June 2003. Golestan province: Ali-Abad, 3♀, 1♂; September 2005.
Distribution: Russia, Caucasia.

Pterostichus (Platysma) niger (Schaller, 1783)

Material: Golestan province: Kordkoy, 4♀; August 2004. Khorasan province: Kashmar, 2♀, 3♂; July 2004. Tehran province: Varamin, 3♀, 4♂; August 2004. Fars province: Darab, 6♀, 4♂; September 2005. Mazandaran province: Behshahr, 3♂; August 2004.
Distribution: Central Asia, Europe, Turkey, Caucasia, Iran, Siberia.

Tribus Sphodrini Laporte, 1834

Sphodrus leucophthalmus (Linnaeus, 1758)

Material: Golestan province: Nokandeh, 2♀, 2♂; August 2003.
Distribution: North Africa, South and West Asia, Europe, Turkey, Caucasia, India, Canary Island.

Taphoxenus (s. str.) ***goliath*** (Faldermann, 1836)

Material: Golestan province: Ali-Abad, 3♀, 2♂; July 2005. Khorasan province: Kashmar, 1♀; October 2004.
Distribution: Russia, Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan.

Taphoxenus* (*Lychnifugus*) *persicus persicus Jedlicka, 1952

Material: Mazandaran province: Ghaemshahr, 2♀; April 2005. Tehran province: Varamin, 1♂; June 2006.
Distribution: Europe, Iran.

Taphoxenus* (*L.*) *persicus sahendensis Morvan, 1981

Material: Golestan province: Azadshahr, 1♀, 1♂; September 2003.
Distribution: Palearctic Region.

Subfamily Scaritinae Bonelli, 1810

Tribus Dyschiriini Kolbe, 1880

Dyschirius (s. str.) ***nitidus chivensis*** (Fedorenko, 1992)

Material: Ardabil province: Dasht-e-Moghan, 2♂; September 2003.
Distribution: Caucasia, Transcaucasia.

Dyschirius (s. str.) ***nitidus nitidus*** Dejean, 1825

Material: Golestan province: Aghghala, 3♂; September 2004.
Distribution: Middle Asia, Caucasia, Siberia.

Tribus Scaritini Bonelli, 1810

Clivina (s. str.) ***attenuate*** Herbst, 1806

Material: Golestan province: Nokandeh, 2♀; July 2005.
Distribution: Palearctic Region.

Clivina (s. str.) ***collaris*** (Herbst, 1784)

Material: Khorasan province: Kashmar, 3♀, 1♂; July 2005.
Distribution: Middle Asia, Europe, Turkey, Czech Republic, Slovakia, Caucasia, Russia.

Coryza (Clivina) carinifrons Reitter, 1900

Material: East Azarbayjan province: Arasbaran, 1♀, 2♂; June 2004. **New record for Iranian fauna.**
Distribution: Middle Asia.

Distichus planus Bonelli, 1813

Material: Tehran province: Varamin, 1♀; August 2005. Khorasan province: Kashmar, 2♂; October 2004.
Distribution: South, West and Middle Asia, Africa, Caucasia, Mediterranean Countries.

Scarites procerus eurytus Fischer, 1828

Material: Mazandaran province: Galogah, 1♀, 3♂; November 2002.

Distribution: Syria, Israel, Russia, Armenia, Kazakhstan, Turkmenistan, Uzbekistan, Mountains of Middle Asia.

Scarites* (*Parallelomorphus*) *terricola pacificus Bates, 1873

Material: Golestan province: Ramian, 2♂; June 2005.

Distribution: Russia, Caucasia.

Subfamily Siagoninae Bonelli, 1810

Tribus Siagonini Bonelli, 1810

Siagona europaea Dejean, 1826

Material: Mazandaran province: Behshahr, 2♀; September 2006.

Distribution: Africa, Central Asia, Europe, Iraq, Iran, India, Turkey, Mediterranean Countries.

DISCUSSION

The result of this research indicated that there is a diverse fauna of Carabidae in the cotton fields and surrounding grasslands of Iran. Among the 115 identified species, 7 species including, *Harpalus rufipes*, *Acinopus laevigatus*, *Broscus laevigatus*, *Calosoma olivieri*, *Poecilus cupreus*, *Pterostichus niger*, and *Zabrus trinii* are more abundant than the others.

Carabid beetles are increasingly used as taxonomic study group in biodiversity and as bio-indicators in monitoring or site assessment studies for nature conservation purposes (e.g. Luff et al. 1989, 1992; Luff, 1990; Desender et al. 1991, 1992; Erwin, 1991; Loreau, 1994; Heijerman & Turin, 1995). The very high number of species, estimated some ten years ago at about 40000 described species (Noonan, 1985), as well as the well studied pronounced habitat or even microhabitat preference of many of these (Thiele, 1977) are important reasons for the increasing interest they get. Furthermore, the majority of carabid beetles (at least in temperate or subarctic climates) are relatively easily collected in a more or less standardized way by means of pitfall trapping. Nevertheless, much discussion remains on the necessary methodologies in sampling (details of techniques, intensity and duration of trapping) as well as in data analyses (multi-variate analysis techniques for community and indi-Eyrecator analyses, see e.g. Konjev and Desender, 1996) or in diversity assessment (Southwood, 1978).

One problem related to the study of carabid diversity is to assess which part of the species caught at a certain site actually belongs to the local fauna and has reproducing populations. Related to this problem is the question of observed turnover in species richness from year to year on a given site. A short review of the literature shows that most authors either deny the problem (i.e. assume that all species caught on a site belong to the local fauna and/or that species caught in low numbers have a small local population) or use a more or less arbitrary limit between so-called local species and accidentally caught species. Surprisingly, there have been few attempts to discriminate between the two by means of long term population studies or by investigating additional aspects of the biology (dispersal power and reproductive characteristics) and ecology (occurrence in surrounding or nearby other habitats). A comparable problem is also encountered on a larger geographical scale, where one recently has started to distinguish between core and satellite species (e.g. Niemels & Spence 1994; Konjev and Desender, 1996).

A second problem is the lack of knowledge of year-to-year variation in numbers of many carabid species, in other words data on the magnitude of population dynamics in more or less natural situations. Such studies of course require a continuous long term sampling effort, which is probably the most obvious reason for their scarcity. If one does not take succession studies into account (which address different questions (e.g. Meijer 1980; Verschoor & Krebs 1995a, b) but not always are able to discriminate natural dynamics from those linked to directional changes), there are indeed only a few studies where sampling has continued for over 5 years. As a result, until now relatively few authors have tried to document and explain these dynamics in carabids, and if and how these might be regulated (Weber & Klenner 1987; Den Boer 1990, 1991; Luff 1990; Van Dijk & den Boer 1992; Den Boer et al. 1993; Van Dijk 1994). Also, a recent paper by Den Boer & van Dijk (1994) shows that many of their long term series on carabid dynamics seem to have been influenced to a high degree by recent directional changes in environmental conditions (e.g. air pollution, changed drainage and vegetation cover) which could mean they have to be classified more as success studies.

Although producers are beginning to adopt reduced tillage practices, the effects of these new tillage systems on pest populations in cotton have received little attention in Texas. For example, a recent economic analysis by Johnson and Polk (2004) of different farming operation indicated that cost savings for labor, fuel, machinery, equipment, repairs and maintenance were offset by higher chemical costs due to a reliance on herbicides to manage weeds. Studies of this type indicate that producers need to look at all aspects of production when assessing the change of production practices.

In a review of conservation tillage studies, Stewart (2003) indicated that most data indicate that in-season pest populations are minimally affected by tillage operations. Lower thrips populations were associated with conservation tillage plots (All et al. 1992, Leonard, 1995). Cotton aphid densities were higher in conservation tillage plots than in conventional tillage plots (Leonard, 1995). Similar studies in Texas have been confounding. De Spain et al. (1992) reported that early season aphid numbers were elevated in reduced tillage plots compared to conventional tillage plots in three out of the four years of the study. These studies were conducted in the Lower Gulf Coast region of Texas where humidity levels are generally higher and the cropping system is composed of corn and grain sorghum. Leser (1995) reported fewer thrips and aphids in reduced tillage systems compared to conventional systems in the High Plains of Texas. Both Leser (1995) and Leonard (1995) reported higher survival of bollworm/tobacco budworm pupae in reduced tillage systems but both also noted that migration is probably a bigger factor in determining if this insect will be an economic pest in any particular season. The High Plains system is dominated by continuous cotton planted into terminated wheat.

Clearly, conservation tillage practices have both potentially positive and negative effects on both pest and beneficial populations in cotton. As these effects are unknown for cotton production, results of this project may help plan IPM programs needed to fully realize the benefits of reduced tillage systems in cotton. Also, growers may be reluctant to adopt conservation tillage because of perceived risks due to increased insect problems. Results of this study identify some of the risks and benefits relative to insect pests and thus speed adoption of conservation tillage.

The researches of Sansone and Minzenmayer (2005) indicated that the reduced tillage systems did show higher numbers of ground predators and spiders early in the season. These predators may play a role in reducing the first generation populations. The impact of these ground predators is difficult to measure because most of them are active at night. As the season progressed, natural enemy populations became similar in both tillage systems.

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THE LIFE CYCLE OF *DANAUS CHRYSIPPUS* LINNAEUS (LEPIDOPTERA: NYMPHALIDAE) ON *CALOTROPIS PROCERA* IN BUSHEHR-IRAN.

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[**Golestaneh, S. R., Askary, H., Farar, N. & Dousti, A.** 2009. The life cycle of *Danaus chrysippus* Linnaeus (Lepidoptera: Nymphalidae) on *Calotropis procera* in Bushehr-Iran. Munis Entomology & Zoology, 4 (2): 451-456]

ABSTRACT: *Danaus chrysippus* L. (Lep.: Nymphalidae) is the most important pest on *Calotropis procera* in Bushehr-Iran. The larvae feed on the leaves and make some damages and losses on host. This study carried out on *D. chrysippus* life cycle in Bushehr from 2006 to 2007. For the life cycle studies, the eggs were collected from the nature and were developed in Petri dishes and 10×12 plastic dishes from egg to adult at under laboratory condition (25±2 °C and 22±2 °C, %60±10 RH and 16/8 L:D). The Egg, Larval and Pupal periods were frequently 3.4 ± 0.1 and 4.5 ± 0.1; 12.5 ± 0.2 and 19.1 ± 0.4; 9.8 ± 0.3 and 14.6 ± 0.7 days in 25 °C and 22 °C at lab. The total period from egg to adult was 26.07± 0.8 and 37.08± 0.5 days in 25 °C and 22 °C at laboratory condition.

KEY WORDS: Life cycle, *Danaus chrysippus*, *Calotropis procera*, Bushehr, Iran.

Calotropis procera is an *Asclepias* genus that is distributed in tropical and subtropical areas such as Africa, India, Egypt, Pakistan, Iran, Arabic islands and Australia. In Iran this species has distributed in tropical and coastal areas from Khuzestan to Baluchistan in south of Iran (Sabeti, 1994; Mir Heidar, 1994; Faker Baher, 1994). *C. procera* has so important ecological roles because it's settlement in sandy soils, preventation of soil erosion, natural reproduction and its uses in the weavering, rubbering and medical industries (Hosseini, 2000). The important pest of *C. procera* in south of Iran is *Danaus chrysippus* L. (Lep.: Nymphalidae, Danainae). The adults are shiny, orange in color with black and white spots on their wings (Borror *et al.*, 1989). The larva feeds on the leaves and makes some damage and losses on the host. The larval attacks on young shrubs and causes decline and death at last (Abaii, 1999). In this project the life cycle of *D. chrysippus* was studied during 2006 to 2007 in Bushehr-Iran. *D. chrysippus* previously recorded from Iran (Farah Bakhsh, 1960; Pazucki et al., 1995; Abaii, 1999). Its common name is plain tiger in Asia and African Monarch in Africa. *D. chrysippus* was found on an Egyptian tomb about 3500 B.C. and becomes the first record of butterflies in the world (Larsen, 1994). The Biology of *D. chrysippus* on *Calotropis gigantean* was studied in India in 1978. The egg, larval, pupal and adult longevity periods were frequently 3 days, 9.58 to 10.66 days, 5.86 to 6.96 days and 5 to 15 days (Wadnerkar et al., 1979). The life cycle of *D. chrysippus* on medical plants was studied in India in 2005. The incubation period was 2.60 ± 0.54 days. The larval period was 9.80 ± 0.27 days. The pupal period was 8.80 ± 0.27 days and the adult's longevity was 6.60 ± 0.54 days (Sharma &

Verma, 2005). The life cycle of *D. chrysippus* on *C. gigantea* studied in India in 1997. The larval development time from first instars to fourth instars was 2 to 3 days for each larvae but this time was 3 to 4 days for fifth instars. The pupal period was 6 to 7 days. A total between 22 to 24 days was taken from Egg to adult (Ramana et al., 1998). The biology of *D. chrysippus* on *Ipomoea bona_nox* was studied in Egypt in 1972. The oviposition was solitary. The larval development time from first to fourth instar was 2 days for each one in 22.5 ^oC, but this time was 4 days for fifth instar. The total larval periods were 8 to 14 days at 25.5 ^oC to 21.9 ^oC. The total pupal period was 8 to 28 days at 25.2 ^oC to 16.4 ^oC (Swailem & Esmail, 1972).

MATERIAL & METHODS

For the morphological studies, the twenty numbers of each biological stage (eggs, larva, pupa, adults) were selected. All the stages were examined and photographed with an Olympus SZ60 wide zoom camera attached to an Olympus SZ-ST binocular stereo zoom microscope. Data was collected from Bushehr in south of Iran (29^{o}N, 52^{o}E) from 2006 to 2007. The sampling was done weekly by the two stage cluster sampling method in nature. One hundred eggs were collected from the nature and moved to Laboratory. In the Lab, each egg separately was inserted in a Petri dish of 8 cm in diameter and the data was recorded, daily. After the first instars larva, the seconds was transferred to cylindrical containers (10×12 cm) with the fresh leaves of *C. procera*. The containers were examined daily from larva to pupa. After the emergence of adults, the each pair was transferred to larger cylindrical containers (10×30 cm) with honey solution and fresh flowers of *C. procera*. The Laboratory conditions were (25±2 ^oC and 22±2 ^oC, 60±10 %RH and 16/8 L:D).

RESULTS

Oviposition observed just in the nature and our treatments that provided with the flowers and honey solution did not succeed in the lab. Females laid their eggs singly, only on the underside of the leaves. A butterfly settles on a leaf, then turns its abdomen to underside and inserts one egg on one leaf. At first, the egg is white shiny color then gradually change creamy and at last become brownish. The egg is dome shaped, with 12 – 13 longitudinal ridges and some cross ridges. It is 1.7 ± 0.5 mm in length and 0.5 ± 0.1 mm in diameter (Fig. 1A). The egg incubation period was 3.4 ± 0.1 mm days and 4.5 ± 0.1 mm days frequently at 25 ^oC and 22 ^oC (tables 1 and 2). We determined 5 instars larvae based on length and head capsule measurements that adapted with Dayar's law. The first instar body was creamy and its head capsule was black. It was 4 ± 0.1 mm in length and 0.9 ± 0.2 mm in wide (Fig. 1B). The first instar head capsule was 0.6 ± 0.3 mm. The second instar larva was grey and the black and yellow strips can be easily seen in dersolateral. The second instar was 8.1 ± 0.2 mm in length and 1.5 ± 0.1 mm in wide and head capsule was 0.9 ± 0.2 mm (Fig.1C). The third instar was 14.3 ± 0.5 mm in length, 3 ± 0.1 mm in wide and its head capsule was 1.4 ± 0.4 mm (Fig. 1D). The fourth instar was 25.1 ± 0.6 mm in length, 5 ± 0.1 mm in wide and its head capsule was 2.3 ± 0.5 mm (Fig.1E). The fifth instar was 36.5 ± 0.4 mm in length, 6.8 ± 0.1 mm in wide and its head capsule was 3.4 ± 0.1 mm (Fig. 1F). The larval development time was 12.5 ± 0.2 and 19.1 ± 0.4 days frequently at 25 ^oC and 22 ^oC (Tables 1 and 2). In prepupal period, the larva stops feeding and settle down motionless. Its color changes from grey to brown (Fig.1G). The prepupa size decreases with 36 ± 0.1 mm in length and 6.4 ± 0.1 mm in wide. The prepupa development time was 1.5 ± 0.1 and 2.4 ± 0.1 days frequently at 25 °C and 22 °C (Tables 1 and 2). Pupa was found either pale green or pale brown in color (Fig. 1H - I). The pupa was 17.4 ± 0.4 mm in length and 7.5 ± 0.4 mm in wide. Its development time was 9.8 ± 0.3 days and 14.6 ± 0.7 days frequently at 25 °C and 22 °C (Tables 1 and 2). This study didn't observe any difference between males and females pupae. The adults are the shiny butterflies with orange and brown colors. The main difference between males and females is the spots on the hind wings. Each hind wing of males has four black spots while the females have only three black spots (Fig. 1J - K). The adult males and females were similar in sizes. The antenna was 12 ± 0.1 mm in length. Wingspans was 75.4 ± 0.7 mm. The body was 22.7 ± 0.4 mm in length and 4.4 ± 0.1 mm in wide. The adults head capsule was 3.4 ± 0.1 mm. The male longevity was 10.4 ± 0.7 and 15.1 ± 0.4 days frequently at 25 °C and 22 °C. The female longevity was 7.8 ± 0.3 and 11.2 ± 0.3 days frequently at 25 °C and 22 °C. The total development time from egg to adult was 26.7 ± 0.8 and 37.8 ± 0.5 days frequently at 25 °C and 22 °C (Tables 1 and 2).

DISCUSSION

This was the first study on *D. chrysippus* in Iran. The morphological studies showed that *D. chrysippus* sub sp. *chrysippus* is distributed in the south of Iran. The oviposition just observed in nature that adapted with Swilem & Esmail (1972), Wadnerkar et al. (1979), Smith et al. (1988) and Sharma & Verma (2005). Non oviposition in laboratory makes some problems on culturing this butterfly for laboratory investigations, genetical studies and life tables. It seems the main reason that makes this problem is the adult need to feed on different flowers for ovary and fermons development that as well as described by Smith et al. (1988). The oviposition behavior was same as Wadnerkar et al. (1979), Kunte (2005) and Sharma & Verma (2005) but different from Swilem & Esmail (1972) and Ramana et al. (1998). The laying of more than one egg on one leaf can be due to few hosts or invasion population. The larval, prepupal and pupal development times were same with Ramana et al. (1998) and Sharma & Verma (2005) but different from Swilem & Esmail (1972) and Wadnerkar et al. (1979). The main reasons for these differences can be because of the variety in subspecies, hosts and climates. Pupa was found in pale green and pale brown colors that same with Swilem & Esmail (1972) and Sharma & Verma (2005) but different from Ramana et al. (1998) and Braby (2000) who reported just one color form in the pupal period. The color variety in pupa was reported by Smith et al. (1988) that controlled by the greening hormone in the larval head. Diapuse didn't observe in any biological stages of *D. chrysippus*. A total of 26 to 37 days were taken for development from egg to adult that adapted with Swilem & Esmail (1972), Wadnerkar et al. (1979), Ramana et al. (1998) and Sharma & Verma (2005).

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Table 1: Developmental time for biological stages of *Danaus chrysippus* at 25 °C

Stages/instar	Days
Egg	3.4 ± 0.1
First larva	2.5 ± 0.1
Second larva	2.5 ± 0.1
Third larva	2.5 ± 0.1
Fourth larva	2.5 ± 0.1
Fifth larva	2.5 ± 0.1
Prepupa	1.5 ± 0.1
Pupa	9.8 ± 0.2
Adult female	7.8 ± 0.3
Adult male	10.4 ± 0.7

Table 2: Development time for biological stages of *Danaus chrysippus* at 22°C

Stages/instar	Days
Egg	4.5 ± 0.1
First larva	3.4 ± 0.1
Second larva	3.9 ± 0.1
Third larva	3.9 ± 0.1
Fourth larva	3.9 ± 0.1
Fifth larva	3.9 ± 0.1
Prepupa	2.4 ± 0.1
Pupa	14.6 ± 0.7
Adult female	11.2 ± 0.3
Adult male	15.1 ± 0.4

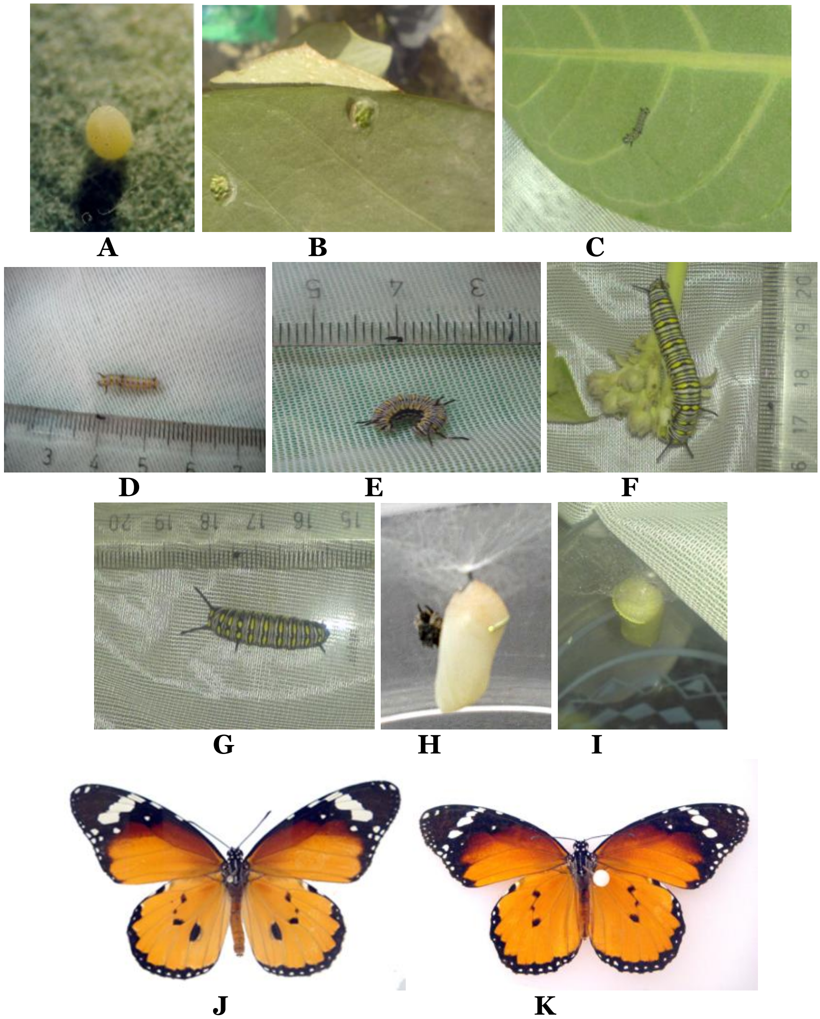

Figure 1. Biological stages of *Danaus chrysippus*. (A) An egg; (B-F): Larvae (B) First instar; (C) Second instar; (D) Third instar; (E) Fourth instar; (F) Fifth instar; (G) Pre pupa; (H) Pale Brown pupa; (I) Pale Green pupa; (J) Adult Male; (K) Adult Female.

A SHORT REVIEW ON THE GENUS *PLAGIONOTUS* MULSANT, 1842 (COLEOPTERA: CERAMBYCIDAE: CERAMBYCINAE)

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[Özdikmen, H. & Turgut, S. 2009. A short review on the genus Plagionotus Mulsant, 1842 (Coleoptera: Cerambycidae: Cerambycinae). Munis Entomology & Zoology 4 (2): 457-469**]**

ABSTRACT: All taxa of the genus *Plagionotus* Mulsant, 1842 in Turkey and the whole world are evaluated. The genus are also discussed in detail. The main aim of this work is to clarify the current status of the genus in Turkey and the whole world. New faunistical data from Turkey are given in the text. A key for Turkish species is also given.

KEY WORDS: *Plagionotus,* Cerambycinae, Clytini, Cerambycidae.

Subfamily CERAMBYCINAE Latreille, 1802

Tribe CLYTINI Mulsant, 1839

This group was recently divided by Kasatkin (2005) into three genera as *Plagionotus* Mulsant, 1842 (type species: *Leptura detrita* Linnaeus, 1758); *Neoplagionotus* Kasatkin, 2005 (type species: *Clytus bobelayei* Brullé, 1832) and *Paraplagionotus* Kasatkin, 2005 (type species: *Cerambyx floralis* Pallas, 1773) on the base of endofallic characters.

Burakowski et al. (1990) stated that *Echinocerus* Mulsant, 1863 is a junior homonym of *Echinocerus* White, 1848 (Crustacea). According to Sama (1994), *Echinocerus* Mulsant, 1863 is synonym of *Plagionotus* Mulsant, 1842. However, according to Kasatkin (2005) *Echinocerus* Mulsant, 1863 and *Plagionotus* Mulsant, 1842 are separate genera on the base of endofallic characters. So, the generic name *Paraplagionotus* was proposed by Kasatkin (2005) as a replacement name for *Echinocerus* Mulsant, 1863.

Consequently, according to Alonso-Zarazaga (2007) *Echinocerus* White, 1848 (Crustacea) is unavailable name, as it is just a wrong spelling of *Echidnocerus* White, 1842. So *Echinocerus* Mulsant, 1863 is a valid generic name, not a homonym. Finally, according to Sama (2008), *Echinocerus* Mulsant, 1863, *Paraplagionotus* Kasatkin, 2005 is synonym of *Plagionotus* Mulsant, 1842.

The genus *Neoplagionotus* (type species: *Clytus bobelayei* Brulle, 1832) was described by Kasatkin (2005) on the base of endophallic characters.

As the best solution for this problematic group, now we accept the genus *Plagionotus* Mulsant, 1842 has three subgenera as *Echinocerus* Mulsant, 1863; *Neoplagionotus* Kasatkin, 2005 and the nominotypical *Plagionotus* Mulsant, 1842. Since the Kasatkin's work on the base of endofallic characters is important and valuable for us in terms of to showing diversities in this group. Furthermore, also diversities of known larval host plants of the species supported the approach of Kasatkin (2005). In such a way that the larvae of subgenus *Echinocerus* Mulsant, 1863 is polyphogous in roots of herbs (*Euphorbia, Medicago, Achillea*), the larvae of subgenus *Neoplagionotus* Kasatkin, 2005 feed in roots of Malvaceae

(*Malva, Lavatera*) and the larvae of subgenus *Plagionotus* Mulsant, 1842 is polyphagous in deciduous trees (*Quercus, Betula, Castanea, Fagus, Carpinus, Salix, Acer, Tilia, Prunus, Robinia* etc.).

Genus *PLAGIONOTUS* Mulsant, 1842

[A replacement name for *Platynotus* Mulsant, 1839.
Type sp.: *Leptura detrita* Linnaeus, 1758]
= *Platynotus* Mulsant, 1839
= *Plagyonotus* Thomson, 1860 (misspelling)
= *Plagiogonus* Fairmaire, 1864 (misspelling)
= *Echinocerus* Mulsant, 1863 (Subgenus)
= *Neoplagionotus* Kasatkin, 2005 (Subgenus)
= *Paraplagionotus* Kasatkin, 2005 (Subgenus)

Body length is medium size (approximately 8-25 mm).

Body robust, subcylindirical. Frons feebly grooved medially. Antennal knolls small, dentiform. Antennae relatively long, reaching posterior third of elytra in male and middle of elytra in female. Pronotum transverse, finely margined both anteriorly and posteriorly, with very rounded lateral margins. Elytra slightly tapering posteriorly and separately rounded apically. Front legs short, hind tibiae slightly bent in male (Bily & Mehl, 1989).

The principal characters defining the genus are: frons longitudinally carinate, prothorax strongly transverse, excavated at base, and at anterior margin, elytra distinctly wider than the base of prothorax, and metathoracic episterna subparallel (Villiers, 1978).

Larval development is in roots of herbs (e.g. *Euphorbia, Medicago, Achillea*), in roots of Malvaceae (*Malva, Lavatera*) and in deciduous trees (*Quercus, Betula, Castanea, Fagus, Carpinus, Salix, Acer, Tilia, Prunus, Robinia* etc.) (Bily & Mehl, 1989; Sama, 2002; Verdugo, 2004 and 2005; Hoskovec & Rejzek, 2009).

In some species, pupation takes place in a pupal cell in the outer sapwood or in the bark (Bily & Mehl, 1989).

Life cycle is 1-2 years (Bily & Mehl, 1989; Sama, 2002; Hoskovec & Rejzek, 2009).

The genus has Holarctic chorotype. 12 species are known in the world fauna as *Plagionotus* (*Neoplagionotus*) *andreui* (Fuente, 1908); *P.* (s.str.) *arcuatus* (Linnaeus, 1758); *P.* (s.str.) *astecus* (Chevrolat, 1860); *P.* (s.str.) *bartholomei* (Motschulsky, 1859); *P.* (s.str.) *bisbifasciatus* Pic, 1915; *P.* (*Neoplagionotus*) *bobelayei* (Brullé, 1832); *P.* (s.str.) *christophi* (Kraatz, 1879); *P.* (s.str.) *detritus* (Linnaeus, 1758); *P.* (*Echinocerus*) *floralis* (Pallas, 1773); *P.* (s.str.) *lugubris* (Ménétriés, 1832); *P.* (s.str.) *pulcher* Blessig, 1872 and *P.* (*Neoplagionotus*) *scalaris* (Brullé, 1832).

Clytus latreillei was described by Laporte & Gory (1836), and transferred to *Plagionotus* Mulsant, 1842 by Aurivillius (1912). Then it was transfered by Iorio (1998) to *Megacyllene* (*Megacyllene*) Casey, 1912. According to Monné & Bezark (2009), the species distributes in South America (S Brasil, Uruguay and Argentina). Therefore, the genus *Plagionotus* is excluded from the South American fauna.

Plagionotus is represented only by one species as *P. astecus* (Chevrolat, 1860) in North America. According to Monné & Bezark (2009), the species distributes only in Mexico. So only one species, *P.* (s.str.) *astecus* (Chevrolat, 1860), occurs in Nearctic region. Others occur in Palaearctic region. *P.* (s.str.) *arcuatus* (Linnaeus, 1758); *P.* (s.str.) *detritus* (Linnaeus, 1758) and *P.* (*Echinocerus*) *floralis* (Pallas, 1773) are wide spread species. *P.* (*Neoplagionotus*) *bobelayei* (Brullé, 1832) and *P.* (*Neoplagionotus*) *scalaris* (Brullé, 1832) are rather widely distributed in this area. *P.* (s.str.) *bartholomei* (Motschulsky, 1859) and *P.* (s.str.) *lugubris* (Ménétriés, 1832) occur only in Caucasus and Iran. They have SW-Asiatic (Irano-Caucasian) chorotype. *P.* (s.str.) *christophi* (Kraatz, 1879) and *P.* (s.str.) *pulcher* Blessig, 1872 occur only in Russia, Japan and China. They have E-Palearctic chorotype. The remaining species, *P.* (s.str.) *astecus* (Chevrolat, 1860) is Mexican endemic, *P.* (s.str.) *bisbifasciatus* Pic, 1915 is Chineese endemic and *Plagionotus* (*Neoplagionotus*) *andreui* (Fuente, 1908) is Spanish endemic.

So the genus is represented by 11 species in the Palaearctic region (except *P.* (s.str.) *astecus* (Chevrolat, 1860)).

5 species as *P.* (s.str.) *arcuatus* (Linnaeus, 1758); *P.* (*Neoplagionotus*) *bobelayei* (Brullé, 1832); *P.* (s.str.) *detritus* (Linnaeus, 1758); *P.* (*Echinocerus*) *floralis* (Pallas, 1773); *P.* (*Neoplagionotus*) *scalaris* (Brullé, 1832) are known from Europe and Turkey. The number of species in Europe is 6 together with the species *Plagionotus* (*Neoplagionotus*) *andreui* (Fuente, 1908).

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al. (1999). In the text, as far as possible as one chorotype description can be identificated for each taxon.

In the present text, Sama (2002), Özdikmen (2007) and Danilevsky (2009a,b) are used for the information of general distribution of the species.

Subgenus *ECHINOCERUS* Mulsant, 1863

[Type sp.: *Cerambyx floralis* Pallas, 1773]
= *Paraplagionotus* Kasatkin, 2005
[A replacement name for *Echinocerus* Mulsant, 1863]

The monotypic subgenus has Sibero-European or European chorotype. It is wide spread in W-Palaearctic region. So the subgenus is represented by 1 species in the Palaearctic region, Europe and Turkey.

floralis Pallas, 1773

Original combination: *Cerambyx floralis* Pallas, 1773

Other names: *arcuatus* Scopoli, 1772 (preocc.); *nigrofasciatus* Vort, 1778; *fasciatus* Herbst, 1784; *aulicus* Laicharting, 1784; *indicus* Gmelin, 1790; *controversus* Schrank, 1798; *zebra* Dalman, 1817; *zebra* Castelnau & Gory, 1841; *variabilis* Motschulsky, 1859; *abruptus* Kraatz, 1870; *pruinosus* Kraatz, 1870; *basicornis* Reitter, 1890; *pilifer* Reitter, 1890; *armeniacus* Reitter, 1890; *araratensis* Pic, 1901; *clermonti* Pic, 1927; *biinterruptus* Pic, 1938; *duodecimguttatus* Plavilstshikov, 1940; *hofferi* Heyrovsky, 1955; *delici* Adamovic, 1965; *miksici* Adamovic, 1965; *muelleri* Adamovic, 1965; *heyrovskyi* Adamovic, 1965; *bobici* Adamovic, 1965; *podanyi* Adamovic, 1965.

Material examined: Antalya prov.: exit of İbradı, Gevenli beli pass, 1288 m, N 36 09 E 31 32, 11.06.2007, 2 specimens; Alanya, Dikmetaş plateau, 1142 m, N 36 35 E 32 26, 14.06.2007, 3 specimens; Alanya, Sarımut-Çayarası, 1108 m, N

36 38 E 32 23, 14.06.2007, 1 specimen; Konya prov.: İbradı-Derebucak road, 12 km to Derebucak, 1213 m, N 37 18 E 31 27, 11.06.2007, 4 specimens; Bozkır: Yalnızca env., 1445 m, N 37 09 E 32 15, 12.06.2007, 4 specimens, 1437 m, N 37 09 E 32 15, 13.06.2007, 5 specimens, 1490 m, N 37 09 E 32 15, 12.06.2008, 1 specimen; Bozkır, 1229 m, N 37 10 E 32 14, 10.07.2007, 1 specimen; Hadim: Korualan env., 1648 m, N 36 58 E 32 24, 12.06.2008, 54 specimens; Ahırlı: Aliçerçi village env., 1213 m, N 37 14 E 32 09, 12.06.2008, 7 specimens.

Records in Turkey: Niğde prov.: Çamardı, Antalya prov.: Toros Mountains (Bodemeyer, 1900); Turkey (Winkler, 1924-1932; İyriboz, 1938; Danilevsky & Miroshnikov, 1985; Lodos, 1998; Sama, 2002); Asia Minor as *P. floralis* a. *pilifer* Reitter, 1890 (Winkler, 1924-1932); Amasya prov., Between Erzurum prov. and Ağrı prov.: Mirgemir Mountain, Between Bayburt prov. and Erzurum prov.: Kop Mountain (entry Bayburt and Erzurum) (Villiers, 1959); İzmir prov.: Bornova (Demelt & Alkan, 1962); İzmir prov.: Bornova, Afyon prov., Isparta prov.: Eğirdir, İçel prov.: Namrun (Demelt, 1963); Yozgat prov., Ankara prov.: Kavaklıdere (Villiers, 1967); Ankara prov. (Özer & Duran, 1968); Erzincan prov.: Central, Tunceli prov., Tokat prov.: Niksar, Elazığ prov.: Hazar lake (Fuchs et Breuning, 1971); Isparta prov.: Eğirdir (Tuatay et al., 1972); İzmir prov.: Karşıyaka / Turgutlu (Gül-Zümreoğlu, 1972); Manisa prov.: Turgutlu - N. İyriboz (Ex. Gül-Zümreoğlu, 1975); Isparta prov.: Uluborlu, İzmir prov.: Karşıyaka / Kemalpaşa / Bergama (Kınık) / Foça, Manisa prov.: Turgutlu (Gül-Zümreoğlu, 1975); Erzurum prov. and near (Özbek, 1978); İzmir prov., Manisa prov.: Akhisar, Çorum prov.: Mecitözü, Ardahan prov. (Sama, 1982); Ankara prov.: Ayaş / Beynam Forest, Kayseri prov.: Sultanhanı (Öymen, 1987); Çanakkale prov.: Ayvacık (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Trabzon prov.: Uzungöl (Alkan, 2000); Adana prov.: Kozan (Savruk), Antalya prov.: Central (Karain cave), Artvin prov.: Hopa / Sarp / Sugören / Yusufeli, Bilecik prov.: Central, Erzincan prov.: Central / Bahçeli / Bahçe / Ballıköy / Üzümlü / Bayırbağ / Pişkidağ, Erzurum prov.: University Campus / Dumlu (Köşk) / Karagöbek Mts. / Kargapazarı Mts. / Palandöken / Aşkale / Hınıs / Ilıca / Atlıkonak / İspir / Madenköprübaşı / Oltu / Başaklı / Çamlıbel / Karakaban / Sarısaz / Sütkans / Pasinler / Çalıyazı / Pazarroad (Akbulut) / Şenkaya (Turnalı) / Tortum / Kaledibi / Pehlivanlı / Uzundere (Dikyar), Giresun prov.: Central, Iğdır prov.: Melekli, Kars prov.: Sarıkamış / Akkurt / Karakurt / Şeytangeçmez, Konya prov.: Çayırova / Beyşehir (Gökçimen) / Güneysınır (Gürağaç), Sivas prov.: Ümranlı (Kızıldağ) (Tozlu et al., 2002); Zonguldak prov.: Çaycuma-Safranbolu road (Ahmet Usta pass), Karabük prov.: Cumayanı, Sinop prov.: Boyabat (Çukurca village), Denizli prov.: Çivril (Sarılar village), Isparta prov.: Keçiborlu (Özbahçe village / Yenitepe) / Eğirdir (between Eğirdir and Gelendost) / Yalvaç (Sultan Mountains), Uşak prov.: Ulubey (Ovacık village, Gökgöz hill), Konya: Akşehir (Çimendere village, Sultan Mountains) / Taşkent (Beyreli village, Gevne valey), Antalya prov.: Alanya (Gökbel plateau), Burdur prov.: Gölhisar (Çameli road), Yozgat prov.: exit of Sarayköy / Saraykent (Arpalık village) / Çiğdemli (Gökiniş village), Çorum prov.: Alaca (Kıcıllı), Gümüşhane prov.: Kelkit (Güllüce village / Günyurdu village), Erzincan prov.: Tercan (Rızabey village) / Aşkale (Çatalbayır village) / Nenehatun village, Sivas prov.: Hafik (Akpınar village) / Ulaş (Özdikmen & Çağlar, 2004); Isparta prov.: Eğirdir, İzmir prov.:

Karşıyaka / Kınık, Kayseri prov.: Develi, Ankara prov.: Polatlı / Ayaş (Ilıca) / Bala, Yozgat prov., Erzurum prov.: Tufanç village, Niğde prov.: Altunhisar-Altınova, Eskişehir prov.: Kaymaz / Seyitgazi (Özdikmen et al., 2005); Kocaeli prov.: İzmit (Ballıkayalar Natural Park), Osmaniye prov.: entry of Yarpuz (Cebel, turn of Oruçgazi road) / Bahçe (Yaylalar village), Niğde prov.: Azatlı (Azatlı dam, Çiftlik), Kırşehir prov.: Mucur road (entry of Mucur) (Özdikmen & Demirel, 2005); Amasya prov.: Aydınca (İnegöl Mt.), Antalya prov.: Irmasan pass, Bilecik prov.: İnegöl-Bozüyük, Bolu prov.: Gerede / Mudurnu, Bursa prov.: Uludağ, Çankırı prov.: Çerkeş, Erzurum prov.: from Pazar road to Gölyurt pass, Kars prov.: Çam pass / Karakurt, Kırklareli prov.: Demirköy, Kırşehir prov., İçel prov.: from Erdemli to Güzeloluk, Malatya prov.: Reşadiye pass / Yesilyurt, Muş prov.: Buğlan pass, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Ankara prov.: Çal Mountain / Azap Deresi / Kızılcahamam (Güvem / Bel Pınarı / Işık Mountain / Yukarı Çanlı) (Özdikmen & Demir, 2006); Ankara prov.: Kızılcahamam (Işık Mountain / Yenimahalle village / Yukarı Çanlı / Güvem / Yasin village / the peak of Bel), Adana prov.: Pozantı (entry of Fındıklı), Niğde prov.: Niğde-Bor road (Derbent place) / near Ulukışla / Çamardı (Yelatan village / Bademdere-Elmalı / Bulduruş pass) / exit of Ulukışla-Adana / Bor-Altunhisar / between Araplı-Höyük / Tepeköy, Kayseri prov.: Yahyalı (Senirköy) / Güzelöz (Yeşilhisar), İçel prov.: between Mut-Karaman / Mut-Karaman road (Gökçeören pine grove / Değirmenbaşı), Karaman prov.: Karaman-Ereğli road (entry of Ayrancı) / Ayrancı-Ereğli road (Özdikmen, 2006); Kahramanmaraş prov.: Göksun (Andırın-Göksun road / Göksun-Çardak / Kamışcık village / Mehmetbey / Meyremçil plateau) / Ekinözü (Türkeli / Alpınar village) / Pazarcık (Sakarkaya-Çağlayancerit road / Sakarkaya village (Göynük env.) / Başkonuş forest / Andırın-Çokak road (Akifiye / Parmaksız plateau) / Andırın (Çokak-Geben road / Geben (Ardıççalısı) (Özdikmen & Okutaner, 2006); Erzincan prov.: Kemaliye, Ankara prov.: Beytepe, Kastamonu prov.: Ilgaz Mountains, exit of Tosya (Zincirli Kuyu), Devrekani–Çatalzeytin road, Hanönü env., Karabük prov.: Safranbolu, Bartın–Safranbolu road (Soğuksu place) (Özdikmen, 2007); Ankara prov.: Beytepe, İncek, Bağlum (Özdikmen et al., 2009).

Range: Europe (Spain, France, Italy, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slovakia, Poland, Latvia, Lithuania, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), Siberia, Central Asia, Caucasus, Armenia, Transcaucasia, Turkey, Iran, Jordan.

Chorotype: Sibero-European or European

Remarks: It distributes widely in Turkey.

Subgenus *NEOPLAGIONOTUS* Kasatkin, 2005

[A replacement name for *Echinocerus* Mulsant, 1863.
Type sp.: *Clytus bobelayei* Brullé, 1832]

The subgenus has W-Palaearctic chorotype. 3 species are known in the world fauna as *Plagionotus andreui* (Fuente, 1908); *P. bobelayei* (Brullé, 1832) and *P. scalaris* (Brullé, 1832). The last two species are rather widely distributed in this area. *P. andreui* (Fuente, 1908) is endemic to Spain. According to Verdugo

(2005), *P. andreui* (Fuente, 1908) is a separate species and *P. marcorum* López-Colón, 1997 that has a synonym name, *P. marcae* López-Colón, 1997 (incorrect original spelling) is a synonym of *P. andreui* (Fuente, 1908). *P. andreui* was described as a subspecies of *P. bobelayei* (Brullé, 1832). In addition to this, according to Sama (2008) *P. siculus* (Castelnau & Gory, 1841) is a synonym of *P. scalaris* (Brullé, 1832).

So the subgenus is represented by 3 species in the Palaearctic region and Europe.

In Turkey, the subgenus is represented by two species as *P. bobelayei* (Brullé, 1832) and *P. scalaris* (Brullé, 1832).

bobelayei Brullé, 1832

Original combination: *Clytus bobelayei* Brullé, 1832

Other names: *speciosus* Adams, 1817 (preocc.); *mouzafferi* Pic, 1905; *luristanicus* Pic, 1911.

Material examined: Antalya prov.: Alanya, Sarımut-Çayarası, 1108 m, N 36 38 E 32 23, 14.06.2007, 1 specimen; Konya prov.: Seydişehir-Antalya road, 1224 m, N 37 22 E 31 52, 10.06.2007, 2 specimens.

Records in Turkey: Malatya prov. (Heyden,1888); Isparta prov.: Eğirdir as *Plagionotus speciosus* (Demelt & Alkan, 1962); Isparta prov.: Eğirdir (Demelt, 1963); Yozgat prov. as *Plagionotus speciosus* (Villiers, 1967); İzmir prov. as *Plagionotus speciosus* (Sama, 1982); Turkey as *Plagionotus speciosus* (Danilevsky & Miroshnikov, 1985; Lodos, 1998); Muş prov.: Buğlan pass as *Plagionotus speciosus* (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998; Sama & Rapuzzi, 2000); Artvin prov.: Yusufeli, Gümüşhane prov., Tunceli prov.: Pülümür (Tauzin, 2000); Ağrı prov.: Hamur, Artvin prov.: Yusufeli / Sebzeciler, Bingöl prov.: Solhan (Buğlan pass), Erzurum prov.: University Campus / İspir (Madenköprübaşı) / Oltu (Sütkans) / Olur (Coşkunlar), Kars prov.: Sarıkamış (Akkurt) (Tozlu et al., 2002); Adıyaman prov.: Nemrut Mt., Erzurum prov.: İspir / İspir-Çamlıkaya, İçel prov.: Erdemli-Güzeloluk, Hatay prov.: Yayladağı, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Kırıkkale prov.: Kılınçlar (Özdikmen & Demir, 2006).

Range: Europe (Spain, Macedonia, Greece, Bulgaria, European Turkey, Romania, Ukraine, Crimea, European Russia), Turkmenistan, Caucasus, Transcaucasia, Turkey, Iran, Jordan, Syria.

Chorotype: Turano-European (Turano-Sarmato-Pannonian)

Remarks: It distributes rather widely in Turkey. The present materials are the first record for Antalya and Konya provinces.

scalaris Brullé, 1832

ssp. ***scalaris*** Brullé, 1832
ssp. ***vivesi*** López-Colón, 1997

Original combination: *Clytus scalaris* Brullé, 1832

Other names: *siculus* Castelnau & Gory, 1841, *validus* Rungs, 1952.

Records in Turkey: Turkey (Winkler, 1924-1932; Lodos, 1998); Amasya prov. as *Plagionotus scalaris* (Gfeller, 1972).

Range: Europe (Italy, Sicily, Sardinia, Albania, Macedonia, Greece, Bulgaria), North Africa (Algeria, Morocco, Tunisia), Turkey.

Chorotype: E-Mediterranean plus N-Africa.

Remarks: In Turkey, the species has been known only from N Turkey. It is represented by the nominotypical subspecies in Turkey. Other subspecies *P. scalaris vivesi* López-Colón, 1997 occurs in N Africa. According to Sama (2008), *P. scalaris vivesi* López-Colón, 1997 is a synonym of *P. scalaris,* but he did not examine the type materials.

Subgenus *PLAGIONOTUS* Mulsant, 1842

[A replacement name for *Platynotus* Mulsant, 1839.
Type sp.: *Leptura detrita* Linnaeus, 1758]

The subgenus has Holarctic chorotype. 8 species are known in the world fauna as *Plagionotus arcuatus* (Linnaeus, 1758); *P. astecus* (Chevrolat, 1860); *P. bartholomei* (Motschulsky, 1859); *P. bisbifasciatus* Pic, 1915; *P. christophi* (Kraatz, 1879); *P. detritus* (Linnaeus, 1758); *P. lugubris* (Ménétriés, 1832) and *P. pulcher* Blessig, 1872. Only one species, *P. astecus* (Chevrolat, 1860), occurs in Neotropical region. Others occur in Palaearctic region. *P. arcuatus* (Linnaeus, 1758) and *P. detritus* (Linnaeus, 1758) are wide spread species. *P. bartholomei* (Motschulsky, 1859) and *P. lugubris* (Ménétriés, 1832) occur only in Caucasus and Iran. They have SW-Asiatic (Irano-Caucasian) chorotype. *P. christophi* (Kraatz, 1879) and *P. pulcher* Blessig, 1872 occur only in Russia, Japan and China. They have E-Palearctic chorotype. The remaining species, *P. astecus* (Chevrolat, 1860) is Mexican endemic and *P. bisbifasciatus* Pic, 1915 is Chineese endemic.

So the subgenus is represented by 7 species in the Palaearctic region.

In Europe and Turkey, the subgenus is represented only by two wide spread species as *P. arcuatus* (Linnaeus, 1758) and *P. detritus* (Linnaeus, 1758).

arcuatus Linnaeus, 1758

Original combination: *Leptura arcuata* Linnaeus, 1758

Other names: *detritus* Voet, 1778; *lunatus* Fabricius, 1781; *salicis* Schrank, 1798; *buyssoni* Dauphin, 1825; *lugubris* Ménétries, 1832; *reichei* Thomson, 1860; *connatus* Mors, 1863; *apicalis* Hampe, 1863; *interruptus* Morse, 1863; *colbeaui* Morse, 1863; *interruptus* Morse, 1863; *stauropolicus* Plavilstshikov, 1913; *rufescens* Pic, 1913; *martialis* Pic, 1918; *disjunctus* Plavilstshikov, 1924; *pagnioni* Pic, 1925; *multiinterruptus* Pic, 1925; *henoni* Pic, 1925; *algericus* Pic, 1925; *milliati* Pic, 1925; *lenkoranus* Pic, 1928; *inbasalis* Plavilstshikov, 1927; *prozhigai* Plavilstshikov, 1927; *subarcuatus* Plavilstshikov, 1927; *humeralis* Marcu, 1932; *bidisjunctus* Plavilstshikov, 1940; *substauropolicus* Plavilstshikov, 1940; *posticedivisus* Plavilstshikov, 1940; *semiconfluens* Plavilstshikov, 1940; *mediodisjunctus* Sekera, 1947; *podanyi* Sekera, 1947; *apicepunctatus* Sekera, 1947; *albosignatus* Sekera, 1947; *puncticollis* Sekera, 1947; *fasciicollis* Sekera, 1947; *tridivisus* Heyrovsky, 1955; *interrupteconnatus* Schmidt, 1958; *pici* Podany, 1960; *apiceniger* Podany, 1960; *niedli* Podany, 1960; *sekerai* Podany, 1960; *pseudoreichi* Villiers, 1978; *stupidus* Villiers, 1978; *descarpentriesi* Villiers, 1978.

Records in Turkey: İstanbul prov.: Belgrad Forest (Acatay, 1943); İstanbul prov.: Bosphorus region / Belgrad Forest (Schimitschek, 1944); Turkey (Acatay, 1948, 1961, 1968; Danilevsky & Miroshnikov, 1985; Önder et al., 1987; Lodos, 1998; Sama, 2002); İstanbul prov.: Alem Mt. (Demelt, 1967); Isparta prov.: Eğirdir (Tuatay et al., 1972); İstanbul prov.: Belgrad Forest, Artvin prov. (Erdem & Çanakçıoğlu, 1977; Çanakçıoğlu, 1983); Artvin prov.: Saçinka Forests (Sekendiz, 1981); Düzce prov.: Central, İstanbul prov.: Bahçeköy (Öymen, 1987); Tokat prov.: Topçam Mountain, Kastamonu prov.: Masruf pass (Küre) (Adlbauer, 1992); European Turkey (Althoff & Danilevsky, 1997); Muş prov.: Central, Osmaniye prov.: Central (Tozlu et al., 2002); Isparta prov.: Eğirdir (Özdikmen et al., 2005); Bilecik prov.: İnegöl-Bozüyük, Çanakkale prov.: Kirazlı (Malmusi & Saltini, 2005); Samsun prov.: Alaçam (Doyran) (Özdikmen, 2007).

Range: Europe (Portugal, Spain, France, Italy, Sicily, Sardinia, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Greece, Crete, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Denmark, Germany, Luxembourg, ?Great Britain, Czechia, Slovakia, Norway, Poland, Sweden, Finland, ?Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), North Africa (Algeria, Morocco), Caucasus, Transcaucasia, Turkey, Iran, Syria.

Chorotype: European + N-Africa or W-Palaearctic

Remarks: It distributes mostly in North and West Turkey.

detritus **Linnaeus, 1758**

ssp. ***detritus*** Linnaeus, 1758
ssp. ***caucasicola*** Plavilstshikov, 1940

Original combination: *Leptura detrita* Linnaeus, 1758

Other names: *brabantinus* Voet, 1804; *convertinii* Petagna1819; *rufescens* Pic, 1891; *theresae* Pic, 1913; *roubali* Jesatko, 1935; *transversefasciatus* Plavilstshikov, 1940; *inbasalis* Plavilstshikov, 1940; *kanabei* Plavilstshikov, 1940; *spaceki* Plavilstshikov, 1940; *obscurebasalis* Pic, 1942; *curvatofasciatus* Tippmann, 1952; *freyi* Tippmann, 1952; *kulzeri* Tippmann, 1952; *reitthofferi* Tippmann, 1952; *abnormis* Niedl, 1953; *podanyi* Heyrovsky, 1955; *apicebimaculatus* Schmidt, 1958; *anticereductus* Schmidt, 1958; *ornatus* Podany, 1960; *niedli* Podany, 1960; *flavoextensus* Slama, 1963; *villosus* Slama, 1963; *equestris* Villiers, 1978.

Records in Turkey: İstanbul prov.: Belgrad Forest (Acatay, 1943); Turkey (Danilevsky & Miroshnikov, 1985); İstanbul prov.: Alem Mountain, Sinop prov.: Ayancık (Schimitschek, 1944); Erzurum prov.: Tercan (Öymen, 1987); European Turkey (Althoff & Danilevsky, 1997); Adana prov., Hatay prov., Antalya prov. (Lodos, 1998); Kahramanmaraş prov.: Central (Tozlu et al., 2002); Manisa prov.: Muradiye (Tezcan & Rejzek, 2002); Manisa (Kırkağaç-Gelenbe) (Tezcan & Can, 2009).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Albania, Croatia, Bosnia-Herzegovina, Serbia, Greece, Crete, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Belgium, Netherlands, Germany, Czechia, Slovakia, Poland, Sweden, Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), ?Siberia, Caucasus, Transcaucasia, Turkey, Iran, Syria.

Chorotype: European. According to Sama (2002), it is not present in North Africa.

Remarks: It probably distributes rather widely in Turkey. It is represented only by the nominotypical subspecies in Turkey. Other subspecies, *P. detritus caucasicola* Plavilstshikov, 1940 occurs only in North and West Caucasus.

A short identification key for Turkish *Plagionotus* species

1 Elytral apex truncate or incurved, outer angle spined.. ....***detritus*** Linnaeus, 1758
- Elytra rounded apically..**2**

2 Elytra black with over 5 color spots or bands of yellow hairs................................ ....***arcuatus*** Linnaeus, 1758
- Elytra black with 5 color bands of yellow hairs..**3**

3 Scutellum glabrous and brilliant..***scalaris*** Brullé, 1832
- Scutellum covered with yellow pubescence..**4**

4 Bands of yellow hairs on elytra (especially second tranverse band) undulating, second tranverse band clearly run to near scutellum on the sutur........................... ....***bobelayei*** Brullé, 1832
- Bands of yellow hairs on elytra (especially second tranverse band) more or less smooth, second tranverse band not run to near scutellum on the suture................. ....***floralis*** Pallas, 1773

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THE FIRST RECORD OF *COCCOBIUS TESTACEUS* (MASI, 1909) (HYMENOPTERA: APHELINIDAE) ON *LEPIDOSAPHES PISTACIAE* (ARCHANGELSKAYA) (HOMOPTERA: DIASPIDIDAE) IN TURKEY

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[Özgen, İ., Karsavuran, Y. & Japoshvili, G. 2009. The first record of *Coccobius testaceus* (Masi, 1909) (Hymenoptera: Aphelinidae) on *Lepidosaphes pistaciae* (Archangelskaya) (Homoptera: Diaspididae) in Turkey. Munis Entomology & Zoology, 4 (2): 470-471**]**

ABSTRACT: Natural enemies of *Lepidosaphes pistaciae* (Archangelskaya) (Hemiptera: Diaspididae) were collected from pistachio growing areas of Siirt Province in 2003 and 2004. The parasitism of *L. pistaciae by Coccobius testaceus* (Masi, 1909) (Hymenoptera: Aphelinidae) was determined as the first record in Turkey

KEY WORLDS: *Lepidosaphes pistaciae*, *Coccobius testaceus*, new host, Turkey

Aphelinidae family has more than 1225 species under 34 genera (Noyes, 2008). The members of this family are widespread across the world and they are either endo or ecto-parasites of Aphidoidea, Aleyrodidae, Psylloidea and primarily Coccoidea superfamilies. *Coccobius* species are parasitoids of many pests belonging to Diaspididae family (Japoshvili & Karaca, 2003). Although *Coccobius* has 81 species, only *C. testaceus* was reported from Turkey (Noyes, 2008). This study focused on the possible parasitism of *L. pistaciae*, an important pest of pistachio, by *C. testaceus*.

MATERIALS AND METHOD

This study was carried out in two pistachio orchards infested by *L. pistaciae* in Siirt Province in 2003 and 2004. Depending on the size of the orchards, 5 to 10 infested pistachio shoots, 15 to 20 cm in length were cut and taken to the laboratory. The shoots were placed in paper bags with glass tubes on top to observe emergence of parasitoids that move toward light into the tubes. The tubes were checked daily and emerged individuals were collected from tubes and placed in vials containing 70% alcohol. The emergence of parasitoids was recorded on a weekly basis.

RESULTS AND DISCUSSION

Among the individuals emerged from *L. pistaciae,* 2 females and 1 male parasitoids were identified as *Coccobius testaceus*. These individuals emerged from the samples collected on 01.05.2004. *C. testaceus* is known as the parasitoid of some *Lepidosaphes* species (*L. malicola*, *L. ulmi* and *L. pistaciae*) (Davatchi & Chojai 1969; Aydoğdu & Toros, 1987; Oncuer, 1991; Japoshvili & Karaca, 2002;

Mansouri, 2005; Noyes, 2008; SclaeNet, 2008). *C. testaceus* parasitizes *Chionaspis salicilis*, which is pest of willow (Doganlar, 1985). However, the parasitism of *L. pistaciae* by *C. testaceus*, observed in this study is the first record in the Turkey. Further investigations are needed for the opportunities to utilize *C. testaceus* in the biological control of *L. pistaciae* in the future.

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CALLING BEHAVIOUR OF THE CAROB MOTH, *ECTOMYELOIS CERATONIAE* (ZELLER) (LEPIDOPTERA: PYRALIDAE), LABORATORY AND FIELD EXPERIMENTS

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[**Sarjami, M. S., Ghanbalani, G. N., Goldansaz, H. & Zakaria, R. A.** 2009. Calling behaviour of the carob moth, *Ectomyelois ceratoniae* (Zeller) (Lepidoptera: Pyralidae), laboratory and field experiments. Munis Entomology & Zoology, 4 (2): 472-485]

ABSTRACT: The calling behaviour of virgin female of carob moth, *Ectomyelois ceratoniae* (Zeller) (Lep.:Pyralidae) was studied at three different constant temperatures under laboratory conditions. Most virgin females called during the first and fewer during second scotophase after emergence, regardless of the temperature. Moths maintained at 30°C started calling significantly later in the scotophase than those maintained at 20 or 25°C. At all temperature regimes, the mean onset time of calling (MOTC) advanced from about 453rd to 345th minute after the onset of the scotophase, and the mean time spent calling (MTSC) increased by >30 minutes over the 8 days. Cohorts of females were also observed at two different periods in middle summer-late summer (early August and early September 2006) in the field to examine the effect of fluctuating abiotic conditions (temperature, wind velocity) and age on calling behaviour. All females started calling from eclosion day on. Calling started from the 370 to 280 minutes of scotophase depending on the age of the females and the mean time spent calling (MTSC) increased by >100 minutes over the 8 days. Age-related changes in the mean onset time of calling and the mean time spent calling were much less evident under field conditions, due to the inhibitory effects of low temperatures and high winds on female calling activity.

KEY WORDS: calling behaviour, *Ectomyelois ceratoniae*, carob moth, and pomegranate.

The carob moth, *Ectomyelois ceratoniae* (Zeller) (Lep.:Pyralidae), is the key pest of many crops worldwide. It inflicts a great deal of damage to the crops annually and is of concern to growers as few insecticides are available for controlling this pest (Vetter et al. 1997). Fortunately chemical control of the pest has not practiced and currently nonchemical methods of control is used and recommended. One of the probable control methods that merit consideration is the use of insect sex pheromone. Synthetic sex pheromone in Lepidoptera has been extensively used for monitoring, timing spray and controlling methods (e.g. lure & kill, mass trapping or mating disruption) (Eiras, 2000 and references therein). Little information is available regarding behaviour of the carob moth (Vetter et al. 1997). The only detailed information on the calling behaviour of *Ectomyelois ceratoniae* (as a date pest) is available from the work of R.S.Vetter in United States, who studied the effect of age and photoperiod. However, a species' pheromone communication system can vary between populations in different geographical regions (Noldus and Potting, 1990). Apart from chemical variation, adaptation to different environmental conditions and host plants might also have led to behavioral variation between populations in different areas (Noldus and Potting, 1990). Therefore this research was conducted to appreciate the pheromone biology of the carob moth under three constant temperature conditions (20, 25, 30°C) in the laboratory and under variable field conditions.

METHODS AND MATERIALS

Insects

Moths were originally collected from pomegranate (*Punica granatum* L.) orchards in the Gherdefaramarz (29°48´-33°30´N, 52°45´-56°30´E) of Yazd province, Iran in 2006 and maintained on dry pistachios diet, local cultivar "Nokhodu" at 29±1°C, 75±5% RH, under a LD 16:8 photoperiod regime.

Laboratory Experiments

For the calling study, eggs were obtained from females, and after the incubation period, larvae were transferred to pistachios and maintained in the described rearing conditions in growth chambers. At least 3 days before eclosion, pupae were separated by sex and females were individually placed in cylindrical plastic transparent cages (12cm height × 6cm diameter) (the tops were covered with gauze) and then held at 29±1°C for the duration of pupal period. Upon emergence, virgin females provided with a 10% sugar solution and then were separated into three groups with one group set up in each temperature regime. Each group of virgin females was placed in growth chambers (20, 25, 30°C). 30, 55, and 45 virgin females were observed for all three replications for 20, 25, and 30°C, respectively in laboratory. Observations were made from eclosion day onwards as a first scotophase to the 8th scotophase. In the field experiments, 15 and 18 females were observed in early August and early September, respectively. In all experiments, females were observed each night at 15 min intervals all through the scotophase, using a torch covered with two layers of tissue paper and a red parafilm layer (Turgeon & McNeil, 1983). If a female was calling on two consecutive observations, she was recorded as having called for 30 min. If she was calling at one observation and not at the next, she was recorded as having called for 15 min. (Goldansaz and Mc Neil. 2003). The calling posture of the female carob moth is curling abdomen between wings.

Field Experiments

Two series of field experiments were conducted in pomegranate orchards of Gherdefaramarz district of Yazd province in early August and early September 2006, using females produced from the laboratory culture. Individual cages containing of virgin females were hanged out from pomegranate trees branches (15 and 17 cages for each experiment respectively). These cages were equipped with a rooflike cover as a sticky layer. This layer prevents:

1-Females to capture by predators (such as ants that attack resting females),

2-Direct radiation on cages (these were major mortality factors in our preliminary observations). Observations were made every 15 min 2h after sunset to 30 min after sunrise on each night for 8 days to determine the mean age of first calling, the mean onset time of calling and the mean time spent calling. Preliminary observations had shown that calling did not occur in first 2 h of scotophase and terminated in early morning. Temperature measurements beside the trees were taken coincident with each observation period and wind speed measurements were taken from Yazd Meteorology Center by 1 km distance from experiment plot.

Statistical Analysis

Analysis of variance, followed by a least significant different test, was used for the mean age of calling for the first time data in the laboratory experiments. The data for the mean onset time of calling and mean time spent calling from all experiments were subjected to ANOVA. In the field experiments the effects of wind speed and ambient temperature on the proportion of calling females throughout the night were examined using a multiple regression analysis on transformed (logit) data (JMP6 (SAS product, 2005)).

RESULTS

The mean age of calling for the first time was not affected by temperature under laboratory conditions, with females at 30°C calling for the first time at a not significantly older age than those at the lower temperatures(Fig.1). This parameter did not vary between two field tests and all females initiated calling from eclosion day at both early August and early September.

In our experiments *E. ceratoniae* ″calling″ did not weaken with age and became intensive on the 1-3rd day from the emergence and more intensive on 4-6th day and most intensive on 7-8th day (Fig.2a), in other word MTSC was significantly different between days 1-3, 4-6 and 7-8. The mean onset time of calling, MOTC (Fig.2b) occurred significantly earlier at consecutive days of calling and the significant temperature×age interaction resulted from the earlier onset of calling of females during 4th day and later onset on 7th day of calling (Table 1, Fig.2b). The mean time spent calling, MTSC (Fig.2a) increased significantly on consecutive days of calling. There was also a significant effect of temperature on the mean time spent calling (Table 1), with females at 25°C calling more than those at lower and upper temperatures (Fig.2a).

Females placed in the field in early August (mean daytime temperature: 26.24°C) called for the first time at the same age (0 day) that the other cohort started 29 days later, when the mean daily temperature was 23.79°C . All females initiated calling from eclosion day at both early August and early September. The age-related changes in the mean onset time of calling and the mean time spent calling seen in the laboratory (Fig.2) were less evident under the field conditions (Fig.3). This was due to marked day- to- day variations associated with changing climatic conditions, and is reflected by significant cohort×age interactions (Table 2). In both field experiments, the best regression models (in the proportion of females calling) included temperature, time of night and wind speed (Tables 3, 4).The relationship between wind and time of night present in early August (Table 3) and in early September (Table 4). There was a significant opposite relationship between calling and wind speed in both experiment (Table 3 and 4). For interpretation we require wind tunnel data that has not been studied or published by any authors to date. An examination of the temporal patterns of the proportion of females calling on specific days provided some insights into the manner in which different abiotic factors may influence calling behaviour. For example, the best part of the cohort called for ≈ 3 h on 9 August, when the air temperature was very steady and wind speeds decreased to ≈ 0 m/s in 5th hour of night. Mean and maximum wind speed was 0.335, 1.9 m/s respectively (Fig. 4a). In contrast, on 11 August, females called for only ≈ 45 minutes. At this time the mean and maximum wind speed was 1.6, 3.65 m/s respectively. On 11 August, majority of calling occurred during 345 to 390 min. after sunset and a significant high wind speed (mean of wind speed = 3.16 m/s) inhibited calling in the earlier minutes (240-330 min) of night (Fig. 4c). In other words, all calling behaviour was delayed until 330th minute of night, coinciding with a < 3.5 m/s wind speed, however calling resumed right away under the declined wind speed. In the models (Tables 3 and 4), time of night was a significant parameter. Clearly, there was a significant $time^2 \times temperature$ interaction in early September (Table 4), but it is possible that this was due to the changes in some other abiotic factors that were not measured in this study. On 8th September an increase in wind speed from 0 to >2 m/s at late night (530-570 min.) influenced females, and all calling behaviour stopped at late night (Fig.5) contrary to patterns generally observed in other nights. No clear fluctuation in temperatures was seen in all nights in both field experiments, and an equal trend was seen, that is temperature decreased gradually to morning. Mean of temperature decrease in first experiment was 5.24°C and in second trial was 7°C. High wind speeds at earlier minutes of night on three successive days in September (9, 10, 11 Sep.) (Fig.6a, b, c) inhibited calling to start at 240-300 min. but on 12 September still air in this period (Mean wind speed = 0.2875 m/s) allowed calling window to transfer to earlier times (240th min. after sunset) (Fig. 6d) and to extend to almost 280 min. (The greater calling window on 6th night of calling).

Pattern of Calling Behaviour

The pattern of calling behaviour of virgin *E.ceratoniae* females was the same during the scotophase. Shorter periods of pheromone release behaviour (up to 90 min.) prevailed during the activity under laboratory conditions, but longer (up to 150 min.) periods were dominant during the activity under the natural conditions.

DISCUSSION

E. ceratoniae has been considered a crepuscular and nocturnal moth. Our data indicates that late night is a typical pheromone release period for the carob moth, however there was only one peak of calling, suddenly declined to zero by appearance the photophase, contrary with some moth species, e.g. in the sesiids *Paranthrene tabaniformis kungesana* (Rott.) and *Synanthedon tipuliformis* (Cl.) (Mozuraitis et al., 2006). In these species, it has been suggested that the small peaks of calling activity observed early in the morning, under laboratory conditions, and these peaks are concealed in nature by low morning temperatures (Mozuraitis et al., 2006). Also in our field experiments some natural conditions, especially low temperature at late night suppressed the calling window. Our data showed that females stopped calling during change period from darkness to light, indicating that light might be an important signal to stop calling. Our results clearly indicate that patterns of calling in *E.ceratoniae* vary with age. The age at which females initiate calling for the first time is not temperature dependent in *E.ceratoniae*. This finding is in accord with the patterns generally reported for the Lepidoptera species (McNeil, 1991). Virgin females modified their calling patterns in response to temperature with some limitations. Females at 25ºC called more than those called at lower and upper temperatures. In other words, this temperature regime relatively may be an appropriate thermal condition for pheromone release by this species. In our experiments *E.ceratoniae* ″calling″ did not weaken with age and became intensive on successive days (Fig. 2a), contrary with the patterns generally reported for most pyralids (Karalius and Buda, 1995). Once pheromone emission has been initiated, both mean onset time of calling and mean time spent calling of *E.ceratoniae* changes as a function of age at all temperatures, although the differences are more pronounced under the constant laboratory conditions than under variable field conditions. These changes have been reported in a large number of Lepidoptera (McNeil, 1991). Swier et al. (1977)

suggested that these changes may increase the probability of an ageing virgin female attracting a mate, when rival with younger conspecifics. This idea is supported by work on the oblique banded leafroller, *Choristoneura rosaceana*, in which younger females had higher pheromone titer (Delisle & Royer, 1994) and under field conditions attracted many more males than did older conspecifics (Delisle, 1992). From the results of field experiments (that males were captured during calling period each night) (data not shown), it can be concluded that calling behaviour and pheromone production of *E.ceratoniae* females is synchronous that have been reported for many moth species (Mazomenos et al. 2002). In these species pheromone production occurs during the period where females are calling and releasing pheromone (Mazomenos, et al. 2002). Most virgin females called for the first time during eclosion day. This is contrary to the patterns generally reported for many moth species (e.g. *Mamestra configurata*, Howlader and Gerber, 1986). Age and temperature are two of the many factors affecting the occurrence of calling behaviour of female insects (Howse et al. 1998).

There are limited research papers in which the calling behaviour of females under natural conditions is compared with the calling behaviour under constant temperatures. Females of species *Choristoneura rosaceana* showed no significant difference in the mean time spent calling under a constant 20°C temperature regime and under thermocycle (in the range from 12 to 25°C), but the corresponding activity was shorter under a cooler periodically changing temperature programmes (in the range of 9-17 °C) than under constant regimes at 15°C (Delisle, 1992).

Under natural conditions, the calling periods of females of *Lambdina fiscellaria fiscellaria* (Guenee) were longer during cooler nights with temperature ranges of 5-8°C than during warmer nights with temperature ranges of 10-14°C (West and Bowers, 1994). In our field experiments temperature differences between 8 nights were not so clear and great to change the calling patterns, but in a given night the calling periods were longer than a given scotophase in laboratory constant temperature regimes.

In the second field experiment, due to irrigation of the orchard (where first experiment had been done), cages placement and observations were limited to marginal trees and closer to orchard walls, therefore wind speed effect in these areas was less evident, probably due to less coverage of wind on areas in question. Further laboratory experimentation and field testing should take our result into account. It should be noted that to increase the efficacy of sex pheromone collection under laboratory conditions by solid phase micro extraction method, which is usually carried out for about 3 h, it is suitable to extend the total duration of the calling activity of the females by keeping temperatures about 25°C during the scotophase and in the final quarter of 8th scotophase.

ACKNOWLEDGEMENTS

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Table 1. Analysis of variance of the mean onset time of calling and mean time spent calling by virgin *Ectomyelois ceratoniae* females as a function of calling age under different constant temperature conditions in the laboratory.

	effect	d.f.	*F*-value	*P*
Mean onset time of calling	Block	2	0.0446	-
	Temperature	2	5.5461	0.0702
	Age	7	10.8806	0.0000
	Temperature × age	14	3.1784	0.0045
	Block	2	3.9097	0.1145
Mean time spent calling	Temperature	2	20.0665	0.0082
	Age	7	6.4354	0.0001
	Temperature × age	14	2.6920	0.0125

Table 2. Analysis of variance of the mean onset time of calling and mean time spent calling by virgin *Ectomyelois ceratoniae* females as a function of calling age under field conditions at two different periods in summer 2006.

	effect	d.f.	*F*-value	*P*
Mean onset time of calling	Cohort	1	1.9907	0.1774
	Age	7	13.2064	0.0000
	Cohort × age	7	4.5256	0.0002
		1	0.5656	-
Mean time spent calling	Cohort	7	2.0594	0.0538
	Age	7	4.8896	0.0001
	Cohort × age			

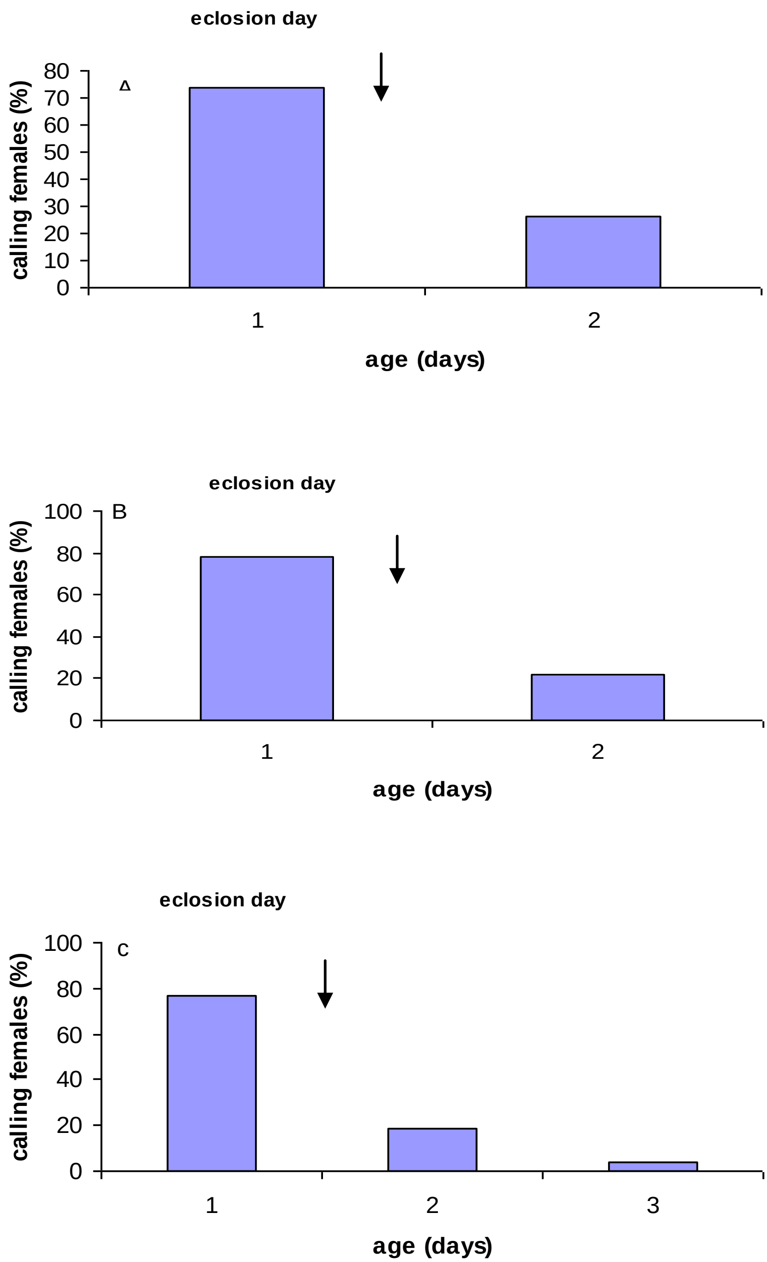


Fig. 1. The age (days after eclosion) at which virgin *Ectomyelois ceratoniae* called for the first time at three different constant temperature regimes: (A) 20 °C, (B) 25 ° C, and (C) 30 ° C.

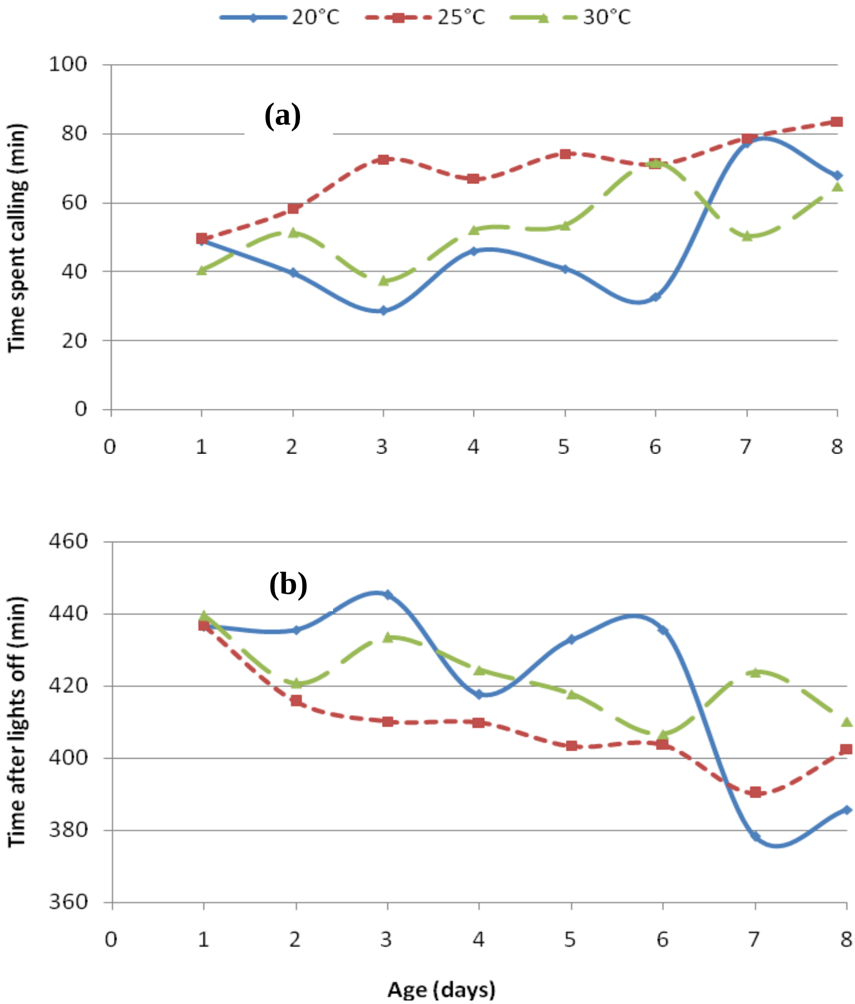


Fig.2. (a) Mean time spent calling (minutes) and (b) mean onset time of calling (minutes after lights-off signal) of virgin *E. ceratoniae* as a function of calling age at 20, 25, and 30 ° C.

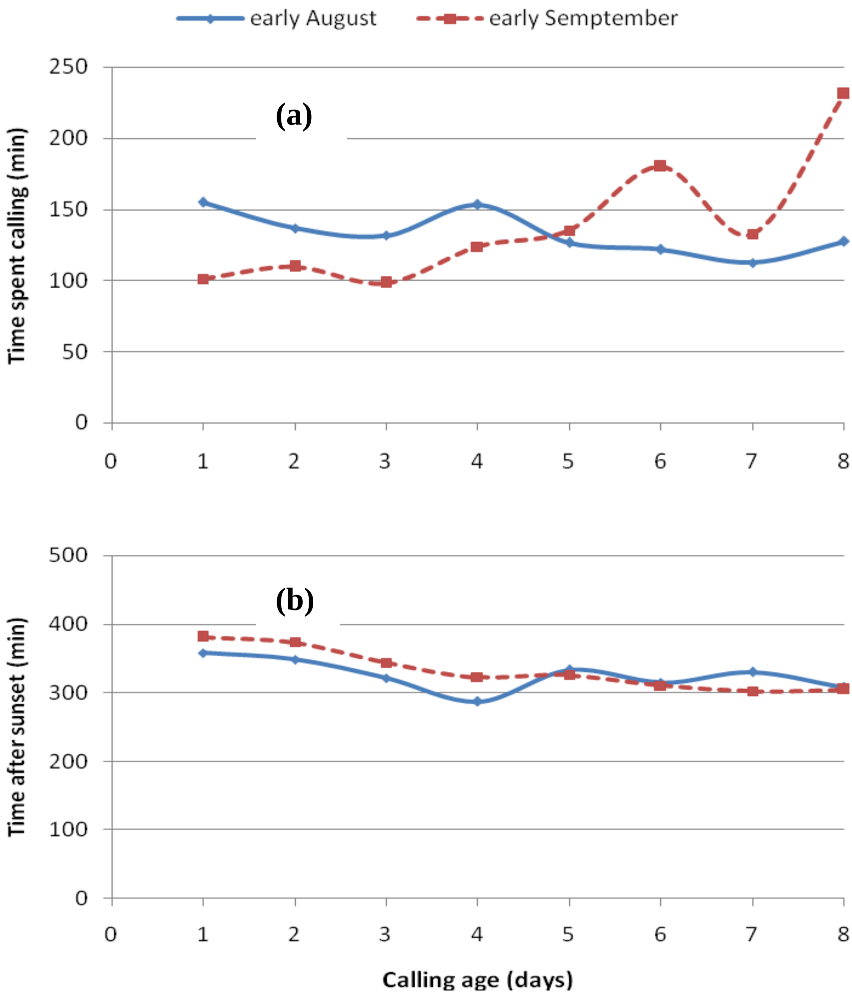


Fig.3. (a) Mean time spent calling (minutes) and (b) mean onset time of calling (minutes after sunset) of virgin *Ectomyelois ceratoniae* as a function of calling age under field conditions in early August and early September 2006.

Table 3. Regression analysis of the proportion of virgin *E .ceratoniae* calling throughout the scotophase under field conditions from 7 to 14 August 2006 as a function of time of night, temperature, and wind speed.

Factor	d.f.	PE*	SE	*t*	*P*
Intercept	1	27.217732	11.09879	2.45	0.0341
Time of night	1	-0.028442	0.008594	-3.31	0.0079
Wind	1	-2.267366	0.720398	-3.15	0.0104
Temperature	1	-0.286532	0.31421	-0.91	0.3833
$Time^2$	1	0.0001777	0.000245	0.73	0.4847
$Time^3$	1	3.7131e-7	8.571e-7	0.43	0.6741
$Wind^2$	1	2.5658159	2.052906	1.25	0.2398
$Wind^3$	1	2.9726479	0.72744	4.09	0.0022
$Temperature^2$	1	0.2155203	0.609069	0.35	0.7308
Wind × time	1	0.0498296	0.035101	1.42	0.1861
Temperature × time	1	0.0078448	0.021275	0.37	0.7200
Wind × $time^2$	1	-0.000258	0.00013	-1.99	0.0751
Temperature × $time^2$	1	1.3514e-5	2.928e-5	0.46	0.6543

*parameter estimate

Table 4. Regression analysis of the proportion of virgin *E. ceratoniae* calling throughout the scotophase under field conditions from 6 to 13 September 2006 as a function of time of night, temperature, and wind speed.

Factor	d.f.	PE*	SE	*t*	*P*
Intercept	1	8.1086602	1.874041	4.33	0.0007
Time of night	1	-0.006729	0.001386	-4.86	0.0003
Wind	1	0.1906338	0.149756	1.27	0.2238
Temperature	1	-0.055824	0.063877	-0.87	0.3969
$Time^2$	1	-0.0001	1.289e-5	-7.78	<.0001
$Time^3$	1	6.1463e-7	1.308e-7	4.70	0.0003
$Wind^3$	1	-0.317954	0.142048	-2.24	0.0420
$Temperature^2$	1	0.0018732	0.023197	0.08	0.9368
Wind × time	1	-0.003416	0.001583	-2.16	0.0488
Wind × $time^2$	1	3.9042e-6	1.653e-5	0.24	0.8167
Temperature × $time^2$	1	1.2654e-5	5.399e-6	2.34	0.0344

*parameter estimate

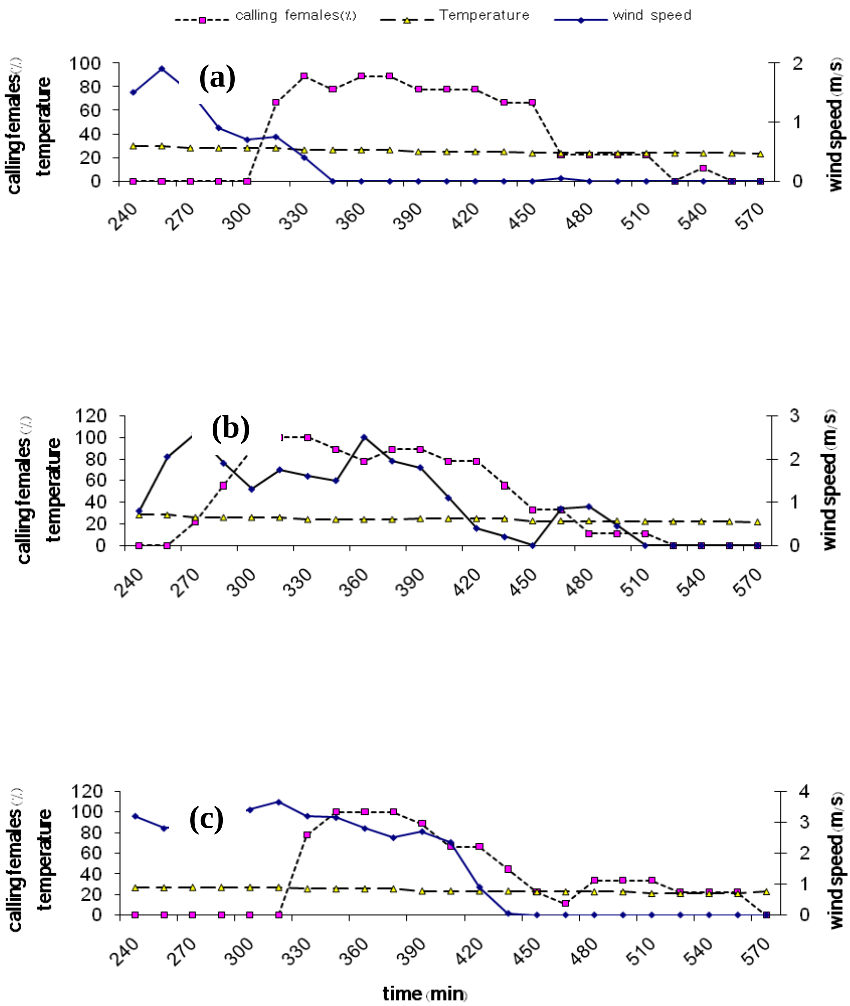


Fig.4. Variability in the proportion of virgin *Ectomyelois ceratoniae* calling throughout the night, as a function of temperature and wind speed on (a) 9, (b) 10, and (c) 11 August 2006.

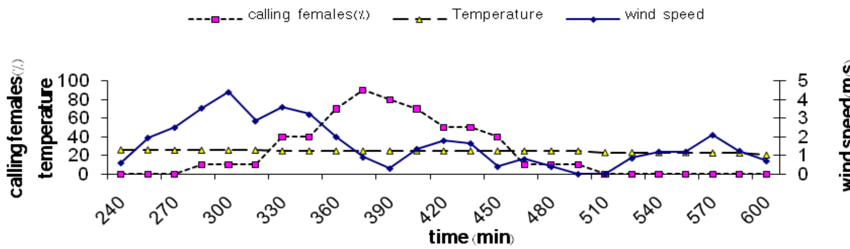
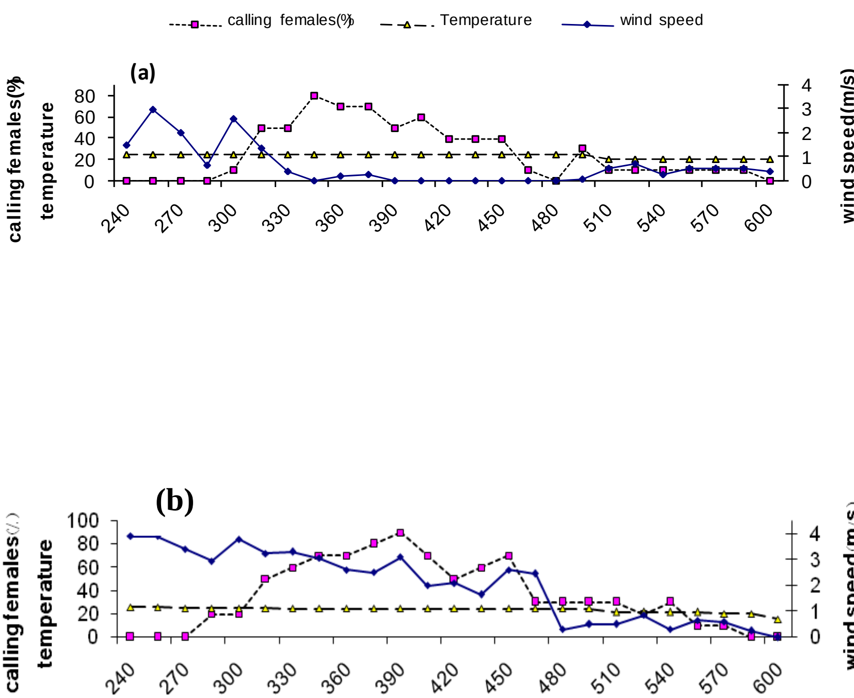
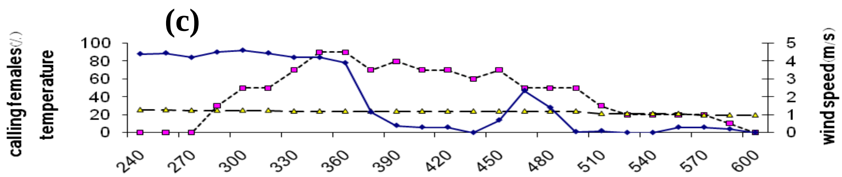


Fig.5. Variability in the proportion of virgin *Ectomyelois ceratoniae* calling throughout the night on 8 September 2006.





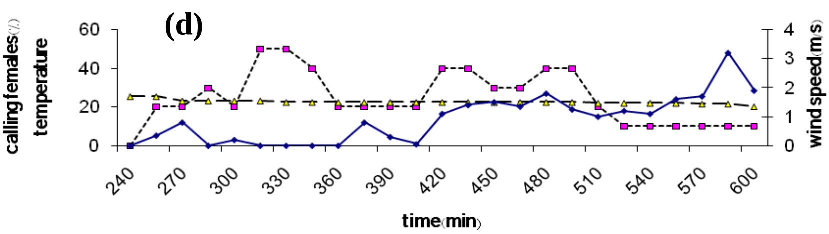


Fig.6. Variability in the proportion of virgin *Ectomyelois ceratoniae* calling throughout the night, as a function of temperature and wind speed on (a) 9, (b) 10, (c) 11, and (d) 12 September 2006.

EFFECT OF EMULSIFIABLE OIL ON OVERWINTERING ADULTS OF OLIVE PSYLLID *EUPHYLURA OLIVINA* COSTA (HOM.: APHALARIDAE) AND ITS PHYTOTOXICITY ON OLIVE TREES IN TAROM REGION- IRAN

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[Khaghaninia, S. 2009. Effect of emulsifiable oil on overwintering adults of olive psyllid *Euphylura olivina* Costa (Hom.: Aphalaridae) and its phytotoxicity on olive trees in Tarom region- Iran. Munis Entomology & Zoology, 4 (2): 486-492**]**

ABSTRACT: Olive psyllid *Euphyllura olivina* Costa is the most important pest of olive trees in Tarom region. The results of recent investigations on controlling overwintering adults of olive psyllid using emulsifible oil instead of summer insecticides spraying, show very precise control and farmers apply these successfully in their gardens. In order to study the effects of oil spraying in winter and autumn and also its feasible phytotoxicity on olive trees.This study carried out as a factorial experiment in completely randomized design block considering oil dosage and time of spraying as factors. The results showed no significant differences between oil treatments but there was a significant difference among different times of spraying. Therefore with the progress of the season, sensitivity of overwintering adults of olive psyllid and also the percentage of control increased. Survey of 50 fruits weight indicated that 3% oil treatment decreased yield and caused phytotoxicity during November, December and March. According to this study, early March application of 2% oil is the best choice to control olive psyllid and 3% oil in February or 1% oil in March are recommended as alternatives.

KEY WORDS: Olive psyllid, Oil spray, phytotoxicity, *Euphyllura olivina*.

Olive psyllid *Euphyllura olivina* Costa is the most important pest of olive trees in Tarom region. In this area the pest completes only one generation per year on olive. It overwinters as adult in crevices or holes on olive trunks, mating occurs in late March, followed by egg laying on the flower buds in early April and then the larva could be seen in second half of April. The pest has five larval stages (Saeb et al., 2001).

The pest, especially older stages of larva feed by rupturing cells and imbibing the sap, damaging the attacked tissues of new growth. The insect damage not only affects yield lose by direct sap feeding but also indirectly cause flowers abortion by producing waxy secretions even in those not attacked directly. The presence of honey-dew and sooty moulds aggravate the latter situation. Feeding may cause flowers to drop prematurely. Large populations are able to retard the growth of young trees and also to decrease the fruit biomass (Prophetou & Tzanakis, 1976; Saeb et al., 2001). Olive psyllid is widely distributed in Olive growing regions of Western Europe, Mediterranean countries and eastward to Iran. It occurs on olives as high population densities causing important economic losses. *E. Olivina* is a major pest of olive trees and has two summer and winter generations per year and the second generation causes more serious damage (Mustafa, 1989). In Greece and some of European countries it completes one generation per year and females lay egg in early spring and larval different stages could be observed from middle of April to late May, then the adults emerge which act all through the year on olive trees (Prophetou & Tzanakis, 1976). Olive psyllid cause about 21.2 to 23.2

percent damage and is known as an important pest of olive in Jordan (Mustafa, 1984). Pala et al. (1994) indicated that olive psyllid is a very serious sucking insect in Turkey olive orchards and its activity cause significant decrease of flowering, pollination and fruit set. Selim *et al.* (1981) through investigation in Iraq showed that the insect distribution in the four quarters of infested olive trees was not at the same level, since the northern quarter harbored the highest population, the eastern the lowest and also its population on the upper parts of the tree was higher than the lower ones.

Rallo and Martin (1991) indicated that olive flower formation starts in early November and the induction of flower buds takes place in the winter after passing essential chilling and in this period the flowers come out of dormancy indicated by an increase its biomass. Michele et al. (1973) through studies in Sicily, showed that physiological differentiation of olive flower takes place in December to January and a morphological one occurs in the middle of February.

The extensive use of pesticides has incurred ecological and toxicological side effects. These include environmental contamination, resulting from the vastness of the areas treated, destruction of non target organisms including natural enemies of pests, severe outbreaks of other secondary pests and finally presence of insecticides residues in the olive oil that are caused mainly by lipophilic pesticides (Pala et al., 1997).

In order to investigate the possibility of overwintering adult pest control through autumn and winter, evaluating lethal effects of various oil spray dosages on the adult and also oil spray possible phytotoxicity effects on shedding the flowers and leaves and thus lose of olive yield, this study was carried out during 2002 in Tarom region.

MATERIALS AND METHODS

This research was carried out during 2002 in Motahari orchard with yellow cultivar olive tree in Tarom region as a factorial experiment in completely randomized design block with two factors in three replications. First factor was oil dosage at four levels: a_0= 0% (control), a_1= 1%, a_2= 2% and a_3= 3% and the second one was time of spraying, at five levels: b_1= 4th of November, b_2= 4th of December, b_3= 4th of January, b_4= 4th of February and b_5= 4th of March. Each block included 4×4 = 16 trees and sampling was done on 2×2= 4 trees at the center of each block.

Adults were collected by hand beating twigs over a 50 cm diameter net at four main geographical directions of each sampling tree. Samples of adults were taken two days before and a week after each oil spraying so they were about at one_ month intervals through autumn and winter. A hundred liter spraying machine (Mitsubishi G510L type machine, Japan) and also emulsifible oil with 80% technical mineral oil and 92 degree of sulfate were used. The number of overwintering adults was transformed to mortality percent by means of the Handerson- Tilton formula including control treatment. The Formula follows 1-($T_a/T_b \times C_b/C_a$) × 100 where C_b, C_a, T_b and T_a are collected adults number before at control, after at control, before at treatment and after at treatment blocks respectively.

In order to evaluate the phytotoxicity effects, the treated trees were monitored for yellowing and dropped leaves and also weight of 50 fruits used as an index of yield. For this purpose about 10 kilos fruit of 2×2 = 4 trees from the center of each block, synchronizing harvesting olive trees to conserve use in late of September, 2003, were gathered and then 50 fruits randomly picked up and weighted.

The data were analyzed by means of MSTATC software then the main and interaction effects of factors were compared by a Duncan test.

RESULTS AND DISCUSSION

Analysis of variance of time and dosage of oil spaying to control overwintering adults of *Euphyllura olivina* indicated significant differences at 1% probability among of spraying times and also no significant differences between the dosages of sprayings (Table 1).

The means comparison of adult's mortality percent grouped the times of spraying in three levels (Fig. 1).

March with 82.63% mortality, showed the highest mortality, February and November with 76.78% and 72.49% mortality respectively located in the second cluster and in the end January and December with 70.90% and 68.68% mortality located in third group. There were no significant differences between November and January, December. The results indicated that except of November, as the season continued, the sensitivity of overwintering adults increased. Mustafa (1989) reported that the body fat residue of overwintering olive psyllid decreased through autumn and winter so it could be the probable reason for the increase in adult sensitivity by going on the season. It seems that the reason for the exception of November in view point of adult control, could be resulted from its high mobility and incomplete transition to overwintering places.

The interaction effects of oil dosage and times of spraying on mortality percentage of overwintering adults showed that March was the best time of oil spraying to control the pest (Fig. 2).

For introducing the best time and dosage, must be investigated in point of view probable oil phytotoxicity effects and costs of controlling processes.

Analysis of variance of time and dosage of oil spaying on weight of 50 olive fruits revealed that there are significant differences between times of spraying and also oil dosages at 5% and 1% probability respectively (Table 2).

The mean weight of 50 olive fruits was increased as the season continued by oil spraying during autumn and winter (Fig. 3). The highest weight of 50 fruits belonged to March, February and January. There was no significant difference between January and December from this view point. Finaly, the lowest amount belonged to November and also there was no significant difference between that and December. These results are in accordance with the illustration of Fig. 1 concluding the incisive control of olive psyllid was resulted by oil spraying in March.

The effect of various oil dosage spraying on mean weight of 50 olive fruits illustrated that the spraying with 2% and 1% oil dosages were successful in comparison to control treatment (0% oil), but the 3% one had side effects and decreased the fruit weight (Fig. 4). Our surveys during sampling a week after oil spraying showed leaves necrosis and dropping of trees that were treated with 3% oil dosage in November, December and slightly in March. These were confirmed by Michele et al. (1973) and Rallo and Martin (1991) studies on olive tree physiology which showed olive tree dormancy through winter and its activity during early autumn and late winter. Indeed mean weight of 50 fruits were decreased by decreasing the leaf area or photosynthesis level.

The interaction effects of Spraying times and dosages on mean weight of 50 olive fruits indicated that the highest fruit weight belonged to treatment with 2% oil in March then 3% in February and 1% oil in March located at second level. The lowest amount belonged to 3% oil in November and the others located between two extremes.

CONCLUSION

According to this study, early March application of 2% oil is the best choice to control overwintering olive psyllid and 3% oil in February or 1% oil in March are recommended as alternatives. These applications will kill about 80 percent of overwintering adults before laying egg and the remaining 20 percent is in the range of olive tree tolerance do not cause economic damage and also could keep natural enemies populations alive in olive orchards (Chermiti, 1992).

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Table 1. Two way analysis of variance (ANOVA) of time and dosage of oil spaying to control overwintering adults of *Euphyllura Olivia*.

Source	df	Ms	F
Time	4	278.551	17.201^{**}
Dosage	2	6.273	0.387^{ns}
Time × Dosage	8	0.077	0.004^{ns}
Error	28	16.194	

ns No significant difference, ** Significant difference at 1% probability, CV= 8.44

Table 2. Two way analysis of variance (ANOVA) of time and dosage of oil spaying on 50 fruit weight of olive.

Source	df	Ms	F
Time	4	2861.287	4.298^{**}
Dosage	3	2627.479	3.947^{*}
Time × Dosage	12	1295.224	1.945^{ns}
Error	28	16.194	

ns No significant difference, * Significant difference at 5% probability, ** Significant difference at 1% probability, CV= 11.5

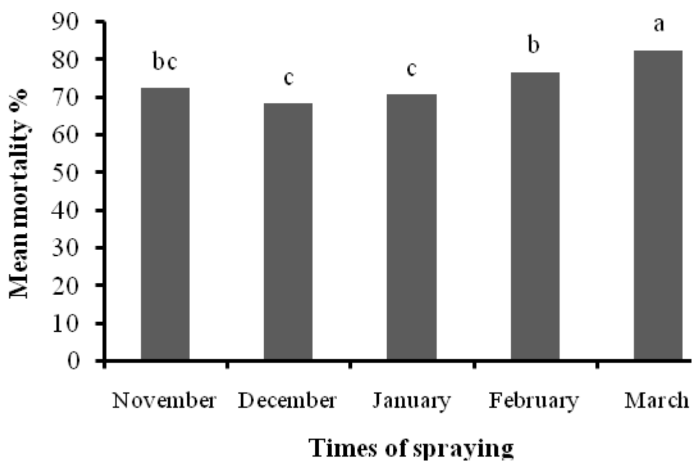

Fig. 1. Means of adult mortality caused by oil spraying during various months.

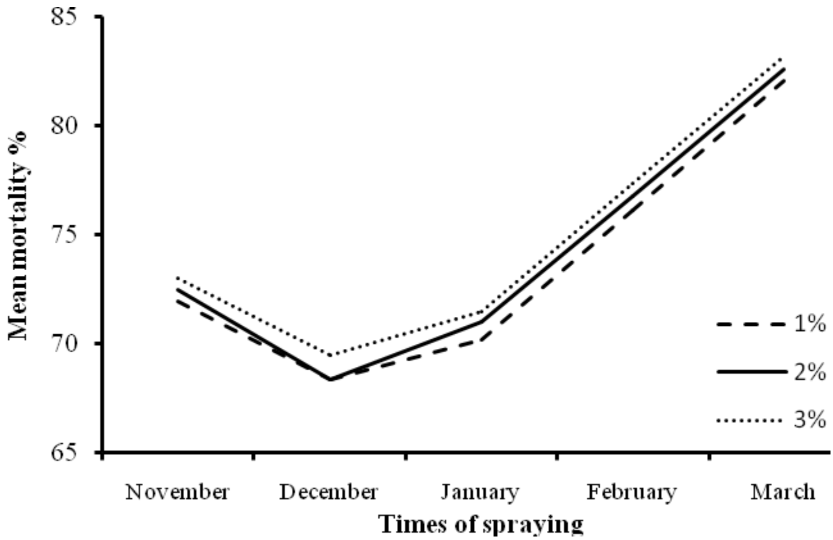

Fig. 2. Effect of oil spraying with different dosages during various months on mortality of overwintering adults of *Euphyllura olivina*.

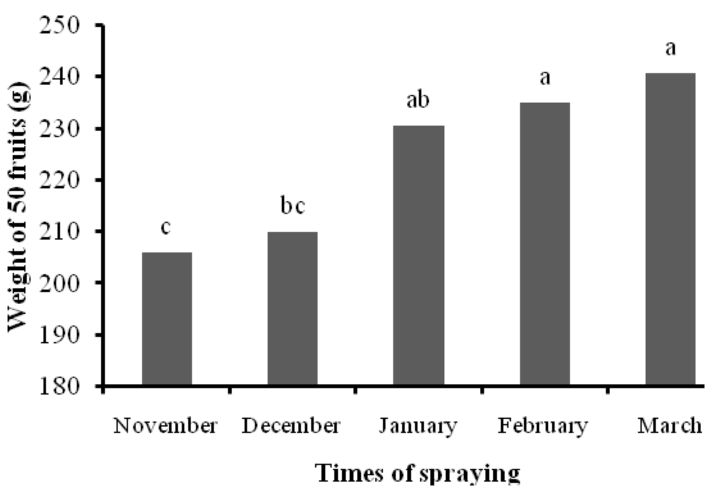

Fig. 3. Effect of oil spraying during various months on weight of 50 olive fruits.

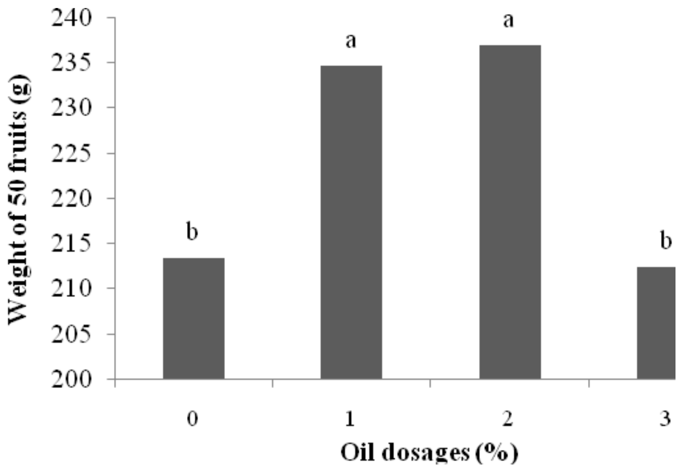

Fig. 4. Effect of oil spraying with various dosages on weight of 50 olive fruits.

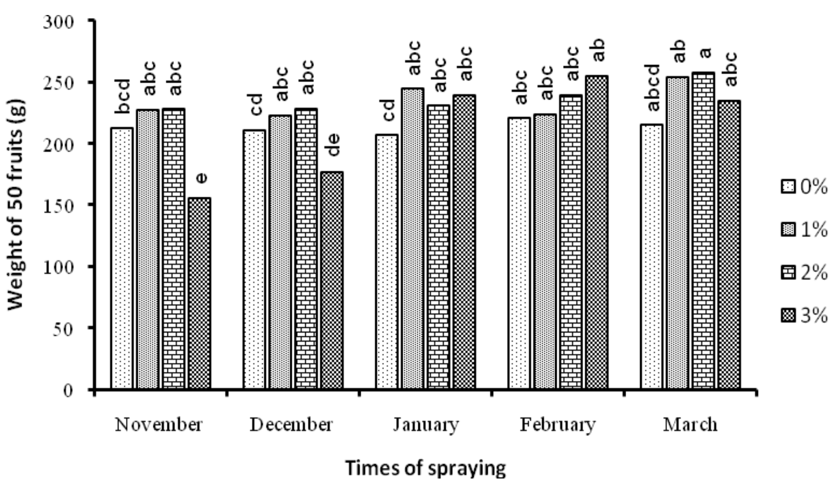

Fig. 5. The interaction effects of oil spraying times and dosages on weight of 50 olive fruits.

CONTROL OF GARLIC FLY, *DELIA* SP. (DIPTERA: ANTHOMYIIDAE) AUTUMN GENERATION BY MEANS OF SEED COATING PESTICIDE

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ABSTRACT: Garlic fly, *Delia* sp. is one of the most important pests of garlic in the Tarom area. In order to control the pest autumn generation, this study was carried out as completely randomized design block experiment considering two different Carbaryl treatments in three replications. The results showed that seed coating with 4 g/ Lit Carbaryl solution gave the satisfied control against garlic fly attack and increased the yield more than 50.78% in comparison to the control but seed treatment with Carbaryl powder in rate of 2 g/kg of garlic seed, illustrated moderate control. The emerged seedlings number during about one- month intervals showed no significant differences among the treatments and control but seed coating especially with Carbaryl solution produced the most robust seedlings.

KEY WORDS: Garlic fly, *Delia* sp., Pesticide control, Seed coating, Carbaryl.

Garlic *Allium sativum*, planted in more than 1800 hectares squares, is a very economic crop in Tarom region. There are complex of garlic and onion flies in this area and we did not identify these species because from the growers' point of view, control measures are independent of species (Mohiseni, A. A., 2002). Through investigations which were conducted in Poland, a complex of seed flies belonged to *Delia* genus were reported as follows: *Delia antique, D. platura and D. florilega* in which *D. antique* was the dominant species (Narkiewicz-Jodko, 1988).

This pest is cosmopolitan and its distribution area includes Northern America, Western Europe, China, Japan, Korea, former USSR and in Central Asia it rises up to 3600 m above sea level, absent in deserts (Elberg, 1981 and Martinson et al., 1988).

The pest larvae damage garden bulb garlic, and also onion, chive, underground onion (shallot), leek, bulbs of tulips. The first generation of the fly is the most harmful because the development of larvae coincides with the beginning of garlic growth. Hatching larvae go into bulb pulp from the root side or through the base of leaves. Larvae hatching from one egg-batch usually keep together and eat away rather big cavities in bulbs. Sometimes more than 50 larva feed on one bulb, originating from eggs laid by different females. Damaged seedlings leaves become yellowish, wilt and finally they are destroyed completely (Gailite, 2002, Martinson et al., 1988 and Park and Lee, 1988).

This pest has two generations in autumn and spring in Tarom and the autumn one is very destructive. Females lay egg in autumn synchronizing with garlic planting, then the larva could be seen at garlic generating time. Larva attack newly emerged seedlings and fresh bulbs, cut the stem base and finally cause wilting, rooting and damping of plants (Mohiseni, 2002).

The various experiments showed seed dressing and granules are the most economical forms of applying insecticides to control the garlic fly which are least harmful to the environment (Emmett, and Savage, 2007, Ester, 1994 and Narkiewicz-Jodko, 1988). Park, and Lee (1988) reported that *Hylemia antique* is the most serious pest of garlic in Korea and showed applications of Diasinon and Carbufuran as granules is the best method of control. Martinson et al. (1988) indicated that the damage increase with more fertilizer in garlic fields. Szwejda (1988) showed the effective control was achieved by applying insecticides as granules or sprays during the oviposition period with Diazinon 25% EC and Triazophos 40% EC.

Among available seed pesticides, Carbaryl was recommended as the most effective one to control garlic fly in Tarom gardens (Mohiseni, 2002). Carbaryl (Sevin)^{R} is a wide-spectrum carbamate insecticide which controls over 100 species of insects, with contact and stomach action, moderately toxic to aquatic organisms, breakdown in soil and vegetation and therefore has low to moderate half- life in water, soil and inside crops and finally is a pesticide with low to moderate toxicity to humane and other non- target organisms (Nkedi-Kizza and Brown, 1998).

This study was carried out in Tarom area, in order to decrease pesticides use as one of the IMP strategies and also to introduce seed treatment instead of common ineffective spring spraying of pesticides against garlic fly and also to compare two types of Carbaryl seed coating,.

MATERIALS AND METHODS

This research was carried out during 2001 and 2002 in Dastjerdeh, a village in Tarom area, as experiment in completely randomized design block with two treatments of Carbaryl 85% WP besides the control in three replications. The treatments were seed coating with 4 g/ Lit Carbaryl solution and Carbaryl powder in rate of 2 g/kg of garlic seed. Nine plots were prepared in 3×3 design which the area of each was 300 m^2 in a randomized pattern.

After preparing the seeds, in the first treatment they were left 5 minutes in Carbaryl solution and for the second treatment after wetting, seeds were mixed completely with Carbaryl powder. Special gloves and mask were used during preparation of seed treatment. Seeds were planted in conventional method and control plots left without any treatments in first of November.

In order to determine the effects of insecticides on control of garlic fly, the numbers of healthy emerged garlic plants on each plot were recorded about one-month intervals after emergence. Yield was assessed by weight of the garlic at harvest time, 29th April, from each plot. Recording seedlings number and yield assessment were conducted at 5 random 40 cm rows and the mean for each plot calculated.

The data were analyzed with MSTATC software and the means of treatments effects on seedling no. and yield were compared by Duncan test.

RESULTS AND DISCUSSION

The results showed that there were no significant differences between seedling numbers in various dates through growing season but there were significant differences between yields affected by different treatments (Table 1).

Whereas there were no significant differences among seedlings number, the highest number related to Carbaryl 4 g/ Lit treatment and powder seed coating in rate of 2 g/kg of garlic seed and control located in lower levels respectively (Fig. 1). Since the decrease of plant numbers during the vegetative and bulbing stages, the most slump was observed in early growth stage which is in agreement with Gailite (2002) and Mohiseni (2002) studies, which indicated the most damage of garlic fly related to new growth seedlings and the damage of autumn generation is higher than the spring one.

The means comparison of yield illustrated significant difference between Carbaryl 4 g/ Lit treatment and control with 51750 kg/ha and 34320 kg/ha amounts respectively (Fig. 2). There were no significant differences between Carbaryl 4 g/ Lit and 2 g/kg of garlic seed treatments and also Carbaryl 2 g/kg of garlic seed treatment and control.

The results indicated that the seed treatment with Carbaryl 4 g/ Lit solution causes good and complete pesticide coating against garlic fly attack and increased yield about 50.78% in comparison to the control but the treatment with Carbaryl powder in rate of 2 g/kg of garlic seed gave moderate control with 43440 kg/ha yield.

Narkiewicz-Jodko (1988) by studies on garlic fly in Poland reported that there was one generation of this species per year and up to 70% of plants were damaged in 1985 and 1986. Effective control was achieved by applying insecticides as granules or sprays during the oviposition period. Diazinon 25% EC and 10% G at 1.5 litre/ha and 1 g/m of row, Triazophos 40% EC and 5% G at 1 litre/ha and 2 g/m of row, Isofenphos 5% G at 2 g/1 m of row, and Fonofos 5% G at 2 g/m of row gave effective control. Similar investigations showed that seed with Diflubenzuron, Fipronil, Imidacloprid and Teflubenzuron gave good control, whereas coating with Benfuracarb and Methiocarb was only moderately effective. The accomplished studies introduced that pre-sowing seed dressing is the best and a precise control method to protect the seeds in their early growth (Emmett and Savage, 2007, Ester, 1999 and Narkiewicz-Jodko, 1988). Since the chlorate pesticides are accumulated in environment and also in alive organisms, seed coating with suitable carbamates like Carbaryl as a good alternative is recommended (Nkedi-Kizza and Brown, 1998).

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Table 1. Analysis of variance (ANOVA) of Carbaryl seed treatment on number of garlic seedlings and yield.

Source	**df**	**Ms**				
		Seedling No.				Yeild
		25th December	30th January	4th March	29th April	
Treatment	2	0.618ns	0.791ns	2.618ns	2.804ns	0.253*
Error	4	0.811	1.731	3.278	1.651	0.034
CV		7.56	8.39	10.28	11.93	8.59

ns No significant difference, * Significant difference at 5% probability

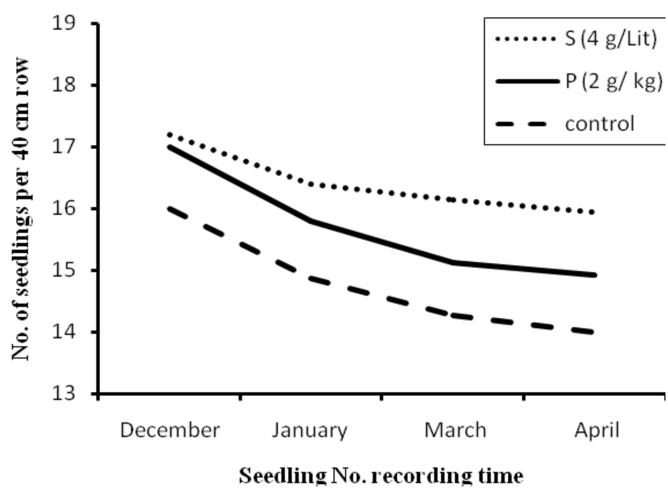

Figure 1. Means of seedlings number in various dates affected by different Carbaryl seed treatments.

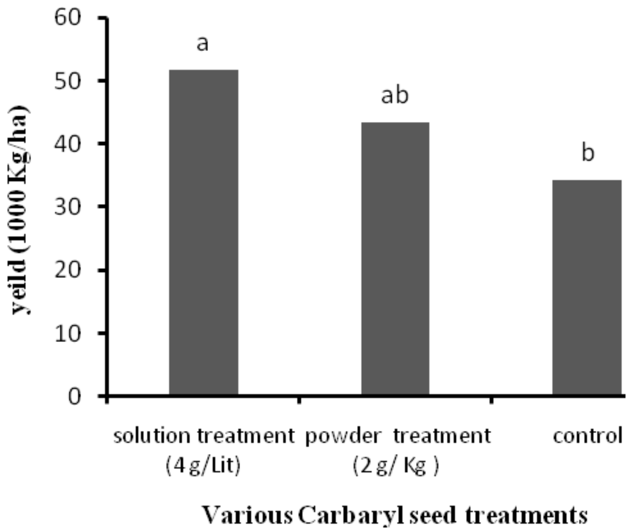

Figure 2. Means of garlic yield affected by various Carbaryl seed treatments.

INTRODUCTION OF SOME HETEROPTERA OF QURIGOL (IRAN)

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[Sadeghi, R., Pourabad, R. F., Kazemi, H. & Hassanzadeh, M. 2009. Introduction of some Heteroptera of Qurigol (Iran). Munis Entomology & Zoology, 4 (2): 498-500**]**

ABSTRACT: In order to carry out a faunistic study on Heteroptera in Qurigol districts in East Azarbaijan province (Iran) 28 species from 12 families were collected and identified, of which one species, *Polymerus brevirostris* Knight, 1925 is new record for the fauna of Iran.

KEY WORDS: Heteroptera, Qurigol, faunistic study, first record

True bugs (Heteroptera) are very important from an agricultural point of view. Their feeding strategies are diverse: predator forms feed on other insects and are a benefit in biological control. Plant sap sucker species are known as serious plant pests (Linnavuori & Hosseini, 2000).There are also parasitic species that feed on vertebrate blood (Borror et al., 1989).

MATERIAL AND METHODS

Qurigol lake is one of the most important water resources in East Azarbaijan province. This international ecosystem has a substantial ecological study for environmental experts.

This region (37°, 55' - 37°, 56' N, 46°, 42' - 46°, 44' E) is located 42 kilometers Tabriz in Iran .In the district nursery plants, pasture plants, lucern, cereal , potato, willow, poplar and fruit trees are grown.

The true bugs were collected from trees, weeds, fields of cereals, hibernating habitats, soil and water by small shovel, sweeping net, aspirator, light trap during 2002-204.The material housed in the collection of Agriculture Faculty of Tabriz University in Iran. All of them are reported for the first time from the region.

In this study, materials has been identified by the authors and confirmed by foreign experts.

RESULTS

In this study twenty eight species belonging to twelve families of the Heteroptera have been studied.

Family Corixidae Leach, 1815

***Corixa punctata* (Illiger, 1807)**

Material examined: Qurigol: 6 specimens, June 2003. From water.

***Sigara nigrolineata* (Fieber, 1848)**

Material examined: Qurigol: 9 specimens, August 2003. From water**.**

Family Pleidae Fieber, 1851

***Plea minutissima* Leach, 1817**

Material examined: Qurigol: 5 specimens, June 2004. From water

Family Miridae Hahn, 1831

***Adelphocoris lineolatus* Geoze, 1778**

Material examined: Korgan, Yousef Abad: 240 specimens, August 2003. On Lucerne
Note: The species is commonly distributed in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal, 2002).

***Deraeocoris pallens* (Reuter, 1856)**

Material examined: Korgan: 70 specimens, September 2002. On weeds.
Note: Pradator of aphids and reported from Tehran province in Iran.Collected from lucern (Modarres Awal, 2002).

***Lygus pratensis* (Linnaeus, 1758)**

Material examined: Korgan: 250 specimens, September 2002. On weeds.
Note: This species is commonly distributed in Iran and collected from lucern, cotton, sugar-beet, potato, sainfoin ((Modarres Awal, 2002).

***Lygus rugulipennis* Poppius, 1911**

Material examined: Korgan: 120 specimens, September 2002. On potato

***Polymerus brevirostris* Knight, 1925**

Material examined: Korgan: 39 specimens, July 2002. On lucern.
Note: New record for the fauna of Iran.

***Stenodema turanicum* (Reuter, 1904)**

Material examined: Yousef Abad: 42 specimens, August 2003. On weeds.
Note: The species reported from Balouchestan, Markazi, Kerman provinces in Iran.

Family Anthocoridae Fieber, 1836

***Orius niger* (Wolff, 1811)**

Material examined: Korgan: 90 specimens, July 2004. On lucern.
Note: Predator and distributed in East Azarbaijan province (Modarres Awal, 2002).

Family Nabidae Costa, 1852

***Nabis pseudoferrus* Remane, 1949**

Material examined: Khire Masjed: 16 specimens, May 2003. On lucerne.
Note: The species is a predator and collected on sainfoin and lucerne (Modarres Awal, 2002).

Family Lygaeidae Schilling, 1829

***Aphanus rolandri* (Linnaeus, 1778)**

Material examined: Khire Masjed: 4 specimens, June 2002. On weeds.

***Nysius senecionis* (Shilling, 1829)**

Material examined: Khire Masjed: 25 specimens, May 2003. On weeds

Coreidae Leach, 1815 Family

***Ceraleptus gracilicornis* (Herrish-Shaffer, 1833)**

Material examined: Khire Masjedi: 12 specimens, June 2002. On potato

***Coreus marginatus* Linnaeus, 1758**

Material examined: Korgan: 5 specimens, May 2003, 2 specimens, June 2004. On *Cirsium*.

Family Pyrrhocoridae Dohrn, 1859

***Pyrrhocoris apterus* Linnaeus, 1768**

Material examined: Yousef Abad: 4 specimens, June 2003.On weeds.
Note: The species has been collected from East Azarbaijan, Khorasan, Tehran, Khozestan, Fars, Gilan and Gorgan provinces in Iran (Modarres Awal, 2002).

Family Rhopalidae Amyot and Servill, 1843

***Corizus hyoscyami* Linnaeus, 1758**

Material examined: Khire Masjed: 3 specimens, May 2004. On weeds.

Family Cydnidae Billberg, 1820

***Cydnus aterrimus* Foster, 1771**

Material examined: Korgan: 2 specimens, May 2002. Collected by light trap.

Family Scutelleridae Leach, 1815

***Eurygaster integriceps* Puton, 1886**

Material examined: Marand: 5 specimens, June 2004. On wheat.
Note: This species is commonly distributed in Iran (Modarres Awal, 2002).

***Odontotarsus robustus* Jakovlev, 1883**

Material examined: Bangi: 1 specimen, May 2003. On weeds.

Family Pentatomidae Leach, 1815

***Apodiphus amygdali* Germar, 1817**

Material examined: Marand: 5 specimens, July 2004. On apricot.
Note: This species has been collected from Tehran, Fars, Markazi. Kerman, Hormozgan, Semnan, Balouchestan, Esfahan provinces in Iran on poplar, almond, apricot, oriental plane, pistachio, tamarisk, oak, tung(Modarres Awal,2002).

***Carpocoris coreanus* Distant, 1899**

Material examined: Yousef Abad: 9 specimens, July 2002. On fruit trees.

***Carpocoris lunata* Fallen, 1852**

Material examined: Korgan: 4 specimens, May 2003. On cereals

***Dolycoris baccarum* Linnaeus, 1758**

Material examined: Khire Masjed: 3 specimens, June 2002. On lucerne.

***Dolycoris penicillatus* (Horvath, 1904)**

Material examined: Korgan: 7 specimens, July 2002. On fruit trees.

***Eurydema ornatum* (Linnaeus, 1758)**

Material examined: Yousef Abad: 5 specimens, April 2003.On lucern and potato.
Note: the species has been collected from different regions of Iran on turnip, cabbage, colza, mustard, wheat, radish and cultivated and wild crucifereae family plants (Modarres Awal, 2002).

***Graphosoma lineatum* (Linnaeuse, 1758)**

Material examined: Khire Masjed: 4 specimens, June 2004. On wild crucifereae.

***Sciocoris ogivus* Jakovlev, 1861**

Material examined: Korgan: 11 specimens, July 2002. On weeds.

Among the species found in this study, families Miridae *and* Anthocoridae had the highest frequency and family Cydnidae had the minimum one.

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LACEWINGS (NEUROPTERA: CHRYSOPIDAE & HEMEROBIIDAE) FROM NORTH EASTERN AND EAST PROVINCES OF IRAN

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[Farahi, S., Sadeghi, H. & Whittington, A. E. 2009. Lacewing (Neuroptera: Chrysopidae & Hemerobiidae) from north eastern and east provinces of Iran. Munis Entomology & Zoology, 4 (2): 501-509**]**

ABSTRACT: Surveys and collecting of the Iranian Neuroptera fauna over the last 133 years (including this survey) have resulted in a collective list including 51 species of Chrysopidae & Hemerobiidae, covering 25 of the 30 provinces. During 2006-2008, a faunistic survey of Chrysopidae & Hemerobiidae was made in North eastern and East provinces of Iran. As a result, 12 species were recorded, seven of which are new to the study areas, including one (*Hemerobius stigma* Stephens, 1836) new for Iran; three species previously reported in the literature were not encountered in the survey. This brings the total number of Chrysopidae & Hemerobiidae recorded from these provinces to 15. Clearly, more species are to be expected after more intensive collecting.

KEY WORDS: Neuroptera, Chrysopidae, Hemerobiidae, Iran, lacewings, Faunistic survey.

The families Chrysopidae and Hemerobiidae (superfamily Hemerobioidea), known as common lacewings and brown lacewings respectively, are the second and third largest families in the order Neuroptera. The two families are similar in general morphology, and green lacewings are possibly the more familiar to non-specialists. By comparison, Hemerobiidae are brownish instead of green, are generally smaller, with different wing venation and are distinguished by moniliform antennomeres (compared to filiform antennomeres in Chrysopidae).

The larvae of both families and a few adults of common lacewings are predaceous, chiefly on aphids, coccids and the other soft-bodied insects they encounter on plants. For this reason, some species have been reared and successfully used for the biological control of pests. To some degree, this biocontrol association drives research in this superfamily, resting on a platform of taxonomy, faunistics, behavioural biology and ecology.

During the years 2006 to 2008 surveys were made in North, Razavi and South Khorasan provinces , North eastern and East Iran, in cereal, sugarbeet and alfalfa fields, during which Chrysopidae and Hemerobiidae were collected and further studied. This paper is the result of that research and lays the foundation for further detailed analysis of species presence and ecology.

Study area

The study area includes 3 provinces of Iran namely North Khorasan, Razavi Khorasan and South Khorasan located in Northeasern and East Iran(30°24'-38°17'N & 55°17'-61°15' E), with an area approximately of 314000 sq. kilometres. It is bounded on the North by the Republic of Turkemenestan, on the East by

Afghanistan, on the South by the Provinces of Kerman and Sistan & Baluchestan, and on the West by provinces of Yazd and Semnan.

The area is a land of mountains and deserts. Northern mountainous region supports a relatively flourishing agricultural and pastoral economy, while deserts and salt plains, where life is centred around oases, dominate the Southern parts.

The survey was conducted in cereals (mainly wheat, but including barley), alfalfa and sugarbeet in an agro-ecosystem of fields often surrounded by sparse hedgerows of trees including apples, plums, cherries, walnuts, almonds and pistachio nuts. A few specimens from other ecosystems such as municipal green spaces and parks were included in the collecting area.

Reviewing the literature, it became clear that the Neuropteran fauna of Iran is not yet completely understood and would benefit from further detailed study. Field studies have hitherto been conducted in nearly all provinces, with specimen documentation focussed on lists of taxa found in regional assessments. Judging from the species additions to the Khorasan provinces we discuss below, this process is not yet complete. Relatively fewer records were known from the eastern provinces than for the western provinces of Iran and this paper is intended (in part) to address that issue, although it is clear that further work will be needed.

According to Mirmoayedi (2008), so far the list of Iranian Neuroptera is 192 species, of which, 46 and 4 species belongs to Chrysopidae and Hemerobiidae respectively. Among them, only 4 species were recorded from the eastern provinces. To the best of our knowledge there is no previous study of Neuropteran fauna in these provinces.

MATERIALS AND METHODS

During the years 2006-2008, the first two authors collected lacewings in different locations of Khorasan provinces. The majority of specimens were collected with a hand net by sweeping vegetation in a variety of situations from cereals, alfalfa and sugarbeet fields. Sometimes, lacewings were captured at lights or in a light trap. Specimens were killed in a killing jar using sodium cyanide and after 1 or 2 hours were pinned dry preserved in 75% ethanol.

Additional specimens from the collection of College of Agriculture were examined. Data, such as number of lacewings, locations and dates were recorded. Plant (or crop-type) associations for the field crops and surrounding vegetation were noted and compared (Table 1) to known crop associations listed in McEwen, New and Whittington (2001).

Vouchers were identified by the third author and deposited in the National Museums of Scotland, while the remainder of the specimens were deposited in the department of Plant Protection, College of Agriculture, Ferdowsi University of Mashhad, Iran.

RESULTS

A total of 10 species of Chrysopidae and two species of Hemerobiidae were recorded in this study (listed below). *Hemerobius stigma* Stephens, 1836 was new to the fauna of Iran. Both species of Hemerobiidae (*Wesmaelius* (*Kimminsia*) *navasi* and *Hemerobius stigma*) and 7 species of Chrysopidae (*Chrysopa pallens, Chrysopa walkeri, Chrysoperla lucasina*, *Chrysopidia ciliata*, *Cunctochrysa albolineata*, *Dichochrysa prasina*, and *Suarius vartianae*) were new for the study area. This brings the total number of Hemerobioidea recorded from the region to 15 (3 species listed in the literature were not encountered in our survey). The following list includes records made by the authors supplemented by those reported in the literature prior to 2008 and includes comment on the plant association from which our collected material was taken.

Chrysopidae

***Chrysopa dubitans* McLachlan, 1887**

2 females Mashhad 26 April 2007, S. Farahi; 3 males, 12 females Fariman, 29 April 2008, S. Farahi; 1 male, 2 females Chenaran, 20 June 2007, S. Farahi.

Associations: 11 out of 20 specimens were caught in cereal fields and 9 were caught in alfalfa fields.

Previous provincial records for Iran: Sistan and Baluchistan, Tehran (Hölzel, 1967); Kermanshah, Tehran, Zanjan (Moddarres awal, 1997); Lorestan (Shakarami, 1997); Hormozgan, Kermanshah, Markazi (Mirmoayedi, 1998); Fars (Mirmoayedi, 1999a); Mashhad (Mirmoayedi, 2000).

***Chrysopa pallens* (Rambur, 1838)**

2 females Mashhad, 31 May 2007, S. Farahi; 3 females Toos, 28 April 2008, H. Sadeghi. First record from Khorasan province.

Associations: 3 out of 5 specimens were caught in sugarbeet fields and 2 were caught in cereal fields.

Previous provincial records for Iran: Tehran (Hölzel, 1967); Hormozgan, Ilam, Kermanshah, Khuzestan, Markazi (Mirmoayedi, 1998); Kermanshah (Mirmoayedi, 2008).

***Chrysopa walkeri* McLachlan, 1893**

2 females Toos, 5 May 2007, S. Farahi; 4 females Fariman (surroundings Mashhad), 14 May 2008, S. Farahi. First record from Khorasan provinces.

Associations: 2 out of 6 specimens were caught in alfalfa fields and 4 were caught in cereal fields.

Previous provincial records for Iran: unspecified location (Heidari, 1995).

***Chrysoperla carnea* (Stephens, 1836)**

7 females, Chenaran, 10 May 2007, S. Farahi; 12 males, 20 females Fariman, 15 April 2008, S. Farahi; 5 females, Shirvan, 2 June 2005 M. Saberi; 2 females, Birjand, 21 April 2008 H. Sadeghi.

Associations: 14 out of 46 specimens were caught in sugarbeet fields, 14 were caught in alfalfa fields and 18 from cereal fields.

Previous provincial records for Iran: Tehran (Hölzel, 1967); Azarbijan, Chahr mahal, Golestan, Hamadan, Isfahan, Kerman, Kermanshah, Khuzestan, Kohkeylouye, Kurdistan, Lorestan Markazi, Mazandaran, Tehran, Yazd, Zanjan, (Modarres awal, 1997); Guilan, Hormozgan, Ilam, Kermanshah, Khuzestan, Markazi, Teran (Mirmoayedi, 1998).

***Chrysoperla lucasina* (Lacroix, 1912)**

3 females Mashhad, 27 May 2007, S. Farahi; 2 males Akhengan (Mashhad), 4 May 2008, S. Farahi. First record from Khorasan provinces.

Associations: 2 out of 5 specimens were caught in alfalfa fields, 2 from sugarbeet fields and 1 was caught in a cereal field.

Previous provincial records for Iran: Kermanshah (Mirmoayedi, 2002b). The taxonomy of the species within the "*carnea*-complex" have recently been the focus of detailed research, an overview of which is discussed in detail by Canard & Thierry (2005). As a consequence of previous ambiguous placement of species with the complex and confusion concerning the morphological separation of these species, previous records of this complex may have been confused or combined with *Chrysoperla carnea* (Stephens, 1836). Thus, *Chrysoperla lucasina* may indeed be more common in Iran and in Khorasan provinces than previously been reported, but misplaced in the (then) portmanteau group "*carnea*". Until any such previous specimens are found and examined, we report this as the first instance that this species has occurred in this part of Iran.

***Chrysopidia ciliata* (Wesmael, 1841)**

1 female Kazemabad (Mashhad), 9 May 2008, S. Farahi; 2 females Parkand abad (Mashhad), 15 May 2007, S. Farahi.

Associations: 1 out of 3 specimens was caught in a sugarbeet field and 2 were caught in cereal fields.

Previous provincial records for Iran: "North Iran" (Heidari, 1995).

***Cunctochrysa albolineata* (Killington, 1935)**

1 female Toos, 25 May 2008, S. Farahi; 2 males Golmakan (Mashhad), 16 May 2007, S. Farahi. First record from Khorasan provinces.
Associations: all 3 specimens were caught in alfalfa fields.
Previous provincial records for Iran: "North Iran" Ari *et al.* (2007).

***Dichochrysa derbendica* (Hölzel, 1967)**

This species, previously recorded in Mashhad (and Kermanshah) by Mirmoayedi (2000) and "North Iran" by Heidari (1995) was not encountered in our survey.

***Dichochrysa prasina* (Burmeister, 1839)**

2 females Mashhad, 23 April 2007 and 1 male, 2 females 29 April 2008, S. Farahi. First record from Khorasan provinces.
Associations: 3 out of 5 specimens were caught in alfalfa fields and 2 were caught in cereal fields.
Previous provincial records for Iran: Guilan, Kermanshah, Markazi (Mirmoayedi, 1998).

***Suarius fedtschenkoi* (McLachlan in Fedchenko, 1875)**

2 females Mashhad, 1 June 2007, S. Farahi; 1 male Soran, 30 May 2007, S. Farahi.
Associations: all 3 specimens were caught in cereal fields.
Previous provincial records for Iran: Lorestan (Shakarami,1997); Hormozgan, Khuzestan, Markazi (Mirmoayedi, 1998); Fars, Kermanshah (Mirmoayedi, 1999a); Mashhad, Esfraeen Mirmoayedi (2000; as *Chrysopa fedtschenkoi*).

***Suarius mongolica* (Tjeder, 1936)**

This species, previously recorded in Khorasan by Heidari (1987, 1995) was not encountered in our survey.
Previous provincial records for Iran: Golestan, Khorasan, Tehran (Heidari, 1987, 1995)

***Suarius nanus* (McLachlan, 1893)**

This species, previously recorded in Mashhad by Mirmoayedi (1999b) was not encountered in our survey.
Previous provincial records for Iran: Tehran (Hölzel, 1967); Isfahan, Sistan and Baluchistan, Tehran (Modarres awal, 1997); Lorestan (Shahkarami, 1997); Ilam, Kermanshah, (Mirmoayedi, 1998); Fars (Mirmoayedi, 1999a); Kermanshah, Mashhad (Mirmoayedi, 1999b); Khuzestan (Sharifi fard & Mosaddegh, 2006).

***Suarius vartianae* (Hölzel, 1967)**

3 females Parkand abad (Mashhad), 26 May 2008, S. Farahi. First record from Khorasan provinces.
Associations: 1 out of 3 specimens was caught in an alfalfa field and 2 were caught in cereal fields.
Previous provincial records for Iran: Tehran (Hölzel, 1967); Hormozgan, Tehran (Modarres awal, 1997); Kermanshah, (Mirmoayedi, 1998).

Hemerobiidae

***Hemerobius stigma* Stephens, 1836**

1 male Akhengan (Mashhad) and 1 female Mashhad, 24 May 2008, S. Farahi.
First records from Iran.
Associations: 1 of the specimens was caught in a sugarbeet field the other was caught in a cereal field.

***Wesmaelius* (*Kimminsia*) *navasi* (Andréu, 1911)**

1 male Mashhad, 30 May 2008, S. Farahi. First record from Khorasan provinces.
Associations: the specimen was caught in an alfalfa field.
Previous provincial records for Iran: Kermanshah (Mirmoayedi, 1993); Mazandran (Modarres awal, 1997); Hormozgan, Hormozgan (Mirmoayedi, 1998).

DISCUSSION

The Iranian Chrysopids and hemerobiid fauna was previously represented by 46 and 4 species respectively (Mirmoayedi 2008), covering 25 of the thirty provinces of Iran. Earlier reports of the Iranian Chrysopidae and Hemerobiidae fauna include: Ari, *et al.* (2007), Daniali, *et al.* (1995), Heidari (1965, 1987 and 1995), Hölzel (1967), Mirmoayedi (1993, 1995, 1998, 1999a,b, 2000, 2002a, b and

2008); Mirmoayedi *et al.* (1998), Modarres awal (1997), Shahkarami (1997) and Sharifi fard & Mosaddegh (2006). With this study, we collectively increase the number of species of these two families in Iran to 51 species, by the addition of *Hemerobius stigma* and increase the number of species known in Khorasan provinces from 6 to 15:

Previously recorded:
- *Chrysopa dubitans* McLachlan, 1887
- *Chrysoperla carnea* (Stephens, 1836)
- *Dichochrysa derbendica* (Hölzel, 1967)
- *Suarius fedtschenkoi* (McLachlan in Fedchenko, 1875)
- *Suarius mongolica* (Tjeder, 1936)
- *Suarius nanus* (McLachlan, 1893)

First records from Iran.
- *Hemerobius stigma* Stephens, 1836

First record from Khorasan provinces:
- *Chrysopa pallens* (Rambur, 1838)
- *Chrysopa walkeri* McLachlan, 1893
- *Chrysoperla lucasina* (Lacroix, 1912)
- *Chrysopidia ciliata* (Wesmael, 1841)
- *Cunctochrysa albolineata* (Killington, 1935)
- *Dichochrysa prasina* (Burmeister, 1839)
- *Suarius vartianae* (Hölzel, 1967)
- *Wesmaelius* (*Kimminsia*) *navasi* (Andréu, 1911)
- *Hemerobius stigma* Stephens, 1836

The crop associations from which samples were collected in this survey, while not a direct pest association, are helpful in linking the data to crops for later consideration in crop protection. In relation to the broader literature (see McEwen, New and Whittington (2001)) these records are both confirmation of previous associations and include the incorporation of new ones.

The three crop types surveyed yielded a total of 10 species of Chrysopidae and two species of Hemerobiidae in the following associations (Table 1):
- wheat 8 species of Chrysopidae and 1 species of Hemerobiidae
- sugarbeet 4 species of Chrysopidae and 1 species of Hemerobiidae
- alfalfa 7 species of Chrysopidae and 1 species of Hemerobiidae
- only *Chrysoperla carnea* was found on all three crops
- *Cunctochrysa albolineata* and *Wesmaelius* (*Kimminsia*) *navasi* were only caught in alfalfa fields
- wheat and sugarbeet yielded: *Chrysopa pallens*, *Chrysopidia ciliata* and *Hemerobius stigma*
- wheat and alfalfa yielded: *Chrysopa dubitans, Chrysopa walkeri, Dichochrysa prasina* and *Suarius vartianae*
- sugarbeet and alfalfa yielded: *Chrysoperla lucasina*.

Only *Chrysoperla carnea* and *Chrysoperla lucasina* had previous associations with wheat, sugarbeet (in the case of *C. carnea*) and alfalfa mentioned in the literature. Most of the species have in the past been associated with the various trees surrounding the crop types examined (see Table 1) and at present we cannot rule out the possibility of drift from the surrounding hedgerows into the fields and collecting sites. Even if such drift is found to be the case, it re-confirms the notion that species residing in the vegetation at the crop edges can be valuable in control of pests within the crop (Szentkirályi, 2001a). This, and confirmation of the pest species that the lacewings are preying on will be the focus of further research in the area, along with more widespread (in a geographical sense) collecting.

CONCLUSIONS

The majority of species collected in this study were found in low abundance, with the exception of *Chrysoperla carnea* (46 specimens) and *Chrysopa dubitans* (20 specimens). Consequently there is a need to reinforce these data with on going surveying and additional intensive collecting, which are expected to yield more species, clearer prey-associations and a better understanding of community dynamics and relative abundance. Moreover, we hope to better analyse the lacewing-pest and lacewing-crop associations and understand the relative population densities, proportion of drift and the potential for crop protection. A much wider geographical survey is also clearly required, given that to date the records for Khorasan provinces are sparse.

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Table 1. Crop-lacewing associations for species encountered in a survey conducted in North eastern and east province of Iran, during 2006-2008. Shaded cells indicate species associated with crops during the survey, numbers indicate published records in chapters of McEwen, New and Whittington (2001): **1.** Canard, 2001, ch 6; **2.** Daane & Hagen, 2001, ch 20; **3.** Duelli, 2001, ch 8; **4.** McEwen & Sengonca, 2001, ch 27; **5.** Pantaleoni, 2001, ch 24; **6.** Paulian, 2001, ch 29; **7.** Szentkirályi, 2001a and b, ch 5 and 9.

	Crops			Fruits			Nuts			syanthropic	
	wheat	Sugar beet	Alfalfa	Apple	Plum	Cherry	Almond	Walnut	Pistachio	houses	gardens
Chrysopidae:											
Chrysopa dubitans McLachlan, 1887					7						
Chrysopa pallens (Rambur, 1838)				5, 7	7	7	7	7		5	5
Chrysopa walkeri McLachlan, 1893				7							
Chrysoperla carnea (Stephens, 1836)	6	1, 2, 4	6	1, 2, 5, 6, 7	6, 7	6,7	7	7		5	5
Chrysoperla lucasina (Lacroix, 1912)	3, 6		3, 6	6	6	6					
Chrysopidia ciliata (Wesmael, 1841)				7				7			
Cunctochrysa albolineata (Killington, 1935)				7				7			
Dichochrysa derbendica (Hölzel, 1967)	not encountered in this survey										
Dichochrysa prasina (Burmeister, 1839)				4, 7	7		7	7		5	5
Suarius fedtschenkoi (McLachlan, 1875)											
Suarius mongolica (Tjeder, 1936)	not encountered in this survey										
Suarius nanus (McLachlan, 1893)	not encountered in this survey										
Suarius vartianae (Hölzel, 1967)											
Hemerobiidae:											
Hemerobius stigma Stephens, 1836				7							
Wesmaelius (*Kimminsia*) *navasi* (Andréu, 1911)				7							

BIONOMICS OF *HYPOLIXUS TRUNCATULUS* (F.) (COLEOPTERA: CURCULIONIDAE: LIXINAE: LIXINI), A MAJOR PEST OF *AMARANTHUS CAUDATUS* L.

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ABSTRACT: *Hypolixus truncatulus* (F.) has been observed as a major pest of cultivated amaranthus viz., *Amaranthus caudatus* L. in the Jammu region whose leaves are used as greens and seeds for medicinal purposes. Maximum of 49 specimens at different stages of development were recorded (±SE) from a single plant. Weevils were found to breed from April to November and overwinter in soil or inside the debris of harvested plants. Adults defoliate the plants while larvae feed on internal tissues of the stem and branches to form irregular zigzag tunnels resulting in galls. Infestation varies from 34.96 to 82.3% with an average of 62.52% ±21.4. Mating normally lasts for one and half an hour. Female after 20-40 minutes of copulation commences laying eggs singly in the excavated hole in the stem, branches, petiole or midrib of the leaves. Incubation varies between 3-6 days with an average of 4.2±0.36 days. Larva when taken out of the stem or branch shows a typical C-shaped curvature. Larval period ranges from 42-45 days with an average of 43.6±0.45 days. Pupal period ranges from 12-15 days with an average of 13.5±0.43 days. Total life cycle takes 58-64 days with a mean of 61.10±0.71 days. At least three overlapping generations were observed from April to November.

KEY WORDS: *Hypolixus truncatulus,* bionomics, *Amaranthus caudatus,* infestation.

Curculionids have been found infesting a variety of host plants not only in the field but also in storage. Among these *Hypolixus truncatulus* (F.) was first noted by Lefroy (1909) as a pest and some life history notes were given by Fletcher (1914). Ayyar (1922) described the nature of damage caused by the larvae while Pruthi (1937) and Ahmad (1939) gave accounts of its biology and parasites. Gupta and Rawat (1954) gave an account of its life history while Agarwal (1985) added some information on its gall inducing habits. Kalia et al. (1994) reported its damage on *Acacia nilotica* and Phogat et al. (1994) recorded its seasonal incidence, and effects on growth and grain yield. Beeson (1938) and Kalia and Lal (1999) reported its damage on *Dalbergia sissoo*. Brief surveys conducted at Jammu on the four species of amaranthus namely *A. caudatus, A. spinosus, A. gangeticus* and *A. viridis* grown for green vegetables revealed its pest status. Hence detailed studies were made on this weevil on *A. caudatus* towards its biology and the results are presented herein.

MATERIAL AND METHODS

Collections were made from five different sites viz., Bhainchh, Kanoyian, Poonch, Khanetar and Lassana from Poonch district of Jammu, and rearings were made through culture on potted caged plants. Adults though copulated did not oviposit in captivity and oviposition alone was studied in the fields through field cages. The incubation period was determined from freshly laid eggs. These eggs were placed in the niches and on the moist filter papers in petridishes to prevent their desiccation before studying them for hatching.

In order to determine the individual larval periods cellular rearing was done in the field plants. Freshly oviposited places on previously uninfested shoots were covered by thin wire mesh cages and examined regularly. From the collected data only the total larval period could be derived; to determine the larval instars, newly hatched larvae and the subsequent larvae of different age groups and size were utilized, and subjected to Dyar's law for analysis.

To determine the pupal period matured larvae collected from the infested plants were observed at intervals till the emergence of adults. For morphological studies, eggs, larvae, pupae and adults were preserved in 90 percent ethyl alcohol.

The mode and extent of damage caused by the adults and larvae were studied by visual observations of the symptoms and by counting the number of damaged plants during May to September when the attack on plants was easily discernible. Infestation was observed by taking into consideration five localities viz., Mandi, Draba-Bufliaz, Bhainchh, Khanetar and Jhullas; localities were selected on the basis of endemic nature and occurrence of pest. At each locality 5-7 plots were considered; minimum 55 to maximum 132 plants were observed in each plot. A total of 2596 plants were observed out of which 1717 were found to be damaged and percentage infestation was calculated.

OBSERVATIONS AND DISCUSSION

Distribution: The results of the present study and the persual of the literature reveal the distribution of the weevil in Poonch and Rajouri; subtropical region of Sunderbani, Nowshera, Kalakote, Rajouri, Manjakote, Balakote, Mendhar and Haveli. Punjab in the West to Myanmar border in the East and Bihar in the North to Madras in the South, besides, Pusa, Coimbatore, Dehra Dun and Kolkata (Ahmed, 1939); New Delhi (Phogat et al., 1994; Butani and Jotwani, 1983); Jabalpur, Madhya Pradesh (Kalia et al., 1994); Mirzapur, Allahabad, Uttar Pradesh (Agarwal, 1985); Nagpur, Maharashtra (Gupta and Rawat, 1954); Chhatisgarh (Oudhia, 2005); Kanpur, Uttar Pradesh (Mall, 1981); Palampur, Himachal Pradesh (Ramesh, 1994); Assam (Deka and Dutta, 1998); Pant Nagar, Nanital, Uttaranchal (Singh, 1970).

Hosts: It is a polyphagous pest and its grubs form galls on the stem of *Amaranthus* spp., while the adults observed to feed besides various species of *Amaranthus* to a large variety of other host plants.

Pest status: It is a major pest of the cultivated amaranthus, larvae tunnel the stems and adult feed on tender leaves. The maximum number of adults recorded from a single plant (2.6m height) is eight; however a maximum of 49 specimens at different stages of development recorded from a single plant, in the month of June-July. Sometimes as many as 33-35 larvae found attacking on a single plant. Percentage infestation was calculated at Mandi, Draba-Bufliaz, Bhainchh, Khanetar and Jhullas 34.96, 45.4, 82.3, 68.8 and 81.2 respectively showing infestation from 34.96-81.2% with average 62.53±21.40. Results reveal it as a serious pest on cultivated amaranthus. It has also been found a major pest of cultivated amaranthus in Madhya Pradesh and 17-18 grubs were found attacking a single plant (Gupta and Rawat, 1954). Ahmad (1939) collected 155 individuals at different stages of development from a single large plant.

Seasonal occurrence: The weevil breeds from April to October and during other periods undergoes overwintering in cracks and crevices of the walls or sometimes it remains inside the dead remains of the harvested stems and in the stumps in the soil. Maximum oviposition had been observed from June to September. All stages found in the field from May to October with considerable overlapping.

Nature and symptoms of damage: The presence of adults in the field is noticed by the scratched stem branches and eaten up tender margins of leaves (Fig. 1) with careful search revealing adults hidden under the leaves. After about 6-8 days, the mature weevil starts ovipositing by notching out holes with the help of its snout in the tender and succulent branches or in the stem at the axil of the leaves or branches; after ovipositing the mouth of the holes were sealed with an yellowish secretion, which after 2-4 days turn dark-brown or black, which further confirms the attack. The presence of eaten leaves with irregular deeply incised margins visible from a distance is the indication of its severe damage. After 6-7 weeks of larval life, pupal chambers get formed at the basal part of the stem or at the axil of the side branches (Fig. 3), which grow in size and form galls. These galls increase in size considerably with the pupa developing inside. After about two months exit holes of the emergence (Fig. 5) of the adults could be observed and longitudinal splitting of the mature stem, presence of broken stems and plants breaking with even slight winds are symptoms at this stage.

Adults cause appreciable damage through feeding on the leaves, upon the epidermis of the tender stems by making irregular scratches, and sometimes eating up all the inner contents of stem leaving behind only the epidermis and hypodermal tissues. Larvae cause damage through tunneling within the stems in a zig-zag way (Fig. 4), thus reducing the vitality and vigour of the plants and chiefly impairing the standing capacity. Many such stems later rupture longitudinally thus exposing to the risk of desiccation; sometimes even 2-3 tunnels may be seen in transverse sections of the stem (Fig. 6). At the places where the larva prepares its pupal chamber, the stem walls become thickened so as to form galls. The adults emerge by biting holes through these galls. As a result, the stem becomes very weak and breaks down at such places during heavy winds; such plants often lie prostrate on the ground and dry up. Similar observations had earlier been recorded by Pruthi (1937), Ahmad (1939), Gupta and Rawat (1954), Butani and Jotwani (1983), Agarwal (1985), Phogat et al. (1994), Kalia et al. (1994), Kalia and Lal (1999) and Oudhia (2005) from various parts of India. The percentage of infestation is low in the temperate belt and high in the subtropical region, extending to 62.5 percent. In Madhya Pradesh, Kalia et al. (1994) observed that the adults feed on tender leaves and shoots of *Acacia nilotica* and damage of seedlings and saplings extend up to 25 percent.

Life history

Emergence: The weevil has a slow and steady development with overlapping generations, fresh adults starting emergence from June to November without any interruption. Synchronized breeding with the growth of the host plant had been observed with adults seen from fourth week of March to second week of November.

Mating behaviour: After few minutes (5-10 min.) of courtship, the male succeeds in riding over the female, which was then held firmly by its legs and antennae, with mating taking place a number of times. Adults are almost sexually matured upon emergence itself and therefore, premating and preoviposition periods are lacking. Mating lasted for about 60 to 90 min. sometimes upto 4-5 hours during night. Oviposition was observed immediately upon copulation. In Uttar Pradesh, adults remain in copulation for 2-5 hours; females copulate with more than one male and after resting for 20 min. to one hour, the impregnated female starts ovipositing which continued for 4-10 days (Agarwal, 1985). With slight disturbance the copulating pair falls to the ground intact in copulatory posture but sometimes they separate and feign death.

Oviposition behaviour: Immediately after copulation or sometimes 20-40 min. after copulation, the female makes a hole, 1-2 mm deep in the tender branches or in the petiole or in the midrib of the leaves, with its mouth parts and rostrum, afterwards turns around and deposits a single egg therein (Fig. 8). The hole is narrower near the opening and broader at the base and its mouth is plugged with a sticky secretion, spread into an oval flap. When fresh, this flap is dull green, thus making it difficult to make out the location of oviposition without careful examination of the twig. After 2-4 days, the flap becomes black, but by this time the egg hatches and the grub bores into the stem. Some similar observations had earlier been recorded by Ahmad (1939), Gupta and Rawat (1954) and Agarwal (1985). It has also been observed that the older branches of the plants, which are usually hard and somewhat dry, are avoided for oviposition and hence no egg recorded in October-November.

Egg (Fig. 7)**:** Freshly laid eggs oval with both ends rounded, surface smooth, shiny, soft, translucent and light yellow, measuring 1.25 ± 0.03 mm long ranging between 0.90-1.46 mm and 0.81 ± 0.02 mm broad, ranging from 0.67-1.05 mm. As development starts, its colour changes to dull yellow. If the egg was removed from the plant and kept on moist filter paper, it fails to hatch.

Egg period: Egg period varies from three to six days in June-July with a mean of 4.2 ± 0.36 days, with egg hatching into a small, apodous, creamish white grub. Variations had been observed in egg period recorded in different parts of the country; Uttar Pradesh, from 3-5 days (Agarwal, 1985), Madhya Pradesh, 2-4 days (Gupta and Rawat, 1954); did not hatch at all if removed from the niche, whereas at room temperature in March and November, egg period lasted for 10-12 days but if kept at constant temperature of 20 ^{o}C and 27 ^{o}C, lasted 10 and 4 days respectively (Ahmad, 1939).

Larva and larval instars (Fig. 9): Five larval instars were recorded in the study. Agarwal (1985) observed three larval instars and all looking more or less alike; in Egypt, 5 larval instars observed (Tawfik *et al.*, 1976). As there is little difference between the instars description of the first and the final instars and only the measurements of body and head capsule are given in detail.

First instar: Creamish white, body C-shaped, slightly curved at the posterior end, posteriorly narrower, segmentation not clearly demarcated. Head light brown with dark brown, prominent, triangular mandibles. Sparse hairs present on the head capsule and on the elongate posteriorly tapering body. When taken out of the niche, larva show ventral curvature and appear C-shaped. Body measures 1.01-1.98 mm long with a mean of 1.48 ± 0.13 mm and 0.45 -0.67 mm wide with a mean of 0.58 ± 0.03 mm. Head capsule measures 0.48 -0.60 mm long averaging 0.53 ± 0.02 mm and 0.41 -0.56 mm wide averaging 0.47 ± 0.02 mm.

Second instar: Similar to the first instar except for the body segmentation clearly demarcated; three thoracic segments with prominent pedal lobes and hairs, and nine abdominal segments; all segments nearly equal in size except the last two being elongate and narrow. Body measures 2.81 ± 0.26 mm long ranging between 2.17 -3.50 mm and 0.78 ± 0.04 mm wide ranging between 0.63 –0.90 mm. Head capsule measures 0.61 ± 0.05 mm long ranging between 0.48 – 0.78 mm and 0.61 ± 0.01 in wide ranging between 0.56 – 0.63 mm.

Third instar: Similar to second instar except increase in size and presence of transverse rows of hairs dorsally in each segment. Head dark brown with sparse, long hairs. Body measures 5.33 ± 0.33 mm long ranging between 4.00 – 6.00 mm and 1.67 ± 0.16 mm wide ranging between 1.01 - 2.00 mm. Head capsule measures 1.00 ± 0.08 mm long ranging between 0.63-1.23mm and 1.05 ± 0.09 mm wide ranging between 0.63 -1.31 mm.

Fourth instar: Similar to the third instar except for body size and eight pairs of spherical spiracles clearly visible, one pair of spiracle present laterally in the inter-segmental area between pro and mesothorax, abdomen has seven pairs of small spherical spiracles with brown margin, laterally on 1-7 segments. Length varies between 7.00 -10.00 mm averaging 8.33 ± 0.53 mm and width between 2.00 – 3.00 mm averaging 2.44 ± 0.18 mm. Head capsule measures 1.25 ± 0.03 mm long ranging between 1.12-1.42 mm and 1.27 ± 0.05 mm wide ranging between 1.01-1.50 mm.

Fifth instar: Full grown larva measures on an average 14.70 ± 0.42 mm long ranging between 3.00 -16.00 mm and 4.05 ± 0.05 mm wide ranging between 4.00 -4.50 mm. Body stout, creamish white, apodous, elongate, cylindrical and when taken out of the gall show typical curvature, becomes C-shaped with posterior end slightly narrower. Head fairly well sclerotized, provided with mandibulate mouth parts. Head dark brown with sparse, long hairs and measures 1.86 ± 0.04 mm long ranging between 1.68 -2.06 mm and 1.98 ± 0.04 mm wide ranging between 1.68 -2.13 mm. Mandibles strong, black, triangular and bidentate. Thorax with three segments, each with a pair of cushion-like pedal lobes on the ventral side, and slightly broader than abdominal segments with transverse rows of hairs dorsally one each in every segment. Abdomen large, prominent, nine segmented slightly narrowing posteriorly. First seven segments similar in size, eighth and ninth narrow and rounded. Sparse hairs present all over the body. One row of long hairs in each segment dorsally. Laterally eight pairs of small spherical spiracles clearly visible. One pair in the segmental groove between pro and mesothoracic segment and seven pairs each in first seven abdominal segments.

Larval period: Total larval period on *Amaranthus caudatus* vary between 42-45 days with a mean of 43.6 ± 0.45 days in the month of June-July. In Madhya Pradesh, however the larva becomes fulfed in 20-24 days in October-November and in 12 days in May (Gupta and Rawat, 1954); grub period lasted for 20-65 days, being longer in winter (Butani and Jotwani, 1983); Ahmad (1939) observed that larvae that hatched between 26th March and 12th April pupated after 40-65 days, and those that hatched at the end of October or beginning of November overwintered in the larval stage.

Feeding behaviour: Immediately after emergence, the larva begins to feed on the internal tissues, making its way into the stem in the form of an irregular zig-zag tunnel, filling it with excreta as it bores down. Larva moves by wriggling movements along the tunnel. Nearly all the pith region gets completely eaten up and it goes on tunneling downwards until fully fed and gets ready for pupation. Galls get induced as a small spherical or oval swelling on the main stem and thick branches or at the places of bifurcations of branches. These galls are regular, subglobose, oval or fusiform, hollow, hard, unilocular, persistent, thick, wartly, having pale brown, short evaginations and longitudinal ridges on the surfaces formed by the withering of the epidermis (Fig. 3). It grows gradually till adult emerges, appears ovoid, tapering gradually towards the distal ends; even after the insect emergence, the gall grows and increases in size so long as the branch bearing it grows in diameter. The size of a mature gall was usually 2.0 to 4.0 cm long with a mean of 3.50 ± 0.16 cm, and 1.0 to 2.5 cm wide with a mean of 1.87 ± 0.10 cm. Galls were concolorus with stem, young galls green but with the growth of the shoot they become pale yellow, old gall from which the adult has emerged shows a rounded or slightly oval exit hole, this passage was cut by the adult for its exit and measures 5.60 ± 0.31 mm long ranging between 4.0 to 8.0 mm, and 3.83 ± 0.19 mm wide, ranging between 3.0 to 5.0 mm.

Pupation: Full grown larva before pupation bores its way upto the stem surface, where a small round hole is made leaving the thin epidermis layer intact. A hole gets formed either at the level of the soil surface or at the axil of basal branch, the hole being intended for the emergence of the adult. At the same place, subsequently the larva encarves elongate oval pupal chamber which afterwards swells up and develops a large gall. Pupal chamber greyish brown, hard, compact, made out of frass and execreta, within which the mature larva pupates. At such places of pupation the stem was found to get swollen and galls get induced (Fig. 3). Pupal chamber measures 16.3 ± 0.04 mm, varying from 13.0 -20.0 mm long, and 4.70 ± 0.13 mm wide varying from 4.0-5.0 mm.

Pupa (Fig. 10): Exarate, naked, with all its appendages distinctly visible and freely projecting on the ventral surface. Creamish white in the beginning but gradually turning pale yellow. Head light brown with yellowish median line, and ventrally prolonged rostrum which was cylindrical and touches forecoxae. Eyes prominent, black, present at the base of the rostrum. A pair of geniculate antennae present on either side of the rostrum and segmentation not clearly demarcated. Sparse hairs present on the head. Thorax three segmented, creamish yellow with two wing pads, and three legs folded on the ventral side. Abdomen prominent, nine segmented, with posterior end narrower. All segments have dorsal transverse row of setae at the middle. Fine sparse hairs present all over the body. Setae in the eighth segment well developed and pupillated structures present. Last segment narrow, ventrally curved with two black curved anal setae on either side of the anal opening. Six spherical brown spiracles visible from segment 2-7. Pupa measures 12.88 ± 0.18 mm long, varying between 11.0 -15.0 mm and 3.84 ± 0.07 mm wide varying between 3.0 -4.00 mm. Total pupal period lasts 13.5 ± 0.43 days, varying between 12-15 days in June-July. Earlier studies recorded that pupal period lasted for 9-10 days at 27 ^{O}C in April and 20-24 days at 20 ^{O}C (Ahmad, 1939); 10 days in summer and 14-18 days in October-November (Gupta and Rawat, 1954); 9-24 days, usually during summer but even longer in winter (Butani and Jotwani, 1983) and 7-10 days during summer (Agarwal, 1985). Pupa ultimately transforms into adult (Fig. 2, 11) and emerges out from the pupal chamber through the emergence hole made by the mature larva. Immatures remain in the pupal chamber for 5-9 days averaging 6.9 ± 0.46 days and finally mature adult emerges out, which was pale brown to start with and gradually changes to dark reddish brown with a bloom in the form of faint ashy marks begins to appear over the elytra and prothorax afterwards.

Adult description (Fig. 12)**:** Adults dark brown, variegated with white hairs and several dark patches of dense pubescence. Body medium sized measuring 11.70 ± 0.27 mm varying from 9.0 - 14.0 mm long and 3.57 ± 0.08 mm wide varying from 3.0 -4.0 mm. Females slightly larger than males. Head prognathus, being broad at the base and extended greatly into a pronounced rostrum, anteriorly at the tip of rostrum. Chewing and biting type of mouth parts present; mandibles prominent, black and bidentate. An oblique scrobe present on either side of the rostrum for the scape of the antennae. Eyes large, well developed, black located at the base of rostrum on either side. Antennae geniculate, fourteen segmented, present on either side of the snout arising from anterior one third of the snout; scape narrow, elongate and broader at the apex; first segment of funicle broader than second, but longer than first; club broad in the middle with pointed tip. Thorax highly sclerotized, fairly large, prothoracic sclerites fused to form an undivided annular band. Forewing modified into highly chitinized elytra, which cover completely the hindwing and extend upto the tip of abdomen dorsally. Dorsally on each elytron there are longitudinal rows of pits which are also clearly visible on pronotum. Laterally there are grooves longitudinally but covered with dense white hairs. Scattered pits on the thoracic region with shining spots. Legs almost similar in structure and size; coxae round, trochanter triangular; femur large, stout roughly cylindrical; tibia narrow at the base and broad at the apex with ventral spine; tarsi four in number, first three bear ventral hairy pads and fourth elongated with two ventrally curved, pointed claws. Abdomen dorsally completely covered by the elytra; from ventral side five segments clearly visible and uniformly dirty white. Though very sluggish and disinclined to fly, adult is quite alert in noticing an approaching hand. By a little but prompt movement it just turns around the stem away from the hand and gets concealed by falling on the ground and feigning death. On falling down it lies ventral surface upwards and legs stretched out. The ventral surface being uniformly dirty white, matches exactly with the ground colour and thus seems to offer a successful protection against enemies.

Number of generations: Total lifecycle takes 58-64 days with a mean of 61.10 ± 0.71 days, there are at least three generations from April to November. Similar observations were recorded earlier (Pruthi, 1937; Ahmad, 1939 and Butani and Jotwani, 1983). Grubs that hatched at the end of September, pupated after 45 days in the month of November at the basal part of the host plant and the collection of pre-mature adults from the pupal chambers in the basal parts of host plants confirm that this weevil passed the entire winter in the adult stage. Some of the earlier emerged adults overwinter in cracks and crevices also. Sometimes adult remains inside the dead remains of the harvested stems and in the stumps in the soil. However in other parts of India, some earlier workers has observed that the individuals of last generation overwinter in all stages (Pruthi, 1937; Ahmad, 1939; Butani and Jotwani, 1983).

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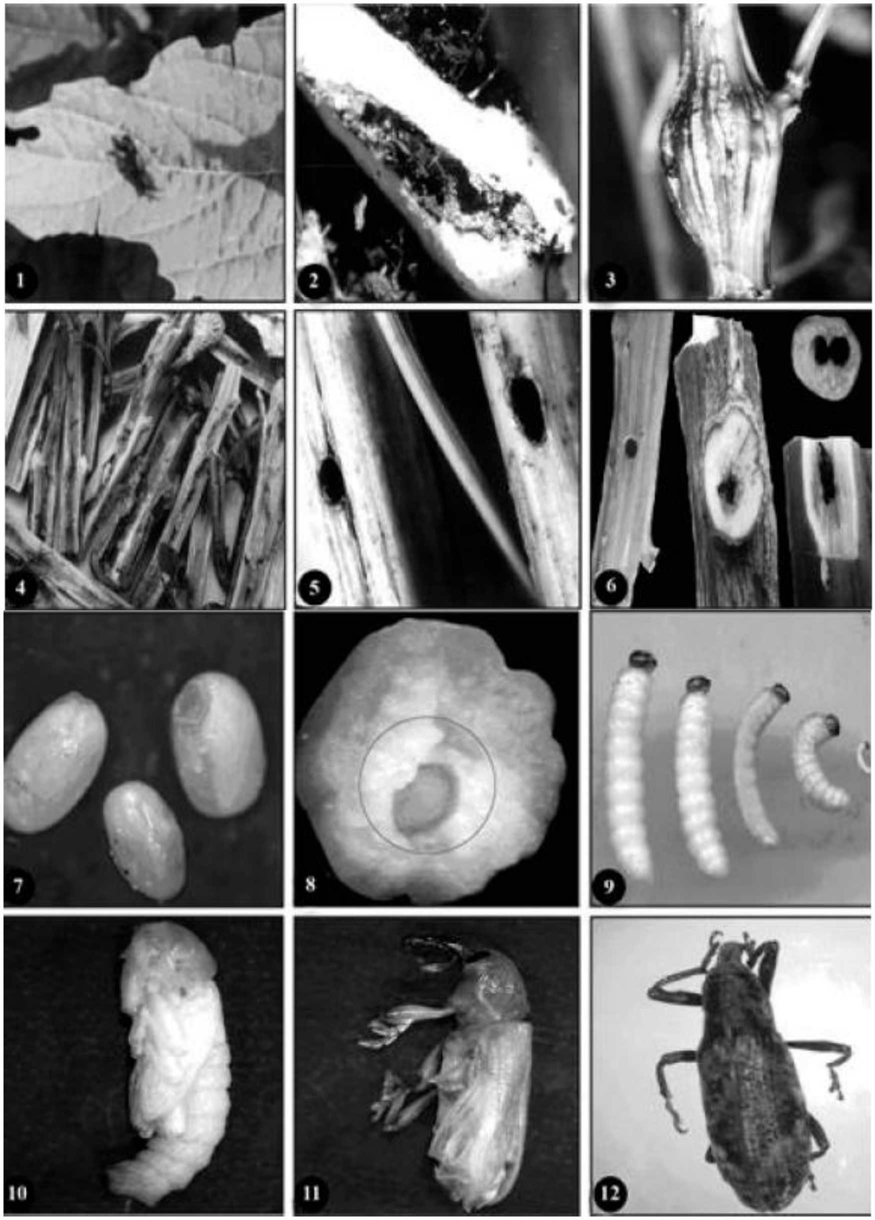

Figs: **1**. Adult damage, **2**. Imago in tunnel, **3**. Gall with larva inside, **4**. Internal galleries formed by larvae, **5**. Exit holes, **6**. Emergence holes and tunnels, **7**. Eggs, **8**. Egg in niche **9**. Larval instar stages, **10**. Pupa, **11**.Adult (young), **12**. Adult (matured).

FAUNISTIC NOTES ON THE SPECIES OF ELATERIDAE (COLEOPTERA) IN İZMİR PROVINCE OF TURKEY

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ABSTRACT: In this study, Elateridae fauna of İzmir province of Turkey was studied and 42 species of 17 genera belonging to six subfamilies of Elateridae were recorded. Among them, 28 species were evaluated as the first record in İzmir fauna.

KEY WORDS: Elateridae, fauna, İzmir, Turkey, new record

Elateridae is one of the largest families of Coleoptera with more than 10 000 described species in approximately 750 genera worldwide. Species of this family are distributed around the world except for polar zones and high mountain ranges covered with snow (Laibner, 2000). Bodies of adults are more or less convex, elongate or broadly ovoid, often oblong, more rarely markedly slender or wide and flat. Body length is a little more than 2 mm and the maximum size is about 80 mm.

From the economic standpoint, most species are inconsequential. Larvae of a few species prey on some forest pests and can be considered useful. However, their control on forest pests is not considered important because they had consumed less food. Some phytophagous species attack radicles and young roots, thus preventing germination or causing weakness of plant (Laibner, 2000). Furthermore, beetles of family Elateridae play a major role in the dead wood habitat. They are known as click beetles because they are able to jump with a spring-like click when they are on their backs (Dajoz, 2000).

There are some descriptions and faunistical records on Turkish elaterids in the entomological literature. After the publication of Heyden Catalogue (Heyden et al., 1906), many species were listed from Turkey by Sahlberg (1912-1913), Winkler (1924-1932) Schenkling (1925-1927). Later Leseigneur (1972), Gül-Zümreoğlu (1972), Tarnawski (1984), Guglielmi & Platia (1985), have included some other species to the fauna of Turkey. Additional records can also be found in many studies of Platia & Schimmel (1992, 1993, 1994), Platia & Gudenzi (1996, 1998, 2000, 2002), Cate & Platia (1997), Lodos (1998), Cate et al. (2002), Dusanek & Mertlik (2004), Kabalak & Sert (2005), Platia & Kovancı (2005), Kesdek et al. (2006), Platia et al. (2007), Löbl & Smetana (2007) and Mertlik & Platia (2008) on the Elateridae fauna of Turkey. These studies contain many species determined both from the province of İzmir and from whole Turkey. In the studies of Sahlberg (1912-1913), Schenkling (1925-1927), Gül-Zümreoğlu (1972), Guglielmi & Platia (1985), Cate & Platia (1997) and Platia & Gudenzi (1998, 2000, 2002) some species of Elateridae from İzmir province have been reported.

This paper has been prepared in order to give some additional information after the completion of PhD project of the first author on the fauna of İzmir province.

MATERIAL AND METHODS

Material have been collected mainly by sweeping net and knock down methods as well as sticky yellow traps, bait traps and pitfall traps. Material have also been collected by hand on the ground, under stone, under the bark of trees during the field studies conducted in İzmir province in 2003-2005.

In addition to these, material collected during 1960-1999 and housed in the collection of LEMT (Lodos Entomological Museum, Turkey) at the Department of Plant Protection, Faculty of Agriculture, Ege University, Bornova, İzmir, Turkey have been evaluated in this study.

All taxa have been given in subfamilies according to Laibner (2000) and arranged in alphabetical order within each subfamily. For each species, information on the name of locality, date of collection, plant or place on which the material collected, and the number of species have been given in brackets.

RESULTS

In this study, 42 species of 17 genera belonging to six subfamilies of Elateridae have been given.

Pyrophorinae Candéze, 1863

Aeoloderma crucifer (Rossi, 1790)

Material examined: Ödemiş-Gereli, 25.i.1972, *Cydonia* sp., (6); **Seferihisar**-Sığacık, 23.xii.1971, *Zea mays*, (4). Totally 10 specimens. This species is the first record for İzmir fauna.

Calais parreyssi (Steven, 1830)

Material examined: Balçova, 20.vi.1981, weeds, (1); **Balçova**-Teleferik, 02.v.1978, *Pinus* sp., (1); **Bornova**-Çiçekli, 23.v.1999, (1); **Kemalpaşa**-Çambel, 22.vi.2004, bait trap, (1); **Kemalpaşa**-Kurudere, 16.iv.2003, *Pinus* sp., (1). Totally 5 specimens. This species is the first record for İzmir fauna.

Drasterius bimaculatus (Rossi, 1790)

Material examined: Bornova, 05.ix.1963, light trap, (3), 06.vi.1975, *Populus* sp., (1); **Kemalpaşa**, 21.ii.1972, *Pyrus communis*, (1), 17.v.2005, sticky yellow trap, (1); 24.v.2005, sticky yellow trap, (1); **Kemalpaşa**–Armutlu, 12.ix.2003, pitfall trap, (3); **Kınık**, 18.v.1973, apiaceous plants, (1); **Kiraz**, 25.i.1972, under stone, (1); **Menderes**-Gümüldür, 01.i.1972, on the ground, (3); **Ödemiş**, 29.xii.1971, on the ground, (7), under stone, (1); **Seferihisar**, 28.xii.1971, under stone, (1); **Seferihisar**-Sığacık, 23.xii.1971, *Zea mays*, (2); **Urla**, 01.i.1972, on the ground, (1). Totally 27 specimens. Previously, this species recorded from İzmir by Sahlberg (1912-1913), Gül-Zümreoğlu (1972) and Guglielmi & Platia (1985).

Lacon punctatus (Herbst, 1779)

Material examined: Bergama-Kozak, 03.vii.2003, *Salix* sp., (1); **Beydağ**, 04.v.2004, *Pinus* sp., (1); **Bornova**, 13.v.1962, (1), 03.ii.1972, *Olea europaea*, (1); **Bornova**-Çiçekli, 04.ix.1999, (1), 21.x.1999, (1), 18.xi.1999, (2); **Kemalpaşa**, 21.ii.1972, *Pyrus communis*, (1), 04.ii.2003, *Olea europaea*, (1); **Kemalpaşa**-Armutlu, 27.iv.2004, *Prunus avium*, (1); **Kemalpaşa**-Kurudere, 16.iv.2003, *Pinus* sp., (7), 12.xii.2003, under stone, (2), 01.iii.2004, under bark, (8); **Kemalpaşa**-Nif Mountain, 25.v.2004, under bark, (1); **Ödemiş**-Bozdağ, 30.iv.2003, *Pinus* sp., (1); **Seferihisar**, 30.iii.2004, under stone, (1). Totally 31 specimens. This species is the first record for İzmir fauna.

Denticollinae Stein & Weise, 1877

Athous haemorrhoidalis (Fabricius, 1801)

Material examined: Ödemiş-Bozdağ, 20.v.1970, poaceous plants, (1), 18.v.2004, *Prunus persica*, (1). Totally 2 specimens. This species is the first record for İzmir fauna.

Athous vittatus (Fabricius, 1792)

Material examined: Çeşme, 01.v.2005, *Pelargonium* sp., (1); **Ödemiş**-Bozdağ-Büyükçavdar, 19.vi.2003, *Juglans regia*, (1). Totally 2 specimens. This species is the first record for İzmir fauna.

Hemicrepidius hirtus (Herbst, 1784)

Material examined: Ödemiş-Bozdağ-Büyükçavdar, 19.vi.2003, *Urtica* sp., (2). Totally 2 specimens. This species is the first record for İzmir fauna.

Cardiophorinae Candéze, 1859

Cardiophorus antennalis Germar, 1843

Material examined: Ödemiş, 25.iv.1973, *Crataegus* sp., (2). Totally 2 specimens. This species is the first record for İzmir fauna.

Cardiophorus cyanipennis Mulsant & Wachanru, 1852

Material examined: Bornova, 20.iv.1977, (1); **Çeşme**, 12.v.1984, weeds, (1); **Narlıdere**, 11.ii.1972, *Olea europea*, (1); **Kemalpaşa**-Ören, 08.i.1999, sticky yellow trap, (1); **Ödemiş**, 24.i.1972, *Platanus* sp., (1), 24.iv.1973, weeds, (2); **Ödemiş**-Bozdağ, 24.v.1978, *Pinus* sp., (1). Totally 8 specimens. This species is the first record for İzmir fauna.

Cardiophorus discicollis (Herbst, 1806)

Material examined: Balçova, 11.vii.1971, *Amygdalus communis*, (5); **Bayındır**, 24.iv.1973, *Crataegus* sp., (1); **Bayındır**-Söğütören, 28.v.2003, *Pyrus elaeagnifolia*, (1); **Bergama**, 14.v.1971, weeds, (1); **Bornova**, v.1962, (1); **Kemalpaşa**, 08.v.1969, weeds, (1); **Kiraz**, 04.iv.2004, *Onopordum* sp., (3); **Menderes**-Gümüldür, 09.iv.1973, weeds, (1); **Ödemiş**, 24.iv.1973, *Rubus* sp., (2); **Ödemiş**-Bozdağ, 18.v.2004, *Mespilus germanica*, (2), *Prunus persica*, (4). Totally 22 specimens. This species is the first record for İzmir fauna.

Cardiophorus nigratissimus Buysson, 1891

Although this species has been recorded from İzmir by Sahlberg (1912-1913) and Guglielmi & Platia (1985), it has not been collected in this study.

Cardiophorus rotundicollis Frivaldszky, 1845

Material examined: Bayındır, 14.iv.1967, weeds, (1); **Menderes**-Gümüldür, 09.iv.1973, weeds, (4); **Menderes**-Gümüldür, 09.iv.1973, (1); **Seferihisar**, 20.iv.1972, *Matricaria* sp., (1). Totally 7 specimens. Recently, this species was recorded from İzmir by Platia & Gudenzi (2002).

Cardiophorus ruficollis (Linnaeus, 1758)

Material examined: Ödemiş-Bozdağ, 30.iv.2003, *Pinus* sp., (1). Totally 1 specimen. This species is the first record for İzmir fauna.

Cardiophorus ruficruris (Brullé, 1832)

Material examined: Bayındır, 14.iv.1967, weeds, (2); **Ödemiş**, 24.iv.1973, *Rubus* sp., (7). Totally 9 specimens. This species was recorded from İzmir by Platia & Gudenzi (2002).

Cardiophorus sacratus Erichson, 1840

Material examined: Ödemiş, 14.v.1970, weeds, (2). Totally 2 specimens. Previously, Sahlberg (1912-1913) and Guglielmi & Platia (1985) recorded this species from İzmir.

Cardiophorus syriacus (Linnaeus, 1758)

Material examined: Balçova-Trazlı, 18.iv.2005, under stone, (1); **Bornova**, 09.iv.2005, shrubs, (1). Totally 2 specimens. This species is the first record for İzmir fauna.

Cardiophorus vestigialis Erichson, 1840

Material examined: Narlıdere, 11.ii.1972, *Pyrus elaeagnifolia*, (1); **Ödemiş**, 24.i.1973, *Platanus* sp., (1); **Seferihisar**, 20.iv.1972, *Cydonia vulgaris*, (4). Totally 6 specimens. This species is the first record for İzmir fauna.

Dicronychus cinereus (Herbst, 1784)

Material examined: Kemalpaşa-Armutlu, 27.iv.2004, *Prunus cerasus*, (1), *Rubus* sp. (3); **Kemalpaşa**-Yukarıkızılca, 11.vi.2003, *Juglans regia*, (2); **Ödemiş**-Bozdağ, 24.v.1972, *Castanea sativa*, (1), *Crataegus* sp., (1), 24.v.1978, *Castanea sativa*, (1), 15.vi.2004, *Castanea sativa*, (1); **Ödemiş**-Hacıhasanlı, 01.vi.2004, *Castanea sativa*, (1), *Prunus cerasus*, (4). Totally 15 specimens. This species is the first record for İzmir fauna.

Dicronychus rubripes (Germar, 1824)

Material examined: Ödemiş-Bozdağ, 24.v.1972, *Crataegus* sp., (1), 14.v.1973, weeds, (1), 24.v.1978, *Pinus* sp., (4). Totally 6 specimens. This species is the first record for İzmir fauna.

Negastriinae Nakane & Kishii, 1956

Quasimus minutissimus (Germar, 1822)

Although this species has been recorded from İzmir under the name of ***Hypnoidus minutissimus*** by Sahlberg (1912-1913), it has not been collected in this study.

Zorochros alysidotus (Kiesenwetter, 1858)

Material examined: Kemalpaşa, 17.v.2005, sticky yellow trap, (1); **Kemalpaşa**-Armutlu, 12.ix.2003, pitfall trap, (2); **Kemalpaşa**-Ören, 21.viii.1994, sticky yellow trap, (1), 01.vi.1998, pitfall trap, (1), 02.xi.1998, sticky yellow trap, (1); **Kemalpaşa**-Örnekköy, 12.ix.1994, sticky yellow trap, (1). Totally 7 specimens. Sahlberg (1912-1913) recorded this species from İzmir under the name of ***Hypnoidus alysidotus***.

Elaterinae Leach, 1815

Adrastus limbatus (Fabricius, 1776)

Material examined: Bayındır, 28.v.2003, *Prunus persica*, (4); **Kemalpaşa**-Armutlu, 11.vi.2003, *Prunus avium*, (6); **Kemalpaşa**-Ören, 11.vi.2003, *Prunus avium*, (3); **Kemalpaşa**-Yukarıkızılca, 11.vi.2003, *Juglans regia*, (7), *Pinus* sp., (1), *Platanus* sp., (2), *Prunus avium*, (4); **Selçuk**-Belevi, 21.v.2003, *Prunus persica*, (2). Totally 29 specimens. This species is the first record for İzmir fauna.

Adrastus pallens (Fabricius, 1792)

Material examined: Bornova-Pınarbaşı, 03.vi.1970, *Juglans regia*, (15); **Ödemiş**-Pirinçci, 28.v.1969, weeds, (1). Totally 16 specimens. This species is the first record for İzmir fauna.

Adrastus rachifer (Geoffroy in Fourcroy, 1785)

Material examined: Bornova, 07.vii.1978, *Rubus* sp., (1). Totally 1 specimen. Guglielmi & Platia (1985) recorded this species from İzmir.

Agriotes brevis Candéze, 1863

Material examined: Karşıyaka-Bayraklı, vi.1983, weeds, (1); **Ödemiş**-Bozdağ, 29.v.2003, *Castanea sativa*, (1); **Ödemiş**-Bozdağ-Büyükçavdar, 19.vi.2003, *Urtica* sp., (1). Totally 3 specimens. Sahlberg (1912-1913) recorded this species from İzmir.

Agriotes gurgistanus Faldermann, 1835

Material examined: Bornova, 25.iv.1984, weeds, (1); **Ödemiş**-Bozdağ-Büyükçavdar, 17.vii.2003, *Urtica* sp., (2). Totally 3 specimens. This species is the first record for İzmir fauna.

Agriotes kraatzi Schwarz, 1891

Material examined: Ödemiş-Bozdağ-Büyükçavdar, 17.vii.2003, *Urtica* sp., (2); **Seferihisar**-Sığacık, 28.xii.1971, *Zea mays*, (1). Totally 3 specimens. This species was recorded from İzmir by Sahlberg (1912-1913).

Agriotes lineatus (Linnaeus, 1767)

Material examined: Kemalpaşa-Nif Mountain, 25.v.2004, *Juglans regia*, (1); **Ödemiş**-Bozdağ, 29.v.2003, *Prunus cerasus*, (2); **Ödemiş**-Üçler Pass, 18.v.2004, *Pyrus elaeagnifolia*, (1). Totally 4 specimens. This species is the first record for İzmir fauna.

Agriotes paludum Kiesenwetter, 1859

Material examined: Ödemiş, 24.iv.1973, *Matricaria* sp., (2). Totally 2 specimens. This species is the first record for İzmir fauna.

Agriotes turcicus Candéze, 1863

Although this species has been recorded from İzmir by Sahlberg (1912-1913), it has not been collected in this study.

Ampedus elegantulus (Schönherr, 1817)

Material examined: Ödemiş-Bozdağ, 24.v.1978, *Urtica* sp., (1), 30.iv.2003, *Pinus* sp., (1). Totally 2 specimens. This species is the first record for İzmir fauna.

Ampedus elongatulus (Fabricius, 1787)

Material examined: Kemalpaşa, 25.v.2004, under bark, (1); **Kemalpaşa**-Kurudere, 16.iv.2003, *Pinus* sp., (1); **Ödemiş**-Bozdağ, 30.iv.2003, *Pinus* sp., (2). Totally 4 specimens. This species is the first record for İzmir fauna.

Peripontius terminatus (Erichson, 1842)

Material examined: Beydağ, 04.vi.2004, *Rubus* sp., (1); **Bornova**, 10.ix.1983, weeds, (1); **Karaburun**-Mordoğan, 08.vi.2003, *Prunus persica*, (3); **Kemalpaşa**, 15.v.2003, *Juglans regia*, (1); **Kemalpaşa**-Armutlu, 15.v.2003, *Rubus* sp., (3), 11.vi.2003, *Prunus cerasus*, (1), 27.iv.2004, *Prunus cerasus*, (6); **Kemalpaşa**-Çambel, 25.v.2004, *Quercus* sp., (4); **Kemalpaşa**-Nif Mountain, 25.v.2004, *Juglans regia*, (2); **Kemalpaşa**-Ören, 11.v.1999, sticky yellow trap, (1); **Ödemiş**-Birgi, 01.vi.2003, *Cupressus* sp., (1); **Ödemiş**-Bozdağ-Gündalan, 17.vii.2003, *Urtica* sp., (1); **Ödemiş**-Kemerköy, 01.vi.2004, *Quercus* sp., (1); **Ödemiş**-Kırkoluk, 29.v.2003, *Ulmus* sp., (1); **Seferihisar**, 28.xii.1971, under stone, (1). Totally 28 specimens. This species is the first record for İzmir fauna.

Pittonotus theseus (Germar, 1817)

Material examined: Bornova, 02.v.1962, (1), 12.v.1962, (1), 15.vii.1963, (1), 20.vi.1979, (1), 17.vi.1980, under stone, (1); **Çeşme**, 01.vii.2004, light trap, (1), 17.vii.2004, light trap, (1), 02.vii.2005, light trap, (2); **Menderes**- Gümüldür, 06.vi.1977, (2); **Karaburun**, 05.vii.1978, light trap, (1); **Kemalpaşa**-Armutlu, 12.ix.2003, pitfall trap, (1); **Konak**, 07.ii.1960, (3), 25.vi.1973, light trap, (1); **Tire**, 31.vii.1988, (1). Totally 18 specimens. This species is the first record for İzmir fauna.

Synaptus filiformis (Fabricius, 1781)

Material examined: Bornova, 20.iv.1993, weeds, (1); **Bornova**-Pınarbaşı, 03.vi.1970, *Juglans regia*, (1); **Bornova**-Zeytinköy, 12.v.1972, *Juglans regia*, (2); **Ödemiş**, 25.v.1973, *Juglans regia*, (1); **Ödemiş**-Bozdağ, 20.v.1970, *Mentha* sp., (1), 24.v.1978, weeds, (1). Totally 7 specimens. This species is the first record for İzmir fauna.

Melanotinae Candéze, 1859

Melanotus brunnipes (Germar, 1824)

Material examined: Selçuk, 29.vi.1971, *Citrullus vulgaris*, (1). Totally 1 specimen. This species is the first record for İzmir fauna.

Melanotus castanipes (Paykull, 1800)

Material examined: Çeşme, 10.vii.2004, light trap, (1), 02.vii.2005, (1), 09.vii.2005, (3), 16.vii.2005, (2). Totally 7 specimens. This species is the first record for İzmir fauna.

Melanotus crassicollis (Erichson, 1841)

Material examined: Bayındır, 14.v.1973, *Quercus* sp., (1); **Ödemiş**-Birgi, 07.vi.1972, weeds, (1). Totally 2 specimens. Sahlberg (1912-1913) recorded this species from İzmir.

Melanotus fusciceps (Gyllenhal, 1817)

Material examined: Bornova, 18.v.1975, (1), 23.vi.1961, (1); **Karaburun**-Mordoğan, vii.1973, light trap, (1); **Kemalpaşa**, 23.iv.1966, (1). Totally 4 specimens. Guglielmi & Platia (1985) recorded this species from İzmir.

Melanotus punctolineatus (Pélerin, 1829)

Material examined: Bornova, 18.v.1975, (1); **Ödemiş**, 14.v.1973, *Ulmus* sp., (1), 18.iv.1980, *Solanum tuberosum*, (4); **Ödemiş**-Bozdağ, 14.v.1973, weeds, (2). Totally 8 specimens. This species is the first record for İzmir fauna.

Melanotus tenebrosus (Erichson, 1841)

Material examined: Bergama-Kozak Plateau, 03.vii.2004, weeds, (1); **Çeşme**, 21.vi.2003, light trap, (1), 28.vi.2003, (1), 03.vii.2004, (1), 17.vii.2004, (1). Totally 5 specimens. Previously, Sahlberg (1912-1913) and Gül-Zümreoğlu (1972) recorded this species from İzmir.

Melanotus villosus (Brullé, 1832)

Material examined: Çeşme, 05.vii.2003, light trap, (1), 03.vii.2004, (1), 10.vii.2004, (1); **Selçuk**-Şirince, 25.vi.2003, weeds, (1). Totally 4 specimens. This species is the first record for İzmir fauna.

RESULTS

As a results of this study, 42 species of 17 genera belonging to six subfamilies of Elateridae have been reported from İzmir. Twenty eight of them namely *Aeoloderma crucifer*, *Calais parreyssi*, *Lacon punctatus*, *Athous haemorrhoidalis*, *A. vittatus*, *Hemicrepidius hirtus*, *Cardiophorus antennalis*, ***C.*** *cyanipennis*, *C. discicollis*, *C. ruficollis*, *C. syriacus*, *C. vestigialis*, *Dicronychus cinereus*, *D. rubripes*, *Adrastus limbatus*, *A. pallens*, *Agriotes gurgistanus*, *A. lineatus*, *A. paludum*, *Ampedus elegantulus*, *A. elongatulus*, *Peripontius terminatus*, *Pittonotus theseus*, *Synaptus filiformis*, *Melanotus brunnipes*, *M. castanipes*, *M. punctolineatus* and *M. villosus* have been determined for the first time in İzmir province.

Among them, *Lacon punctatus*, *Adrastus limbatus*, *Peripontius terminatus*, *Drasterius bimaculatus* and *Cardiophorus discicollis* were the abundant and widespread species. Separately, *Aeoloderma crucifer*, *Dicronychus cinereus* and *Pittonotus theseus* were the other common species.

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A STUDY ON THE HETEROPTERA FAUNA OF SHEND ABAD REGION AND ENVIRON (IRAN)

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ABSTRACT: During 2006-2007, in the course of faunistic survey of Heteroptera in Shend Abad region and environ (located in East Azarbayjan in Iran), 38 species belonging to 14 families were collected and identified. All species are first records from the region.

KEY WORDS: faunistic, Heteroptera, Shend Abad, first record.

The Heteroptera insects feed on plant juices or live as predators. Many of such insects that feed on the plant are known as serious plant pests (Safavi, 1973).

Many species of true bugs catch other insects and Acarina, and have many benefits from an agricultural point of view (Linnavuori & Hosseini, 2000).

MATERIAL AND METHODS

Shend Abad is one of the most important agricultural regions in East Azarbaijan province in Iran. This region (38º, 8' N, 45º, 37' E) is located in the northwest (71 kilometers) of Tabriz.

Research of the Heteroptera was performed in the period of 2006 to 2007. Samples have been taken from different parts of Shend Abad region and environ.

The true bugs were collected by sweeping net, light trap, aspirator and also some specimens trapped by hand. The specimens were put into jars filled with 70% alcohol. All collected specimens were mounted. The material housed in the collection of Agriculture Faculty of Tabriz University in Iran.

All specimens were identified by the authors and confirmed by foreign experts.

RESULTS

In this study thirty eight species belonging to fourteen families of the Heteroptera have been studied.

Family Notonoctidae Latreille, 1968

***Notonecta glauca* Linnaeus, 1758**

Material examined: Shend Abad: 1 specimen, August 2006. From water.

Family Tingidae Laporte, 1877

***Stephanitis pyri* (Fabricius, 1775)**

Material examined: Koushk: 6 specimens, May 2006; **Shend Abad:** 11 specimens, June 2007. From apple orchards.

Note: This species has been collected from different regions of Iran on apple, pear, cherry, peach, japans quince, pyrus, white-thorn, plum, roses, malus, cerasus, alder, oak (Modarres Awal, 2002).

Family Miridae Hahn, 1831

***Adelphocoris lineolatus* Geoze, 1778**

Material examined: Shend Abad: 10 specimens, June 2006. On lucerne.

Note: The species has generally distribution in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal, 2002).

***Deraeocoris punctulatus* (Fallen, 1801)**

Material examined: Koushk: 2 specimens, May 2006. On weeds.

***Lygus rugulipennis* Poppius, 1911**

Material examined: Shend Abad: 23 specimens, July 2007. On lucerne.

***Notostira elongata* (Geoffroy 1785)**

Material examined: Shend Abad: 5 specimens, August 2007. On weeds.

Family Nabidae Costa, 1852

***Nabis Pseudoferrus* Remane, 1949**

Material examined: Shend Abad: 3 specimens, April 2006. On weeds.

Note: The species is predator and collected on sainfoin and lucerne (Modarres Awal, 2002).

Family Anthocoridae Fieber, 1836

***Anthocoris nemorum* (Linnaeus, 1761)**

Material examined: Koushk: 5 specimens, May 2007. On *Populus nigra nigra*(L.)

Note: Predator of *Psylla pyricola, Anthonomus pomorum, Euzophera bigella, Hyponomeuta malinellus* and aphids (Modarres Awal, 2002).

***Anthocoris nemoralis* (Fabricius, 1794)**

Material examined: Shend Abad: 3 specimens, May 2007. On weeds.

Note: Predator of aphids and *Psylla pyricola*

Family Reduviidae Latreille, 1807

***Coriomeris affinis* (Herrich-Schäffer, 1839)**

Material examined: Shend Abad: 2 specimens, August 2006. On weeds.

***Ectomocoris ululans* (Rossi, 1790)**

Material examined: Koushk: 3 specimens, June 2006.

Family Lygaeidae Schilling, 1829

***Emblethis ciliatus* Horváth, 1875**

Material examined: Shend Abad: 4 specimens, July 2007. On ground.

***Lamprodema maurum* (Fabricius, 1803)**

Material examined: Shend Abad: 1 specimen, June 2007. On lucerne.

***Lethaeus picipe* (Herrich-Schäffer, 1850)**

Material examined: Koushk: 1 specimen, September 2006. On weeds.

***Peritrechus rhomboidalis* Puton, 1877**

Material examined: Shend Abad: 2 specimens, July 2007. On weeds.

Family Pyrrhocoridae Dohrn, 1859

***Pyrrhocoris apterus* Linnaeus, 1768**

Material examined: Shend Abad: 5 specimens, July 2006. From Helianthus annus L.

Note: The species has been collected from East Azarbaijan, Khorasan, Tehran, Khozestan, Fars, Gilan and Gorgan provinces in Iran (Modarres Awal, 2002).

***Pyrrhocoris marginatus* (Kolenati, 1845)**

Material examined: Shend Abad: 3 specimens, August 2007. On weeds.

Family Stenocephalidae Dallas, 1852

***Dicranocephalus setulosus* (Ferrari, 1874)**

Material examined: Shend Abad: 1 specimen, May 2006. On weeds.

Family Coreidae Leach, 1815

***Coreus marginatus* Linnaeus, 1758**

Material examined: Shend Abad: 4 specimens, August 2007. On weeds.

***Coriomeris scabricornis* (Panzer, 1809)**

Material examined: Shend Abad: 2 specimens, September 2007. On ground.

***Phyllomorpha lacerata* Herrich –Shaffer, 1835**

Material examined: Shend Abad: 1 specimen, June 2006. On ground.

Family Rhopalidae Amyot and Serville, 1843

***Corizus hyoscyami* Linnaeus, 1758**

Material examined: Koushk: 3 specimens, August 2007. On weeds.

***Maccevethus caucasicus* (Kolenati, 1845)**

Material examined: Shend Abad: 1 specimen, March 2007. On ground.

Family Cydnidae Billberg, 1820

***Cydnus aterrimus* Foster, 1771**

Material examined: Shend Abad: 2 specimens, August 2006. Collected by Light trap.

***Tritomegas sexmaculatus* (Rambur, 1839)**

Material examined: Shend Abad: 1 specimens, September 2006. Collected by Light trap.

Family Scutelleridae Leach, 1815

***Eurygaster integriceps* Puton, 1886**

Material examined: Shengel Abad: 5 specimens, July 2007. On wheat.

Note: This species has generally distribution in Iran (Modarrese Awal, 2002).

***Eurygaster maura* (Linnaeus, 1758)**

Material examined: Shengel Abad: 3 specimens, August 2006. On wheat.

Family Pentatomidae Leach, 1815

***Aelia rostrata* Bohemann, 1852**

Material examined: Shengel Abad: 2 specimens, July 2006. On wheat.

Note: Wheat, barley and wild graminae are the host of the species (Modarreas Awal, 2002).

***Antheminia lunulata* (Goeze, 1778)**

Material examined: Shend Abad: 1 specimen, September 2007. On *Populus nigra nigra* (L.)

***Apodiphus amygdali* Germar, 1817**

Material examined: Shend Abad: 2 specimens, June 2007. On *Armenia vulgaris* L.

Note: This species has been collected from Tehran, Fars, Markazi, Kerman, Hormozgan, Semnan, Balouchestan, Esfahan provinces in Iran on poplar, almond, apricot, oriental plane, pistachio, tamarisk, oak, tung(Modarres Awal,2002).

***Brachynema germari* (Kolenati, 1846)**

Material examined: Koushk: 1 specimen, July 2006. On weeds.

***Carpocoris coreanus* Distant, 1899**

Material examined: Shend Abad: 4 specimens, May 2007. From lucerne.

***Carpocoris fuscispinus* (Bohemann, 1849)**

Material examined: Koushk: 3 specimens, September 2006. On lucerne.

Note: The species has distribution in East Azarbaijan, Mazandaran, Zanjan, Tehran, Esfahan, Khorasan, Loretan in Iran on Lucerne, lupine, wheat, sugar-beet(Modarres Awal,2002).

***Carpocoris lunata* Fallen, 1852**

Material examined: Koushk: 5 specimens, June 2006. On weeds.

***Carpocoris purpureipennis* (DeGeer, 1773)**

Material examined: Koushk: 2 specimens, September 2007. On lucerne.

***Graphosoma lineatum* (Linnaeuse, 1758)**

Material examined: Koushk: 3 specimens, June 2006. From cucurbitaceae family plants.

***Neottiglossa irana* Wagner, 1963**

Material examined: Koushk: 1 specimen, August 2006. On weeds.

***Palomena prasina* (Linnaeus, 1761)**

Material examined: Koushk: 1 specimen, July 2007. On ground.

Among the collected species in the study families Miridae and Pentatomidae had the most frequency and families Notonectidae and Stenocephalidae had the least frequency.

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THE GENOTOXIC EFFECTS OF SOME EDIBLE INSECTS ON HUMAN WHOLE BLOOD CULTURES

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[İncekara, Ü. & Türkez, H. 2009. The genotoxic effects of some edible insects on human whole blood cultures. Munis Entomology & Zoology 4 (2): 531-535**]**

ABSTRACT: In this study, we aimed to determine the effects of different aquatic insect extracts on SCE frequency of cultured human blood lymphocytes. With this aim, the heparinized blood samples obtained from two non-smoking individuals with no history of exposure to any toxic agent. The water soluble extracts containing all body parts were sterilized and added to the culture tubes at different concentrations (10-100 mg/L). SCEs were visualized by a combination of Fluorescent and Giemsa (FPG) techniques. In comparison to control sets, the treatments of different concentrations of water soluble insect extracts did not elevate ($p<0.05$) the frequencies of SCEs. Furthermore, the present findings revealed that human blood cultures may be a useful in vitro system for evaluating the mutagenic potential of edible insect species.

KEY WORDS: Edible Insects, Genotoxicity, Human Blood Culture, SCE Test.

Insects have played an important part in the history of human nutrition in Africa, Australia, Asia and the Americas. Insects often contain more protein, fat, and carbohydrates than equal amounts of beef or fish, and a higher energy value than soybeans, maize, beef, fish, lentils, or other beans. As over 1500 different species of insects have been reported as being consumed or edible around the world (Defoliart, 1995; Food-Info, 2009). Of these, *Hydrophilus piceus, Dytiscus marginalis* and *Cybister* sp., treated here, are widely used for human consumption in many countries. *Hydrophilus piceus* is also used in alternative medicine in South–East Asia countries due to anti-diuretic aspects (Jäch, 2003; Rams–Elorduy, 1997; Morris, 2004).

The sister chromatid exchange (SCE) test in peripheral blood lymphocytes is a very sensitive cytogenetic technique and widely used for the evaluating the genotoxicity of many suspected organic and inorganic substances (Perry and Evans 1975). On the other hand, edible insects constitute a very common and important food source in many developing countries although these insects contain powerful pharmacologically active substances, which are known vertebrate toxins (Akinnavo et al. 2002). So eating of these insects may cause as serious harmful effects on humans. In this context the potential toxic effects of these popular edible insects needs to be investigated in more detail. These toxicity researches will also serve to biomedical productions because it is well known that animal toxins may even become important in curing diseases such as cancer. And the genotoxic effects after exposure to extracts of edible insects have not yet been reported. In this study we assessed the genotoxicity in human whole blood cultures treated with six different concentrations (10, 20, 30, 50, 75 and 100 mg/L) of water soluble extracts of *H. piceus, D. marginalis and Cybister* sp. (Figs. 1a,b,c) for the first time by SCE test.

According to our knowledge, no investigation has been carried out on the genetic effects of these edible insects on humans.

MATERIALS AND METHODS

Beetle samples were collected from its natural aquatic habitats in Erzurum province and surroundings (East Anatolia), and killed without any chemical treatment.

Blood samples were obtained by veinpuncture from two non-smoking individuals at the ages of 25 and 29 with no history of exposure to any toxic agent. The extracts of three different insect species were *H. piceus, D. marginalis* and *Cybister* sp. studied and the sterilized extracts were added to the cultures just before incubation for cytogenetic analysis. Treatments of water soluble insect extracts with all part of the body with various concentrations (0, 10, 20, 30, 50, 75 and 100 mg/L) were applied to human blood cultures. With the aim of providing successive visualization of SCEs, 5-bromo-2'-deoxyuridine (Sigma) was added at culture initation. The cultures were incubated in complete darkness for 72 h at 37 °C. Exactly 70 h and 30 min after beginning the incubations, demecolcine (N-Diacetyl-N-methylcolchicine, Sigma) was added to the cultures. After hypotonic treatment (0.075 M KCl), followed by three repetitive cycles of fixation in methanol/acetic acid solution (3:1, v/v), centrifugation, and resuspension, the cell suspension was dropped onto chilled, grease-free microscopic slides, air-dried, aged for three days, and then differentially stained for the inspection of the SCE rate according to fluorescence plus Giemsa (FPG) procedure (Perry and Wolff, 1974). For each treatment condition, well-spread twenty five second division metaphases containing 42 - 46 chromosomes in each cell were scored by one observer, and the values obtained were calculated as SCEs per cell.

Statistical analysis

Statistical analysis was performed using SPSS Software (version 12.0, SPSS, Chicago, IL, USA). The two-tailed Student's *t*-test was used to compare SCE frequencies between treated and control groups.

RESULTS AND DISCUSSION

Twenty metaphases from each culture were evaluated for SCE. The mean±S.D. of the individual frequencies of SCE values in treated and untreated groups are shown in figures 2, 3 and 4. The water soluble extracts of *H. piceus, Cybister sp.* and *D. marginalis* did not cause any statistically important ($p<0.05$) alterations of SCE frequencies dependent upon the number of doses treated.

According to these results, it is revealed that the edible aquatic insect species, treated here, have no mutagenic potential.

Ordinarily, insects are not used as emergency food to ward off starvation, but are included as a normal part of the diet throughout the year or when seasonally available. Eating insects have become more popular day by day around the world, and therefore further investigations on the potential toxic effects of these popular edible insects should be conducted.

ACKNOWLEDGEMENTS

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Figure 1. A) *H. piceus;* B) *D. marginalis;* C) *Cybister* sp.

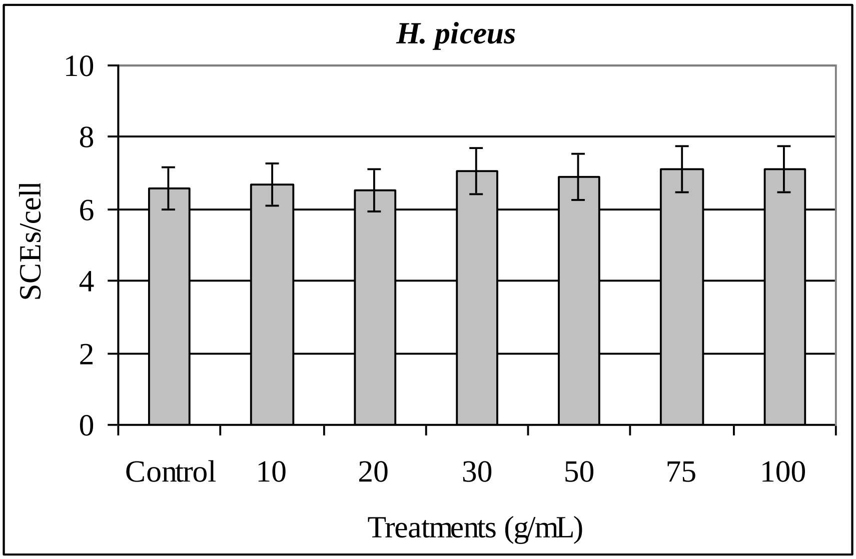

Figure 2. The effects of *H. piceus* extracts on SCE frequency *in vitro*.

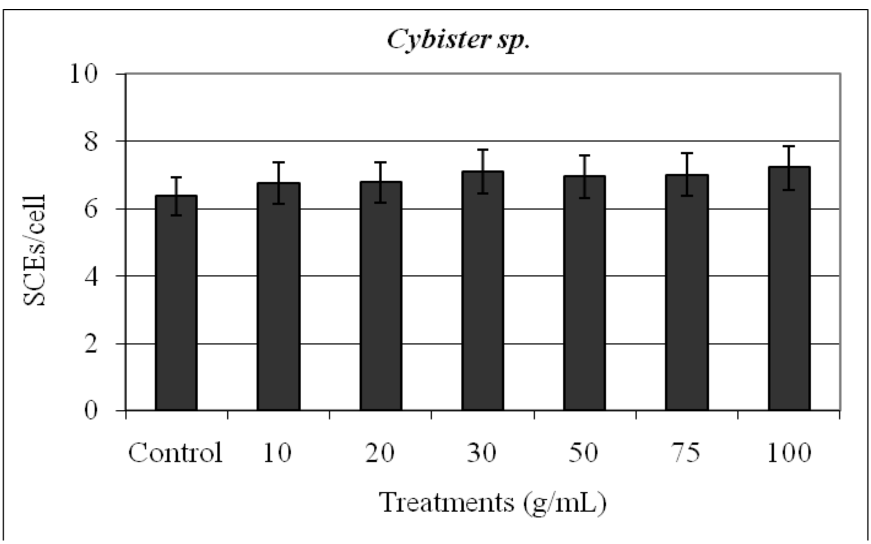

Figure 3. The effects of *Cybister sp.* extracts on SCE frequency *in vitro*.

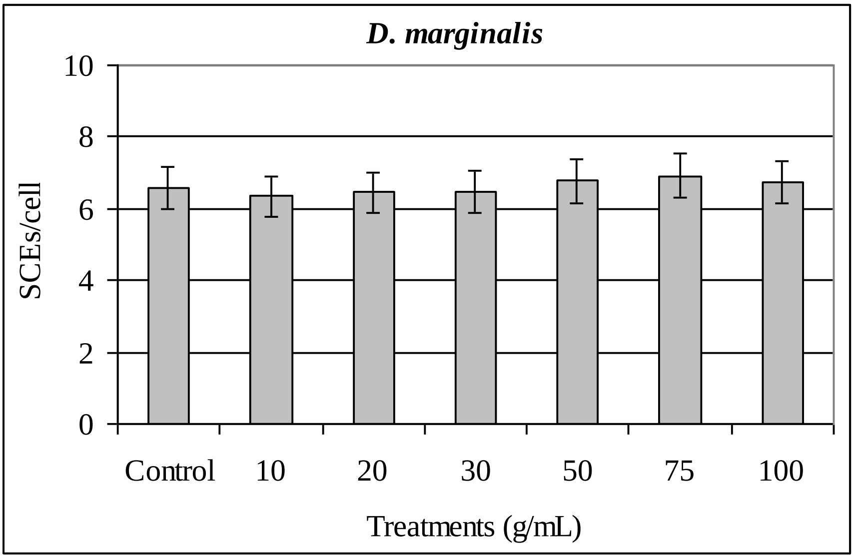

Figure 4. The effects of *D. marginalis* extracts on SCE frequency *in vitro*.

FAUNISTIC STUDIES ON CETONIINAE, DYNASTINAE, MELOLONTHINAE, RUTELINAE (COLEOPTERA: SCARABAEIDAE) GEOTRUPINAE (GEOTRUPIDAE) OF KÜTAHYA PROVINCE, TURKEY.

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[Şenyüz, Y. & Şahin, Y. 2009. Faunistic studies on Cetoniinae, Dynastinae, Melolonthinae, Rutelinae (Coleoptera: Scarabaeidae) Geotrupinae (Geotrupidae) of Kütahya Province, Turkey. Munis Entomology & Zoology 4 (2): 536-541**]**

ABSTRACT: This study was done in the city of Kütahya between 2003 and 2004. *Cetonia aurata, Oxythyrea cinctella, Oxythyrea Funesta, Potasia cuprea, Tropinota hirta, Pentodon bidens, Pentodon idiota, Polyphylla fullo, Blitopertha nigripennis, Geotrupes spiniger, Geotrupes stercorarius* were found. Their chorotypes, distributions in Kütahya, Turkey and world are given. *Cetonia aurata, Oxythyrea Funesta, Potasia cuprea, Pentodon bidens, Pentodon idiota, Polyphylla fullo, Blitopertha nigripennis, Geotrupes stercorarius* were found first time in Kütahya. *Pentodon bidens, Geotrupes spiniger,* and *Blitopertha nigripennis* were found first time in aegean region.

KEY WORDS: Cetoniinae, Chorotype, Coleoptera, Dynastinae, Geotrupinae, Kütahya, Melolonthinae, Rutelinae, Scarabaeidae, Turkey, World.

Turkey, at the centre of Asia, Europe and Africa continents, is located between 26° and 45° east meridians according to Greenwich, between 36° and 42° North paralel according to Ecvator. Some parts of the country belongs to Asia continent (Anadolu Peninsula), and the other belongs to Europe continent (Trakya Region). Also the country is related to Africa continent. According to these features, Turkey has three different bio-geographical regions, namely Europe-Siberian, Mediterranean and Iran-Turan. So, the country is a small continent according to its biodiversity (Lodos, 1995).

There are different migration pathways in Turkey. Some of them passes over Kütahya. This feature is another important subject on biodiversity.

Scarabaeidae is one of the biggest family in Coleoptera order. There have been different studies on Cetoniinae, Dynastinae, Melolonthinae Rutelinae, Geotrupinae subfamily in Turkey. Some of them were Tuatay et al., (1967, 1972), Lodos et al. (1978, 1999), Keith (1998a, 1998b, 1999, 2000a, 2000b, 2001), Rey (1999).

The aim of this study is to determine Cetoniinae, Dynastinae, Melolonthinae Rutelinae, Geotrupinae and the distributions of its members in Kütahya and its surroundings.

MATERIAL AND METHODS

This study was carried out between 2003 and 2004 in Kütahya and its surroundings. The samples were collected by hand and forceps. Then, they were killed by ethyl acetat. Some features of the identified species such as distribution, synonyms were given according to Lobl Lobl and Smetana (2006) and Lodos et al. (1978, 1999).

The samples were identified according to Schaufuss, (1916), Paulian et al., (1959), Balthasar, (1963), by using Olympus SZX9 and then they were checked in Prof.Dr. Niyazi LODOS Musium in Ege University Campus.

RESULTS

Family SCARABAEIDAE Latreille, 1802
Subfamily Cetoniinae Leach, 1815
***Cetonia aurata* Linnaeus, 1761**

Material examined: Bölcek köyü, 25.07.2003, Şenyüz Y. leg. and det., 2 ex.; Dereyalak köyü, 16.08.2003, Şenyüz Y. leg. and det., 1 ex.

Distrubition in Turkey: Adana, Bartın, Bolu, Gaziantep, Karaman, Muğla, Sinop (Zümreoğlu-Gül, 1972, Lodos et al., 1999).

Distrubition in the world: Europe: Albania, Austria¸ Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia¸ Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Netherlands, Norvay, Poland, Romania¸ Russia: Central European Territory, Russia: North European Territory, Russia: South European Territory, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Yugoslavia. **Asia:** Iran, Kazakhstan, Kyrgyzstan, Mongolia, Russia: East Siberia, Russia: West Siberia, Turkey, Uzbekistan, Xinjiang. (Lobl & Smetana 2006).

Chorotype: Asiatic - European. (Carpaneto et al. 2000).

***Oxythyrea cinctella* Schaum, 1841**

Material examined: Bölcek köyü, 25.07.2003, Şenyüz Y. leg. and det., 2 ex.; Dumlupınar Köyü, 26.07.2003, Şenyüz Y. leg. and det., 2 ex.; Domaniç Orman işletmesi mevkii, 31.07.2003, Şenyüz Y. leg. and det., 1 ex.; Porsuk barajı, 05.08.2003, Şenyüz Y. leg. and det., 1 ex.; Erdoğmuş Köyü, 30.07.2003, Şenyüz Y. leg. and det., 3 ex.; Beyköy, 31.07.2003, Şenyüz Y. leg. and det. 1 ex.; Kozcağız köyü, 31.07.2003, Şenyüz Y. leg. and det., 1 ex.

Distrubition in Turkey: Adana, Afyon, Ankara, Antalya, Aydın, Balıkesir, Bartın, Bilecik, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Gaziantep, Hatay, Isparta, İçel, İzmir, Kahramanmaraş, Karabük, Karaman, Kastamonu, Kayseri, Kırıkkale, Kırklareli, Kırşehir, Kilis, Konya, Kütahya, Manisa, Muğla, Nevşehir, Niğde, Osmaniye, Sakarya, Tekirdağ, Uşak (Lodos et al., 1978, Lodos et al., 1999).

Distrubition in the World: Europe: Albania, Armania, Azerbaijan, Bulgaria, Georgia, Greece. Macedonia, Russia: South European Territory, Turkey, Yugoslavia. **Asia:** Afghanistan, Iran, Iraq, Israel, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Pakistan, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Xinjiang. (Lobl & Smetana 2006).

Chorotype: Turano-Mediterranean. (Carpaneto et al. 2000).

***Oxythyrea funesta* Poda, 1761**

Material examined: Bölcek köyü, 25.07.2003, Şenyüz Y. leg. and det., 6 ex.; Dereyalak köyü, 16.08.2003, Şenyüz Y. leg. and det., 1 ex.; Dumlupınar Köyü, 26.07.2003, Şenyüz Y. leg. and det., 3 ex.; Domaniç Orman işletmesi mevkii, 31.07.2003, Şenyüz Y. leg. and det., 9 ex.; Kozcağız Köyü, 31.07.2003, Şenyüz Y. leg. and det., 1 ex.

Distrubition in Turkey: Antalya, Bolu, Bursa, Çanakkale, İzmir, Muğla, Tekirdağ (Lodos et al., 1978, Lodos et al., 1999).

Distrubition in the World: Europe: Albania, Andora, Armania, Austria, Azerbaijan, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, France, Georgia, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Moldavia, Netherlands, Poland, Portugal, Romania, Russia: Central European Territory, Russia: North European Territory, Russia: South European Territory, Slovakia, Slovenia, Spain, Switzerland, Turkey, Ukraine, Yugoslavia. **North Africa:** Algeria, Canary Islands, Libya, Morocco, Tunisia. (Lobl & Smetana 2006).

Chorotype: Europeo – Mediterranean. (Carpaneto et al. 2000).

***Potasia cuprea* Fabricius, 1775**

Material examined: Bölcek Köyü, 25.07.2003, Şenyüz Y. leg. and det., 6ex.; Domaniç Orman işletmesi mevkii, 31.07.2003, Şenyüz Y. leg. and det., 5 ex.

Distrubition in Turkey: Adana, Ankara, Antalya, Bolu, Gaziantep, Hatay, içel, Kahramanmaraş, Karabük, Karaman, Kastamonu, Kayseri, Konya, Niğde, Osmaniye (Lodos et al., 1999).
Distrubition in the World: Europe: France, Italy, Switzerland. (Lobl & Smetana 2006).
Chorotype: Centralasiatic-Europeo-Mediterranean. (Carpaneto et al. 2000).

***Tropinota hirta* Poda, 1761**

Material examined: Büyük saka köyü, 10.04.2004, Şenyüz Y. leg. and det. 6 ex.
Distrubition in Turkey: Adana, Afyon, Ankara, Antalya, Aydın, Balıkesir, Bilecik, Burdur, Bursa, Bolu, Çanakkale, Çankırı, Çorum, Denizli, Edirne, Gaziantep, Hatay, Isparta, İçel, İzmir, Kahramanmaraş, Karabük, Karaman, Kastamonu, Kayseri, Kırıkkale, Kırklareli, Kırşehir, Kilis, Konya, Kütahya, Manisa, Muğla, Niğde, Osmaniye**,** Sakarya, Tekirdağ, Uşak (Lodos et al., 1978, Lodos et al., 1999)**.**
Distrubition in the World: Europe: Albania, Andora, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, France, Georgia, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Poland, Portugal, Romania, Russia: Central European Territory, Russia: North European Territory, Russia: South European Territory, Slovakia, Slovenia, Spain, Switzerland, Turkey, Ukraine, Yugoslavia. **North Africa:** Morocco. **Asia:** Kazakhstan, Turkey. (Lobl & Smetana 2006).
Chorotype: Europeo-Mediterranean. (Carpaneto et al. 2000).

Subfamily Dynastinae MacLeay, 1840

***Pentodon bidens* Pallas, 1771**

Material examined: Akköprü köyü, 06.06.2004, Şenyüz Y. leg. and det. 1 ex.
Distrubition in Turkey: Antalya, Karaman, Konya (Lodos et al., 1999)**.**
Distrubition in the World: Europe: Azerbaijan, Ukraine.**Asia:** Afghanistan, India: Kashmir, Kazakhstan, Kyrgyzstan, Russia: West Siberia, Tajikistan, Turkmenistan, Uzbekistan, Xinjiang. (Lobl & Smetana 2006).
Chorotype: Turano-Europeo-Mediterranean. (Carpaneto et al. 2000).

***Pentodon idiota* Herbst, 1789**

Material examined: Akköprü köyü, 06.06.2004, Şenyüz Y. leg. and det., 1 ex.; Dumlupınar köyü, 05.07.2004, Şenyüz Y. leg. and det., 1 ex.
Distrubition in Turkey: Adana, Ankara, İzmir, Kırşehir, Konya, Muğla (Zümreoğlu-Gül, 1972, Lodos et al., 1999)**.**
Distrubition in the World: Europe: Albania, Armania, Austria, Azerbaijan, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Greece, Hungary, Macedonia, Russia, Russia: Central European Territory, Russia: South European Territory, Slovakia, Turkey, Ukraine, Yugoslavia. **Asia:** Cyprus, Iran, Iraq, Israel, Lebanon, Turkey, Xinjiang. (Lobl & Smetana 2006).
Chorotype: South European. (Carpaneto et al. 2000).

Subfamily Melolonthinae Samouelle, 1819

***Polyphylla fullo* Linnaeus,1758**

Material examined: Dumlupınar köyü, 26.07.2003, Şenyüz Y. leg. and det.
Distrubition in Turkey: Adana, Balıkesir, Bartın, Çankırı, İzmir, Kayseri, Kırklareli, Muğla, Tekirdağ, Zonguldak (Zümreoğlu-Gül, 1972, Lodos et al., 1978, Lodos et al., 1999).
Distrubition in the World: Europe: Albania, Armania, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, France, Georgia, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Netherlands, Poland, Romania, Russia: Central European Territory, Russia: South European Territory, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Yugoslavia. (Lobl & Smetana 2006).
Chorotype: Sibero-European. (Carpaneto et al. 2000).

Subfamily Rutelinae MacLeay, 1819

***Blitopertha nigripennis* Reitter, 1888**

Material examined: Arslanlı köyü, 30.05.2004, Şenyüz Y. leg. and det., 4 ex.
Distrubition in Turkey: Adana, Antalya, Gaziantep, Hatay, İçel, Kahramanmaraş, Kastamonu, Kayseri, Osmaniye, Sinop (Lodos et al., 1999)**.**

Distrubition in the World: Europe: Armania, Azerbaijan, Georgia, Russia: South European Territory. **Asia:** Cyprus, Iran, Israel, Jordan, Lebanon, Syria, Turkey, Turkmenistan. (Lobl & Smetana 2006).
Chorotype: SW-Asiatic

Family GEOTRUPIDAE Latreille, 1802
Subfamily Geotrupinae Latreille, 1802
***Geotrupes spiniger* Marsham, 1802**

Material examined: Karaağaç köyü, 25.09.2003, Şenyüz Y. leg. and det., 14 ex.; Organize sanayi önü, 26.09.2003, Şenyüz Y. leg. and det., 1 ex..
Distrubition in Turkey: Antalya, Kahramanmaraş (Lodos et al., 1999).
Distrubition in the World: Europe: Albania, Armania, Austria, Belgium, Bosnia Herzegovina, Bulgaria, Belarus, Croatia, Russia: Central European Territory, Czech Republic, Denmark, Estonia, France, Great Britain, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Netherlands, Norvay, Romania, Russia, Slovakia, Slovenia, Spain, Russia: South European Territory, Sweden, Switzerland, Ukraine, Yugoslavia. **Asia:** Iran, Turkmenistan, Turkey. **Australian Region.** (Lobl & Smetana 2006).
Chorotype: Turano – European. (Carpaneto et al. 2000).

***Geotrupes stercorarius* Linnaeus, 1758**

Material examined: Organize sanayi önü, 26.09.2003, Şenyüz Y. leg. and det., 1 ex..
Distrubition in Turkey: Muğla (Zümreoğlu-Gül, 1972).
Distrubition in the World: Europe: Andora, Austria, Belarus, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Moldavia, Netherlands, Norvay, Poland, Portugal, Romania, Russia: Central European Territory, Russia: North European Territory, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. **Nearctic Region.** (Lobl & Smetana 2006).
Chorotype: Asiatic-European. (Carpaneto et al. 2000).

CONCLUSIONS

Pentodon bidens, Geotrupes spiniger, and *Blitopertha nigripennis* were found first time in aegean region.

Cetonia aurata, Oxythyrea Funesta, Potasia cuprea, Pentodon bidens, Pentodon idiota, Polyphylla fullo, Blitopertha nigripennis, Geotrupes stercorarius were found first time in Kütahya.

In Table I, percentage and number of species of chorological categories are given. Table II displays the values of results appeared from grouping this categories into main chorotypes. From the listed data , the numeric predominance of widely distributed Holarctic species (90.91%). The European taxa is represented in 9.09% of the total number.

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Table I: Chorological categories with number of species and percentage.

Chorological categories	Number	%
Asiatic – European	2	18.18
Central Asiatic – European	1	9.09
Europeo – Mediterranean	2	18.18
Turano – European	1	9.09
Turano–European-Mediterranean	1	9.09
Turano – Mediterranean	1	9.09
Sibero – European	1	9.09
South European	1	9.09
SW-Asiatic	1	9.09
Total	11	100

Table II: Main chorotypes with number of species and percentage.

Main chorotypes	Number	%
Holarctic	10	90.91
European	1	9.09
Total	11	100

EFFECT OF FIVE DIFFERENT TYPE PESTICIDES ON THE SUNN PEST, *EURYGASTER INTEGRICEPS*

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[Zibaee, A. & Bandani, A. 2009. Effect of five different type pesticides on the sunn pest, *Eurygaster integriceps*. Munis Entomology & Zoology 4 (2): 542-550**]**

ABSTRACT: The Sunn pest, *Eurygaster integriceps*, a key constraint on increasing wheat production in the wide area, causes severe damage to the vegetative growth stage of wheat in the early season. In this study, the effects of selected biopesticides and insect growth regulators were investigated to open a new gate for pesticide application against this major pest of wheat fiels. Five concentrations of different chemicals were used for toxicity and evaluation of LC_{50} values along with a control treated with acetone. Comparison of LC_{50} values showed that *A. annua* extract, *B. bassiana* secondary metabolites and Buprofezin were more effective than pyriproxyfen and metoxyphenozide because of lower amount of LC_{50}. Comparison of mortality percentage of this chemicals demonstrated the significant differences and the most percentage (100%) was observed in *A. annua* extract, *B. bassiana* secondary metabolites and Buprofezin treatments. Elucidation of the mode of action of chemicals is of practical importance for insect control because it may give useful information on the appropriate formulation types. This study has further confirmed the insecticidal potential of metabolic compound produced by *A. annua*, *B. bassiana*, pyriproxyfen, metoxyphenozide and buprefezin. In the future we can expect additional development and more advanced final adjustment of the insecticides and application techniques and obtaining new knowledge about physical-chemical properties that determine their destiny in the environment and in biological systems.

KEY WORDS: *Eurygaster integriceps*, *Artemisia annua*, Secondary metabolites, insect growth regulators.

A key constraint on increasing wheat production in the wide area of the Near and Middle East, Eastern and Southern Europe and North Africa is the Sunn pest (*Eurygaster integriceps* Puton) (Hemiptera: Scutelleridae), which causes severe damage to the vegetative growth stage of wheat in the early season. The pest also feeds on wheat grains in the late growth stage; damaged grains greatly reduce the baking quality of dough. The most important times in the life cycle of *E. integriceps* are (i) the period of late nymphal development and (ii) the intense feeding of newly emerged adults. Nymphs in the early instars do not feed intensively. After the third instar, feeding intensifies and the damage to crops becomes obvious. The emerged adults start intense feeding on wheat grains (Paulian and Popov, 1980; Popov et al., 1996). During feeding, the Sunn pest, with its piercing–sucking mouthparts, injects saliva from salivary gland complexes into the grains to liquefy the food. The liquefied food is ingested and further digested inside the gut. The enzymes that are injected into the grain during feeding degrade gluten proteins and cause rapid relaxation of dough, which results in the production of bread with poor volume and texture (Boyd et al. 2002).

The control of *E. integriceps* was based on intensive usage of two organophosphorus insecticides, fenthione and fenitrothine, by air plaines. Although, biological control by *Trissolcus* species was effective, farmers have not been interested in it. Today worldwide concerns about our fragile ecological balance are making people re-think the use of synthesized pesticides. Chemical pesticides are generally effective against a wide range of insects, have long half-lives and often are found in streams and lakes as pollutants from ground run-off. Hence, agrochemical research has resulted in the discovery of novel insecticides that act on selective biochemical sites present in specific insect groups. This has led to an increase in efforts to find and develop natural pesticides that are species specific and efficient such as pathogens, insect growth regulators (IGRs) and botanical insecticides and antifeedants.

The genus *Artemisia* is a member of a large plant family Asteracea (Compositae) encompassing more than 300 different species of this diverse genus. The species *A. annua* known as sweet worm wood grows wild in Europe and America and is planted widely in China, Turkey, Vietnam, Afghanistan and Australia (Bhakuni et al., 2001). The plant also grows wild in the northern parts of Iran around paddy fields. Several isolated compounds from this species have been shown antimalarial, antibacterial, antiinflamatory, plant growth regulatory and cytotoxicity (antitumor) activities (Bhakuni et al., 2001). Although many studies have reported insecticidal effects of plant extracts (Isman, 2006) including growth retardation and arrest of ovarian development their mode of action has not been elucidated (Akhtar and Isman, 2004).

Well-known entomopathogenic fungi include; *Beauveria bassiana Metarhizium anisopliae* and *Paecilomyces fumosoroseus* are used for pest control (Feng et al., 1990; Wraight et al., 1998). *B. bassiana,* was used for many sucking pests and showed satisfactory results. Wraight et al. (1998) reviewing entomopathogenics of *P. fumosoroseus, P. farinosous* and *B. bassiana* isolates on silver leaf whitefly showed that all of them have pathogenicity on this pest. Hatting et al. (2004) showed that *B. bassiana* could control up to 65% of *Duraphis noxia* in field condition. Talaei (2002), tested *B. bassiana* on *Eurygaster integriceps* and showed that were highly effective especially on the nymphal instars and adults. Many fungi have been found to display antagonistic or parasitic activity against plant pests and diseases. This activity is normally mediated via metabolites secreted in the environment (Wood and Way, 1989). Fungi are, therefore, considered to be a potentially rich source of bioactive molecules for exploitation as agrochemicals or pharmaceutical drugs (Rodgers, 1989).

The insect growth regulators are advantageous because they do not persist long in the environment due to their rapid biodegradation and exhibit low toxicity. The development of resistance to these substances has not been proved as yet and their effectiveness in practical applications has been considered sufficient (Dhadialla et al., 1998; 2005). Insect growth regulators (IGRs) such as chitin inhibitors, juvenile hormone analogues (JHA) and ecdysteroid agonists, affect on the hormonal regulation of moulting and development processes and disrupt the regular physiological processes of insects (Ishaaya, 1990; Dhadialla et al., 1998; 2005; Palli and Retnakaran, 2001).

The aim of the present study was to validate the effects of selected biopesticides and insect growth regulators under laboratory conditions which using of *A.annua* extract and *B.bassiana* secondary metabolites against *E. integriceps* is made for the first time because the majority of works were done on lepidopterous insects. The results can serve as a basis for the development of optimum and reliable technological procedures, which will improve their prospects and use in the control of sunn pests within an integrated *E. integriceps* protection programme.

MATERIAL AND METHODS

Insects rearing

The insects were collected from the Karadj wheat farm in Tehran Province, Iran, and maintained on wheat plants in the laboratory at 27±2° C under a 14 h light:10h dark (LD 14:10) photoperiod. Voucher specimens are kept in the Entomological Laboratory, Plant Protection Department, Tehran University.

Methanolic extract from leaves of A. annua

Leaves of A. annua were collected in June around paddy fields in Rasht, Guilan province of Iran. Leaves were washed with distilled water and dried at room temperature in the shade. Methanolic extraction was carried out according to the procedure described by Moharamipour et al. (2003). Briefly, 30 g of dried leaves were stirred with 300 ml of 85% methanol in a flask for 1 h. The methanolic solution was incubated for 48 h at 4 °C and then stirred for additional hour and then filtered through Whatman No.4 filter paper. The solvent was removed by vacuum in a rotary evaporator and the dark green residue was dissolved in 10 ml acetone and used as a starting stock solution. Further dilutions with either acetone or distilled water were used to prepare different concentrations.

Beauvaria bassiana toxin production

Conidia were harvested from 14-day-old sporulating cultures of *Beauvaria bassiana* by scraping the surface with a spatula suspending the conidia in sterile 0.03% v/v aqueous Tween 80 (BDH) and diluting to 10^8 conidia per ml. of the conidial suspension, 1 ml was used to inoculate 250 ml Erlenmeyer flasks containing 100 ml of Czapek Dox (Oxoid) liquid medium supplemented with 0.5% w/v Bactopetone (Oxoid). Flasks were incubated at 23°C ina cooled orbital incubator at 10000 *r/min* for 12 days. The cultures were harvested by filtering the mycelium through four layers of cheesecloth. The culture filtrate was filtered through a Buchner funnel lined with Whatman No.1 filter paper to ensure removal of conidia and hyphal debris. Culture filtrates were extracted as described by Bandani et al. (1999). This briefly entailed extraction of culture filtrate with Chloroform, filtration of the solvent phase through Whatman No. 1 (Phase separator) filter paper to remove any aqueous residue then removal of solvent on a rotary evaporator. The residue was dissolved in acetone, filtered through a cotton plug, and concentrated under a stream of dry nitrogen at 40 °C. The residue was weight and stored at 4 °C.

Bioassay

Five concentrations of *Artemisia annua* extract, *Beauvaria bassiana* secondary metabolites, Pyriproxyfen, Metoxyphenozide and Buprofezin were used for toxicity and evaluation of LC_{50} values along with a control treated with acetone. In each experiment 30 insects were tested with 5 replicates for each concentration. Insects were treated topically with 2 µl of each concentration on the third thoracic sternum of adults using a microapplicator. Mortality was recorded at 24 and the LC50 was calculated using Polo-Pc software (1987).

RESULTS

The LC values, confidence limit (95%) and regression slope at 24 h exposure to plant extract are shown in Tables 1, 2 and Figure 1. The LC_{10}, LC_{30}, LC_{50} and LD_{90} for plant extract, fungus secondary metabolites, Pyriproxyfen, Metoxyphenozide and Buprofezin were 10, 15, 25, 80; 20.38, 31.75, 43.16, 91.43;

2031, 4584, 8056, 31094; 4256, 6831, 9479, 21108; 631.45, 1508, 2775, 12045, respectively. Comparison of LC_{50} values showed that *A. annua* extract, *B.bassiana* secondary metabolites and Buprofezin were more effective than pyriproxyfen and metoxyphenozide because of lower amount of LC_{50} (Table 1).

Comparison of mortality percentage of this chemicals demonstrated the significant differences and the most percentage (100%) was observed in *A. annua* extract, *B. bassiana* secondary metabolites and Buprofezin treatments (Figure 1). The toxic effect, however, increased with increase in the concentration of extract and duration of exposure to the treated concentrations (Figure 1).

DISCUSSION

Secondary organic compounds synthesized by plants have an important role in protecting plants against insect pests. These compounds affect insects by being toxic causing a delay in larval growth and can act as antifeedant (Isman, 2006). Our results show for the first time, that the methanolic extract of *A. annua* has insecticidal effects on *E. integriceps*. The insecticidal characteristic of *A. annua* extract on elm leaf beetle was topically applied to adults and our results show that they were susceptible to the leaf extract. Jalali et al. (2005) reported that adults were more sensitive than larvae against several plant extracts. Tripathi et al. (2000) showed that adults of *Tribolium castaneum* were more susceptible to cineole which had been extracted from *A. annua*. Shekari et al. (2008) demonstrated that adults of elm leaf beetle were more susceptible to the leaf extract of than larvae *A. annua*. The ethanol extracts from *A. hippocastanum*, A. glutiosa, *H. androsaemum*, and *A. absinthum* have been shown to possess insecticidal and insect repellent components and these protect the Pistacia tree from insect damage (Erturk, 2006). The world flora has a variety of plant species, and in order to increase the number of plants used for pest control, more studies should be carried out. Thus, a variety of effective substances found in different plant species could be discovered.

This study shows for the first time that *B. bassiana* secondary metabolites at relatively low concentrations have insecticidal properties against treated insects. Presumably the epicuticular waxes may assist the uptake of the toxin through the host cuticle as LC_{50} values were significantly lower in all individuals. All the larvae of both insect species died at 24 h at high dose suggesting that these insects absorb the toxins through the cuticle. The toxic effect however increased with increase in the concentration of extract and duration of exposure to the treated concentrations (Figure 1). These observations are in agreement with the report that fungi used in the biological control of pests have to be able to elaborate metabolites harmful to the pests (Zahner et al., 1983). Bandani et al. (1999) showed that efrapeptins extracted from fungus *Tolypocladium* sp. has a significant insecticidal, antifeedant and repellency effects on larvae of *Galleria melonella* Essien (2004) showed that the *Aspergillus niger* extract exhibited a moderate toxicity or low killing effect on *Chrysomya chloropyga* larvae. Although the exact models of toxicity was not determined in the present study, earlier investigations have shown that fungi, particularly the *Beauvaria* spp posses the ability to elaborate harmful metabolites which can induce acute and chronic toxicological effects on insects. The killing effect of *B. bassiana* on *E. integriceps* larvae may be attributed to the mould ability to elaborate toxic chemicals such as oxalic acid and oxalate associated with the related species *B. bassiana*.

With regard to marked differences in the development of insects and vertebrates, the growth and development regulators (IGRs) fulfill, to a considerable degree, the requirements of high selectivity and low toxicity (Dhadialla et al., 1998; 2005). Pyriproxyfen, metoxyphenozide and buprofezin induce changes associated with larvae shedding, from the earliest developmental stages. Larvae cannot shed their old skin and move to the following developmental stage. Those of them that survive have an abnormal shape and some produce deformed stages. In a study, Fenoxycarb, a juvenile hormone analog, was tested in the laboratory at three concentrations for toxicity to eggs, three larval instars and pupae of *Chrysoperla rufilabris* (Burmeister). Significant effects of fenoxycarb on all immature stages of *C. rufilabris* were found and the degree of effects depends on the stages treated and the concentrations used (Liu and Chen, 2001). Kocisova et al. (2005) showed that diflubenzuron and cyromazine strongly affect the development of housefly larvae from the earliest stages. Pyriproxyfen has shown long-term effectiveness against *Ae. aegypti and Ae. albopictus***.** With pyriproxyfen, mortality can occur in larvae soon after application, but with time, mortality is more often observed during adult emergence (Vythilingam et al., 2005). The regulators of growth and development of insects can be used successfully in the control of flies provided that we can affect the population of the target species in the susceptible stage. Another precondition of sufficiently high effectiveness is the synchronous occurrence of the susceptible insect stage in a time-acceptable interval (from the point of view of the persistence of the active ingredient in the environment). On this assumption, the biorational insecticides can successfully reduce the pest population while other components of insect entomocoenosis that are not in the susceptible stage at the time of intervention remain unaffected. However, the insect regulators usable in practice are not so far as selective on the level of organisms as many authors have assumed (Slama, 1999).

Today, the environmental safety of an insecticide is considered of paramount importance. An insecticide does not have to cause high mortality to target organisms in order to be acceptable. Antifeedant and growth inhibiting activity can therefore be incorporated into other insect control techniques in the strategy of integrated pest management (IPM). Elucidation of the mode of action of chemicals is of practical importance for insect control because it may give useful information on the appropriate formulation types. This study has further confirmed the insecticidal potential of metabolic compound produced by *A. annua*, *B. bassiana*, pyriproxyfen, metoxyphenozide and buprefezin. However the accessibility for large scale use is hindered by lack of detailed information on the chemical stability, photo stability, phytotoxicity and non-target of the active compounds in the metabolites. To enhance our knowledge of these factors routine analytical studies on the active properties and their specific toxicity are necessary. In the future we can expect additional development and more advanced final adjustment of the insecticides and application techniques and obtaining new knowledge about physical-chemical properties that determine their destiny in the environment and in biological systems. It should be stressed that there are no safe insecticides; there are only safe methods of their use.

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Table 1. Toxicity of *Artemisia annua* extract, *Beauvaria bassiana* secondary metabolites on *Eurygaster integriceps*.

Different dosages[1]	*Artemisia annua* extract	*Beauvaria bassiana* secondary metabolites
LC_{10}	10	20.38
95% Confidence interval	5.11-16.83	9.86-28.2
LC_{30}	15	31.75
95% Confidence interval	10.23-29.63	20.51-40.4
LC_{50}	25	43.16
95% Confidence interval	20.98-39.43	32.6-53.32
LC_{90}	80	91.43
95% Confidence interval	68.54-120.06	70.88-153.2
Slope±SE	2.161±0.315	3.932±0.564
X^2 (df)	5.369	4.75
p-Value	6.85	6.97

[1]. Concentration in percent

Table 2. Toxicity of Pyriproxyfen, Metoxyphenozide and Buprofezin on *Eurygaster integriceps*.

Different dosages[1]	Pyriproxyfen	Metoxyphenozide	Buprofezin
LC_{10}	2031.6	4256.92	631.45
95% Confidence interval	1124-2904	2871-5391	213-1112
LC_{30}	4584.73	6831.33	1508
95% Confidence interval	3292-8541	5394-8003	771-2274
LC_{50}	8056	9479.2	2775.86
95% Confidence interval	6362-1031	8105-10838	1744-4019
LC_{90}	31946	21108	12045
95% Confidence interval	21821-60449	17476-28524	7602-27297
Slope±SE	2.142±0.372	3.68±0.625	1.624±0.545
X^2 (df)	2.1157	5.9	3.04
p-Value	0.1948	1.553	0.2952

[1]. Concentration in ppm

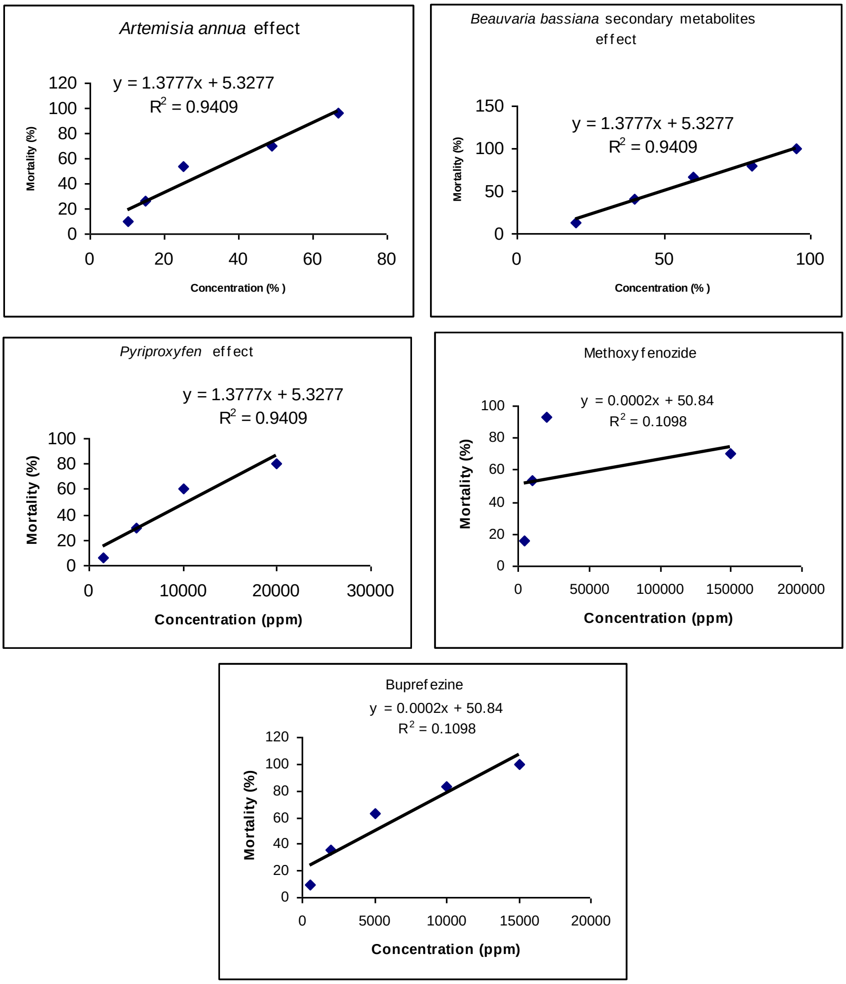

Figure 1. Mortality percentage of different biopesticides on adults of *Eurygaster integriceps*.

SOME ADDITIONAL NOTES ABOUT TACHYPORINAE (COLEOPTERA: STAPHYLINIDAE) FAUNA OF TURKEY

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ABSTRACT: In this study, additional notes on 17 species of Tachyporinae new to certain Turkish provinces are given. *Mycetoporus ignidorsum* Eppelsheim, 1880 is the first record for the Turkish fauna.

KEYWORDS: Staphylinidae, Tachyporinae, new record, fauna, Turkey.

The staphylinid beetle subfamily Tachyporinae contains more than 1.500 known species out of 39 genera worldwide (Herman, 2001). According to Anlaş (2009), 80 species and subspecies of Tachyporinae have been reported for Turkey. However, many Turkish provinces are sparsely investigated regarding their Tachyporinae inventory.

The aim of this study is to further enhance the knowledge on distibutions of Tachyporinae in Turkey.

MATERIAL AND METHOD

The present paper is based primarily on material collected during three field trips to Antalya carried out by Armin Rose in March 2000, 2001, and 2002, as well as recent collections by Sinan Anlaş and Ersen Aydın Yağmur.

Classification and nomenclature of the Staphylinidae suggested by Herman (2001) and Löbl & Smetana (2004) has been followed in this study.

The material referred to in this study is deposited in the following collections:

LEMT .... Lodos Entomological Museum, İzmir (S. Tezcan)

cAnl .... first author’s private collection

cRos .... second author’s private collection

cSch .... private collection Michael Schülke, Berlin

cYag .... private collection Ersen Aydın Yağmur, İzmir

RESULTS

In this study, 17 species of six genera belonging to two tribes of Tachyporinae are newly reported for certain Turkish prvinces. If not stated otherwise the formerly known distribution of these species for Turkey is given by Anlaş (2009).

Subfamily Tachyporinae MacLeay, 1825
Tribe Mycetoporini Thomson, 1859
Bolitobius castaneus (Stephens, 1832)

Material examined: Tunceli: Pertek, Akdemir 3 km E, 1233 m, 38°57'24"N, 39°12'15"E, 14.IX.2007, 1 ex., leg. Anlaş (cAnl).

Distribution in Turkey: Bolu (Fagel, 1968).

Lordithon exoletus (Erichson, 1839)

Material examined: İzmir: Bozdağlar, Ödemiş, 5 km SE Horzum, Subatan Yaylası, 2 exs., 21.V.2006, leg. Anlaş (LEMT, cAnl).

Distribution in Turkey: Mersin, Muğla.

Lordithon thoracicus (Fabricius 1777)

Material examined: Antalya: Central province, near Çatallar, riverbank, from moss, under leaves and gravel, 370 m, 36°29'13"N, 30°04'56"E, 7 exs., 26.III.2001; Kemer 5 km NW, rocky riverbank in canyon, from gravel with leaves and roots, 197 m, 36°36'03"N, 30°29'03"E, 2 exs., 30.III.2001, leg. Rose (cRos, cSch).

Distribution in Turkey: Manisa, Mersin.

Lordithon trinotatus (Erichson, 1839)

Material examined: Manisa: Central province, Karakoca 2 km S, 2 exs., 23.XII.2006, leg. Anlaş, (LEMT, cAnl).
Distribution in Turkey: Ankara, Aydın, İzmir.

Mycetoporus ignidorsum Eppelsheim 1880

Material examined: Antalya: Central province, Kumluca 5 km E, dry meadow with stone pines, shady brookside, sifted, 530 m, 36°22'49"N, 30°22'49"E, 1 ex., 25.III.2002; Çıralı 3 km SW, shady riverbank in deciduous woodland, in gravel close to tree roots, 71 m, 36°25'27"N, 30°26'41"E, 3 exs., 28.III.2001, leg. Rose (cRos, cSch).

Remarks: According to Smetana (2004), the species was previously known from Bosnia Herzegovina, Croatia, Greece. It is here reported from Turkey for the first time.

Mycetoporus longulus Mannerheim 1830

Material examined: Antalya: Saklıkent, slope (SE) with snow fields, grassy litter at snow edges, sifted, 1905 m, 36°50'24"N, 30°19'53"E, 2 exs., 18.III.2002 Akseki 10 km N, moist dip with pines, under stones, 1263 m, 37°07'46"N, 31°47'56"E, 1 ex., 19.III.2002; Akseki, Cevizli, northern slope, watering place, under stones at moist grass roots, sifted, 1215 m, 37°13'21"N, 31°46'36"E, 1 ex., 21.III.2002, leg. Rose (cRos, cSch).
Distribution in Turkey: Giresun (Korge, 1971).

Mycetoporus reichei (Pandellé 1869)

Material examined: Antalya: Akseki 20 km S, picnic area, under stones, 591 m, 36°48'24"N, 31°45'51"E, 1 ex., 19.III.2002, leg. Rose (cRos).

Distribution in Turkey: No locality cited.

Tribe Tachyporini MacLeay, 1825
Sepedophilus immaculatus (Stephens, 1832)

Material examined: Aydın: Dilek Yarımadası, 950 m, 37°39'23"N, 27°08'14"E, 2 exs., 25.XII.2005, leg. Anlaş (LEMT, cAnl).
Distribution in Turkey: İzmir (Sahlberg, 1913).

Sepedophilus obtusus (Luze, 1902)

Material examined: Manisa: Turgutlu, Ovacık Yaylası, 1025 m, 38˚21'49"N, 27˚51'00"E, 1 ex., 03.V.2006, leg. Kaygısız (cAnl).

Distribution in Turkey: Adana, Ankara, Antalya, İzmir, Kayseri, Mersin.

Sepedophilus testaceus (Fabricius 1793)

Material examined: Antalya: Akseki 4 km NW, northern slope, oak litter and mosses, sifted, 1250 m, 1 ex., 16.III.2000, leg. Rose (cRos).

Distribution in Turkey: No locality cited.

Tachinus corticinus Gravenhorst 1802

Material examined: Antalya: Akseki 10 km N, moist grassland with snowfields and stones, under stones, 1350 m, 1 ex., 16.III.2000; Central province, near Ovacık, semi-moist dip with clay soil, under stones, 1051 m, 36°38'37"N, 30°26'14"E, 1 ex., 31.III.2001; Akseki 10 km NW, stony grassland, under stones, 1283 m, 37°07'16"N, 31°49'05"E, 1 ex., 19.III.2002; Akseki, Cevizli, northern slope, watering place, under stones at moist grass roots, sifted, 1215 m, 37°13'21"N, 31°46'36"E, 7 exs., 21.III.2002, leg. Rose (cRos).

Distribution in Turkey: İzmir.

Tachyporus abner Saulcy 1865

Material examined: Antalya: Akseki 4 km NW, northern slope, oak litter and mosses, sifted, 1250 m, 1 ex., 16.III.2000; Akseki 20 km S, picnic area, under stones, 591 m, 36°48'24"N, 31°45'51"E, 2 exs., 19.III.2002, leg. Rose (cRos, cSch).

Distribution in Turkey: İstanbul, İzmir, Mersin-Karaman border (Sertavul Geçidi), Mersin, (Schülke, 1995).

Tachyporus caucasicus Kolenati 1846

Material examined: Antalya: Alanya, Taşkesiği, east bank of Karpuz river, 50 m, 36°45'N, 31°37'E, 1 ex., 17.III.2000; Alanya, Kuzyaka, hillside meadow with creek, from vegetation and blossoms, 180 m, 36°32'N, 32°08'E, 1 ex., 17.III.2000; Kumluca 5 km E, dry meadow with stone pines, insect net, 550 m, 36°22'47"N, 30°22'58"E, 2 exs., 19.III.2002, leg. Rose (cRos, cSch). **İzmir:** Ödemiş, Bozdağlar, Gölcük-Birgi road, 1 ex., 01.IV.2006, leg. Anlaş (cAnl).

Distribution in Turkey: İstanbul (Schülke, 1991).

Tachyporus hypnorum (Fabricius 1775)

Material examined: Adana: Feke 15 km SW, 1 ex., 10.V.2007, leg. Kerem (cAnl). **Antalya:** Akseki 10 km N, moist grassland with snowfields and stones, under stones, 1350 m, 1 ex., 16.III.2000, leg. Rose (cRos). **Kahramanmaraş:** Başkonuk Yaylası, 1290 m, 37°28'51"N, 41°59'58"E , 1 ex., 21.VI.2007; Pazarcık, Sarıköy 2 km W, 1 ex., 02.VI.2006, leg. Yağmur (cAnl). **Şırnak:** Idil, Yörükköy, 2 exs., 12.V.2007, leg. Yağmur (cAnl). **Tunceli:** Central province, Halvoru Kaynağı, Karşılar 2 km E, Munzur river banks, 965 m, 39°10'42"N, 39°27'41"E, 2 exs., 13.IX.2007, leg. Anlaş (LEMT, cAnl).

Distribution in Turkey: Adıyaman, Ankara, Aydın, Bilecik, İzmir, Kahramanmaraş, Manisa, Malatya, Mersin?, Muğla.

Tachyporus nitidulus (Fabricius 1781)

Material examined: Antalya: Akseki, Dikmen, near creek, with insect net, 800 m, 1 ex., 14.III.2000, leg. Bellmann; Akseki 10 km N, eastern slope with snow above wetlands, under stones, 1380 m, 1 ex., 16.III.2000; Alanya, Kuzyaka, hillside meadow with creek, in nearly dry cow dropping, 811 m, 36°47'24"N, 30°28'58"E, 1 ex., 27.III.2001; Kemer 5 km NW, rocky riverbank in canyon, on rotting meat, 197 m, 36°36'03"N, 30°29'03"E, 1 ex., 30.III.2001; Central province, Kemer 15 km WNW, semi-dry stony grassland/cemetary near riverbank, under stones, 1132 m, 36°40'09"N, 30°25'22"E, 2 exs., 30.III.2001; Kemer 15 km WNW, steep westside slope with stone pines, moist patches, under stones, 1115 m, 36°39'21"N, 30°24'48"E, 1 ex., 30.III.2001; Central province, near Armutlu, hillside meadow, moist patches, under stones, 1227 m, 36°42'49"N, 30°26'27"E, 2 exs., 31.III.2001, 8 exs., 25.III.2001-31.III.2001; Central province, Saklıkent 5 km N, northern slope, moist pine litter at snowfield, sifted, 1703 m, 36°51'02"N, 30°20'07"E, 3 exs., 18.III.2002; Central province, Beşkonak 1 km N, Köprülü Kanyon, waterfall, from moist mosses and leaves, 178 m, 37°11'14"N, 31°10'47"E, 1 ex., 22.III.2002, leg. Rose (cRos). **Diyarbakır:** Eğil road 15 km SW, 800 m, 38°10'29"N, 40°04'44"E , 2 exs., 13.IV.2008, leg. Yağmur (cAnl).

Distribution in Turkey: Ankara, Aydın, Bursa, İstanbul, İzmir, Kayseri, Manisa, Mersin?

Tachyporus pusillus Gravenhorst 1806

Material examined: Antalya: Akseki 10 km N, moist grassland with snowfields and stones, under stones, 1350 m, 2 exs., 16.III.2000; same data but, moist dip with pines, under stones, 1263 m, 37°07'46"N, 31°47'56"E, 1 ex., 19.III.2002; same data but, stony grassland, under stones, 1283 m, 37°07'16"N, 31°49'05"E, 2 exs., 19.III.2002; Akseki, Cevizli, northern slope, watering place, under stones at moist grass roots, sifted, 1215 m, 37°13'21"N, 31°46'36"E, 4 exs., 21.III.2002, 7 exs., 17.III.2002-23.III.2002, leg. Rose (cRos, cSch).

Distribution in Turkey: İzmir.

Tachyporus solutus Erichson, 1839

Material examined: Osmaniye: Bahçe, Aşağıarıcaklı, 726 m, 37°11'29"N, 36°36'54"E , 1 ex., 19.V.2008, leg. Yağmur (cYag).

Distribution in Turkey: Bilecik, Eskişehir (Ganglbauer, 1905).

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SUPPORTING NEGATIVE IMPACTS OF LOCAL FAT PLANT (ERZURUM, TURKEY) ON THE POPULATION AND VARIETY OF AQUATIC COLEOPTERA IN KARASU RIVER BY PHYSICO-CHEMICAL PARAMETERS

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ABSTRACT: Negative impacts of the local fat plant (Doyasan) (Erzurum, Turkey) on the population and variety of Aquatic Coleoptera at Karasu River were supported by the physico-chemical parameters. Aquatic Coleoptera species, sampled before and after discharge point of plant, belonging to Helophoridae, Hydrophilidae, Hydrochidae, Dytiscidae and Hydraenidae families, were identified and listed at species level. Both physical (total dissolved solids, temperature) and chemical (pH, dissolved oxygen, conductivity, hardness, organic matter, chloride, phosphate and some metal ions) parameters of two inhabited water were measured and compared.

KEY WORDS: Aquatic Coleoptera, River, Physico-Chemical Parameters, Population and Variety.

Although less than 3% of all species of insects have aquatic stages (Daly, 1984), in some freshwater biotopes insects may comprise over 95% of the total individuals or species of macro invertebrates. Aquatic insects exhibit a vast array of morphological, physiological, and behavioral adaptations enabling inhabitation of virtually all bodies of water. Aquatic stages of insects occur in hot and cold springs, intertidal pools, temporary and constant ponds, water-filled tree holes, intermittent streams, and saline lakes as well as in less severe running and standing-water habitats (Ward, 1991).

Members of Aquatic Coleoptera inhabit freshwater, brackish, and marine environments. The most diverse and abundant fauna occurs in well-vegetated freshwater habitats. Members of a few families, however, reside primarily in rocky-bottomed rapid streams.

Aquatic Coleoptera fauna are easily affected by deteriorating water quality and therefore many species migrate to the other suitable habitats. In the light of this, these beetles may be used as environmental monitor.

Local fat plant (Doyasan) (Erzurum, Turkey) (Figure 1) works as a butter-factor during all summer season and wastages are drained into the Karasu River without filtering process.

In this study, negative impacts of the Local fat plant (Doyasan) on the population and variety of Aquatic Coleoptera at Karasu River have been investigated and shown with quantitative information obtained.

MATERIALS AND METHODS

Sampling

Specimens of Aquatic Coleoptera were collected from two stations (one is 50 m before discharge point of fat plant, and the other is 50 m after discharge point of the fat plant) (Figures 2a, b). Water samples of inhabited water were taken monthly (Table 1) in summer season of 2007 and various water quality parameters (pH, Dissolved oxygen and Temperature were measured in site by a portable multi-parameter (WTW multiline P-4 F SET-3) and (TDS) Total Dissolved Solids (Hanna Instruments).

Analysis

Total Hardness, chloride, phosphate measurements were made according to Standard Methods (AWWA, APHA, WPCF, 1985). Total Organic Matter levels were determined as Total Organic Carbon by a TOC Analyzer (Teledyne-Tekmar Apollo 9000). Metal ions (Fe, Cu, Mn, Zn, Pb, Cd) were measured by an Atomic Absorption Spectrophotometer (Perkin-Elmer). The analytical determination of boron was done potentiometrically by means of mannitol, which forms a complex compound with boric acid. For this purpose, boron analysis was carried out as follows: Solution pH was adjusted to 7.60 after sample was filtered. Then, 5 g mannitol was added to the solution. The solution was titrated with 0.5 N KOH until solution pH became 7.60 (Yılmaz et al. 2005).

RESULTS

Obtained analysis results are presented in table 1. Station-I and station-II represents the sampling points shown in figure 1 respectively. Levels of water quality parameters were determined and evaluated according to Turkish Water Pollution and Control Regulations (TWPCR). There are four main classification according to TWPCR including high quality water (I), weakly polluted water (II), polluted water (III) and highly polluted water (IV) (TWPCR, 2004).

DISCUSSION

First of all, further existence of aquatic Coleoptera depends on the existence of its own habitats as in most living species. Imagines of most aquatic coleopterans are active flyers and leave the water only for dispersal flights (generally migrates to another habitat when its habitat changes negatively).

There is no important difference between the levels of metal ions of station-I and II (Table 1). Manganese concentration is a bit high only for station-II. In station –I, phosphate ion was not present, but this ion was measured low levels only in July and August at station-II. Due to our observations, it can be said that the phosphate ion originates from the faces of the animals. Dissolved oxygen concentration in station-I is extremely high (Table 1). It results from the dense layer of moss. On the contrary in station-II, dissolved oxygen concentration has sharply decreased down to critical levels for aerobic organisms. The reason of this dramatic fall is probably due to the discharge of the wastewaters from local fat plant (Doyasan) because wastewater includes the organic matters which can be oxidized by the micro organisms and this oxidation process consumes the dissolved oxygen. Beetles species, placed in station-I, are less represented or absent at station II (Table 2). These results show that local fat plant (Doyasan) has negative effect on the population and variety of aquatic Coleoptera.

Nomenclature

t: Temperature (°C); DO: Dissolve Oxygen (mg/l); Cl: Total Chloride Concentration (mg/l); P: Phosphate Concentration (mg/l); TDS: Total Dissolved Solids(mg/l); TH: Total Hardness (mg $CaCO_3$/l); C: Total Organic Carbon (mg/l); Fe: Iron Concentration (µg/l); Cu: Copper Concentration (µg/L); Mn: Manganese Concentration (µg/l); Zn: Zinc Concentration(µg/l); Pb: Lead Concentration (µg/l); Cd: Cadmium Concentration (µg/l).

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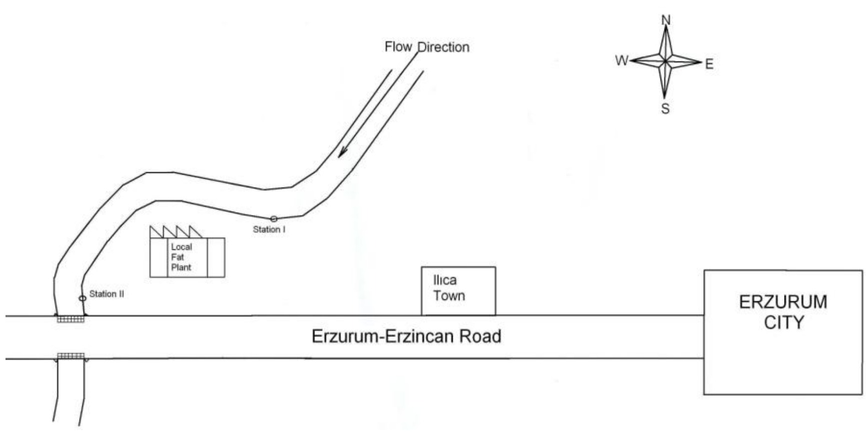
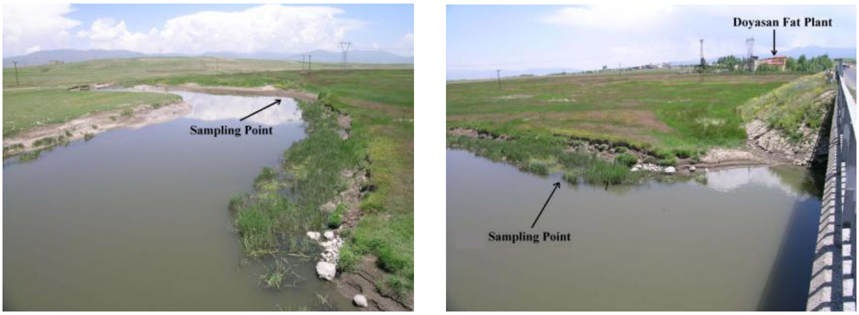


Figure 1. Sketch of research area.



A **B**

Figure 2. A) First sampling station (50 m before the discharge point of fat plant). B) Second sampling station (50 m after discharge point of fat plant). (Sampling points are marked on the photographs with arrow).

Table 1. Water quality parameters for station I and II.

	SD									
	STATION-I					STATION-II				
Parameters	Jun	July	Aug	Sep	Nov	Jun	July	Aug	Sep	Nov
t (^{0}C)	21.6 (I)	24.4 (I)	21.0 (I)	17.5 (I)	15.0 (I)	22.1 (I)	22.7 (I)	21.0 (I)	16.0 (I)	14.O (I)
pH	8.09 (I)	8.31 (I)	7.96 (I)	8.10 (I)	7.95 (I)	7.56 (I)	7.47 (I)	7.53 (I)	7.61 (I)	7.50 (I)
DO (mg/L)	8.10 (I)	8.00 (I)	9.35 (I)	5.50 (II)	6.50 (II)	1.10 (I)	2.10 (I)	0.80 (I)	1.00 (I)	1.03 (I)
Ch (mg/L)	51.00 (II)	81.20 (II)	70.40 (II)	32.90 (II)	44.53 (II)	82.00 (II)	69.00 (II)	84.30 (II)	43.20 (II)	51.63 (II)
P (mg/L)	NA (I)	NA (I)	NA (I)	NA (I)	NA (I)	NA (I)	0.50 (III)	0.86 (IV)	NA (I)	NA (I)
TDS (mg/L)	370 (I)	730 (II)	660 (II)	495 (I)	421 (I)	535 (II)	725 (II)	633 (II)	570 (II)	560 (II)
C (mg/L)	1.43 (I)	2.5 (I)	1.5 (I)	4.13 (I)	2.8 (I)	3.72 (I)	1.93 (I)	2.33 (I)	6.77 (II)	3.50 (I)
H (mg $CaCO_3$/L)	94.20 (I)	151.80 (II)	142.00 (II)	123.60 (II)	110.40 (II)	104 (II)	99.2 (II)	102.2 (II)	104 (II)	103.5 (II)
B (μg/L)	1060 (II)	320 (I)	370 (I)	1170 (II)	660 (I)	1170 (II)	300 (I)	770 (I)	1530 (II)	960 (I)
Fe (μg/L)	71.6 (I)	77 (I)	68 (I)	65.2 (I)	71.2 (I)	66.7 (I)	61.5 (I)	64.9 (I)	78.5 (I)	67.9 (I)
Cu (μg/L)	0.71 (I)	1.25 (I)	0.89 (I)	1.07 (I)	1.32 (I)	2.5 (I)	1.79 (I)	2.68 (I)	3.4 (I)	2.76 (I)
Zn (μg/L)	3.1 (I)	3.6 (I)	3.8 (I)	4.1 (I)	3.4 (I)	5.4 (I)	4.6 (I)	5 (I)	4.3 (I)	4.9 (I)
Mn (μg/L)	3.24 (I)	3.04 (I)	3.38 (I)	2.7 (I)	2.97 (I)	47.52 (I)	43.26 (I)	50.9 (I)	47.02 (I)	45.86 (I)
Pb (μg/L)	60.43 (IV)	57.95 (IV)	60.53 (IV)	59.05 (IV)	59.97 (IV)	73.63 (IV)	74.35 (IV)	73.49 (IV)	73.88 (IV)	74.15 (IV)
Cd (μg/L)	82.8 (IV)	80.5 (IV)	80.1 (IV)	83.8 (IV)	81.6 (IV)	76.6 (IV)	81.4 (IV)	73.8 (IV)	77.1 (IV)	81.2 (IV)

NA: Not Available

Table 2. Aquatic Coleoptera population and variety of both stations (under I shows first station's species number, under II shows second station's species number).

Family	Species	June		July		August		September		November	
		I	II	I	II	I	II	I	II	I	II
Helophoridae	*Helophorus brevipalpis*	13	6	7	3	2	-	-	-	-	-
	Helophorus hilaris	-	-	2	-	1	-	-	-	-	-
	Helophorus frater	1	-	2	1	-	-	3	2	-	-
Hydrophilidae	*Laccobius syriacus*	3	-	-	-	2	-	-	-	1	-
	Laccobius simulatrix	-	-	4	1	2	2	-	-	3	-
	Enochrus fuscipennis	6	3	2	-	1	-	-	-	-	-
	Enochrus bicolor	-	-	-	-	4	3	3	1	2	-
Dytiscidae	*Hydroglyphus pusillus*	1	-	4	-	4	-	2	1	1	-
	Ilybius fuliginosus	-	-	-	-	1	-	-	-	-	-
	Dytiscus marginalis	2	-	-	-	-	-	-	-	-	-
Hydraenidae	*Ochtebius poliginskiyi*	8	-	6	-	4	1	2	-	-	-
	Limnebius papposus	45	-	32	-	54	1	47	-	26	-
	Limnebius stagnalis	12	-	4	-	6	-	-	-	-	-

FAUNISTIC STUDY OF HETEROPTERA OF ZANJANROUD REGION IN ZANJAN PROVINCE OF IRAN

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[Askari, O., Pourabad, R. F. & Khaganinia, S. 2009. Faunistic study of Heteroptera of Zanjanroud region in Zanjan province of Iran. Munis Entomology & Zoology, 4 (2): 560-563**]**

ABSTRACT: A survey was conducted on Heteroptera fauna of Zanjanroud region, in west of Zanjan province during 2006-2007. As many as 1780 specimens were collected from trees, weeds, cereal fields, overwintering places, soil and water. In this study 39 species belonging to 16 families were collected and identified. Three specimens of wihich genus belonging to Lygaeidae, Scutelleridae and Reduviidae were identified at the genus level. Among them The species *Anthocoris nemorum* (Linnaeus, 1761), *Nabis pseudoferus* (Romane, 1949), *Notonecta viridis* (Delcourt, 1909), *Velia affinis* (Kolenati, 1857), *Gerris maculatus* (Tamanini, 1946), *Hydrometra stagnorum* (Linnaeus, 1758), are predators. Species belonging to Pentatomidae had the most frequency. All species are first records from the studied region**.**

KEY WORDS: Fauna, Zanjanroud, Heteroptera.

The Heteroptera are very important insects from agricultural point of view. In this suborder there are aquatic, semi-aquatic and terrestrial species some of which are serious agricultural and silvicultural pests. On the other hand, predacious bugs reduce the number of agricultural pests and may be used in biological control. Because of these reasons; identification of Heteroptera is important (Linnavuori & Hosseini, 2000).

The Heteroptera insects feed on plant juices or live as predators and parasites. Many of such insects that feed on the plant are known as serious plant pests (Safavi, 1973).

The damage caused by the insect as a result of sucking sap from food plants, is often increased by the salivary enzymes, which may considerably alter the quality of plant products such as the baking quality of wheat. On the other hand, many predators, catch other insects and Acarina, and very beneficial from agricultural point of view (Linnavuori & Hosseini, 2000).

MATERIAL AND METHODS

Zanjan is a province located in the North-West of Iran with the Zanjan City being its center. Zanjan province with an area of 36,400 km^2 has a mostly rural, population of 1.7 million. The province lies 330 km northwest of Tehran, connected to it via a freeway. Zanjanroud region is in west of Zanjan province, The climate is cold, semidried with the annual rainfall of 250-350 mm. Agriculture is the principal occupation, and crops include rice, corn (maize), oilseeds, fruits and potatoes. No faunistic study has been carried out on insects in this region, this is the first report of Heteroptera fauna from it.

This study was performed during 2006 - 2007. Samples collected from 20 localities in the west part of Zanjan. Heteroptera insects of Zanjanroud region collected from different plant hosts by different methods.

The visible specimens that weren't very swift trapped by hand but small species collected by aspirator, some of the bugs are collected by sweep net from weeds and some of them by light trap. The specimens were put into tubes filled with 70% alcohol.

RESULTS

In this study 39 species belonging to 16 families were collected and identified.

Family Tingidae Laport, 1877

***Stephanitis pyri* (Fabricius, 1775)**

Material examined: 25 specimens (15♀, 10♂), June 2006 on apple garden.

Note: This species has been collected from different regions of Iran on apple, pear , peach, japans quince, pyrus, white-thorn, plum, roses, malus, cerasus, alder, oak (Modarres Awal, 2002).

Family Miridae Hahn, 1831

***Adelphocoris lineolatus* Geoze, 1778**

Material examined: 78 specimens (45♀, 33♂), June 2006 on sugar-beet.

Note: The species is commonly distributed in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal, 2002).

***Deraecoris pallens* Reuter, 1904**

Material examined: 40 specimens (30♀, 10♂), June 2006 on sugar-beet.

***Stenodema turanica* Reuter, 1904**

Material examined: 27 specimens (20♀, 7♂), June 2006 on sugar-beet.

***Polymerus brevirostris* (Knight, 1925)**

Material examined: 19 specimens (14♀, 5♂), June 2006 on sugar-beet.

***Lygus rugulipennis* Poppius, 1911**

Material examined: 100 specimens (55♀, 45♂), June 2006 on sugar-beet.

***Lygus pratensis* (Linnaeus, 1758)**

Material examined: 130 specimens (75♀, 55♂), June 2006 on potato.

Family Anthocoridae (Fieber, 1836)

***Anthocoris nemorum* Linnaeus, 1761**

Material examined: 18 specimens (15♀, 3♂), July 2006 on apple garden.

Note: Predator of *Psylla pyricola, Anthonomus pomorum, Euzophera bigella, Hyponomeuta malinellus* and aphids (Modarres Awal, 2002).

Family Lygaeidae (Schilling, 1829)

***Afanus rolandri* (Laporte, 1833)**

Material examined: 11 specimens (10♀, 1♂), July 2006 on apple garden.

***Emblethis* Fieber, 1860**

Material examined: 25 specimens (20♀, 5♂), July 2006 on apple garden.

***Nysius senecionis* (Schilling, 1829)**

Material examined: 60 specimens (35♀, 25♂), July 2006 on apple garden.

Family Nabidae Costa, 1852

***Nabis Pseudoferrus* Remane, 1949**

Material examined: 33 specimens (18♀, 15♂), April 2006 on Lucerne.

Note: The species is predator and collected on sainfoin and Lucerne (Modarres Awal, 2002).

Family Coreidae Leach, 1815)

***Coreus marginatus* Linnaeus, 1758**

Material examined: 44 specimens (19♀, 25♂), May 2006, 20 specimens, June 2007 on cirsium.

***Ceraleptus gracilicornis* (Herrich-Schäffer, 1835)**

Material examined: 12 specimens (7♀, 5♂), May 2006, 2 specimens, June 2007 on cirsium.

Family Pyrrhocoridae Dohrn, 1859

***Pyrrhocoris apterus* Linnaeus, 1768**

Material examined: 27 specimens (12♀, 15♂), June 2006 on weeds.

Note: The species has been collected from East Azarbaijan, Khorasan, Tehran, Khozestan, Fars, Gilan and Gorgan provinces in Iran (Modarres Awal, 2002).

Family Rhopalidae Amyot and Servill, 1843

***Corizus hyoscyami* Linnaeus, 1758**

Material examined: 7 specimens (2♀, 5♂), May 2006; 2 specimens, June 2007 on weeds.

Family Cydnidae Billberg, 1820

***Cydnus aterrimus* Foster, 1771**

Material examined: 2 specimens (2♀), May 2007 on lucerne.

Cimicidae Linnaeus, 1758 Family

***Cimex lectularius* Linnaeus, 1758**

Material examined: 2 specimens (2♀), May 2007 on lucerne.

Family Scutelleridae Leach, 1815

***Eurygaster integriceps* Puton, 1886**

Material examined: 75 specimens (45♀, 30♂), June 2006 on wheat.
Note: This species has generally distribution in Iran (Modarrese Awal, 2002).

***Eurygaster maura* (Linnaeus, 1758)**

Material examined: 15 specimens (5♀, 10♂), May 2007 on wheat.

***Odontotarsus* Laporte, 1833**

Material examined: 6 specimens (6♀), May 2007 on weeds.

Family Pentatomidae Leach, 1815

***Aelia rostrata* Bohemann, 1852**

Material examined: 52 specimens (25♀, 27♂), June 2007 on wild graminae

***Aelia virgata* Herrich & Schaeffer, 1841**

Material examined: 85 specimens (40♀, 45♂), June 2007 on wild graminae.
Note: Wheat, barley and wild graminae are the host of the species (Modarreas Awal, 2002).

***Apodiphus amygdali* Germar, 1817**

Material examined: 4 specimens (3♀, 1♂), July 2006 on apricot.
Note: This species has been collected from Tehran, Fars, Markazi. Kerman, Hormozgan, Semnan, Balouchestan, Esfahan provinces in Iran on poplar, almond, apricot, oriental plane, pistachio, tamarisk, oak, tung (Modarres Awal,2002).

***Apodiphus integriceps* Horvath, 1888**

Material examined: 45 specimens (30♀, 15♂), June 2006 on poplar.

***Carpocoris fuscispinus* (Bohemann, 1849)**

Material examined: 42 specimens (17♀, 25♂), July 2006 on lucern.
Note: The species has distribution in East Azarbaijan, Mazandaran, Zanjan, Tehran , Esfahan, Khorasan, Lorestan in Iran on Lucerne, lupine, wheat, sugar-beet (Modarres Awal,2002).

***Carpocoris lunata* Fallen, 1852**

Material examined: 60 specimens (25♀, 35♂), May 2006 on cereals.

***Carpocoris purpureipennis* (DeGeer, 1773)**

Material examined: 34 specimens (22♀, 12♂), August 2006 on weeds.

***Dolycoris baccarum* Linnaeus, 1758**

Material examined: 24 specimens (14♀, 10♂), June 2006 on Lucerne

***Dolycoris penicillatus* Horvath, 1904**

Material examined: 40 specimens (25♀, 15♂), August 2006 on weeds.

***Eurydema ornatum* (Linnaeus, 1758)**

Material examined: 32 specimens (20♀, 12♂), April 2006 on cabbage.
Note: the species has been collected from different regions of Iran on turnip, cabbage, colza, mustard, wheat, radish and cultivated and wild crucifereae family plants (Modarres Awal, 2002).

***Graphosoma lineatum* (Linnaeuse, 1758)**

Material examined: 103 specimens (48♀, 55♂), June 2006 on wild crucifereae.

***Graphosoma semipunctatum* (Fabricius, 1775)**

Material examined: 15 specimens (10♀, 5♂), April 2006 on weeds.

***Neottiglossa irana* Wagner, 1963**

Material examined: 31 specimens (16♀, 15♂), April 2006 on weeds.

***Ancyrosoma leucogrammes* (Gmelin, 1790)**

Material examined: 15 specimens (10♀, 5♂), April 2006 on weeds.

Family Reduviidae Latreille, 1807

***Reduvius* Fabricius, 1775**

Material examined: 1 specimen (1♂), April 2006 on weeds.

Family Hydrometridae

***Hydrometra stagnorum* (Linnaeus, 1758)**

Material examined: 6 specimens (4♀, 2♂), April 2006 on weeds.

Family Gerridae

***Gerris maculates* Tamanini, 1946**

Material examined: 55 specimens (30♀, 25♂), April 2006 on weeds.

Family Veliidae

***Velia affinis* Kolenati, 1857**

Material examined: 305 specimens (170♀, 135♂), April 2006 on weeds.

Family Notonectidae Latreille, 1802

***Notonecta viridis* Delcourt, 1909**

Material examined: 75 specimens (40♀, 35♂), May 2006. From water

Among the species found in this study, Species belonging to Pentatomidae had the most frequency and convertibly family of *Tingidae* had the minimum one.

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PARTIAL CHARACTERIZATION OF GLUTATHIONE *S*-TRANSFERASE IN TWO POPULATIONS OF THE SUNN PEST, *EURYGASTER INTEGRICEPS* PUTON (HETEROPTERA: SCUTELLARIDAE)

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[Zibaee, I., Bandani A. R., Haghani, S. & Zibaee, A. 2009. Partial characterization of glutathione *s*-transferase in two populations of the sunn pest, *Eurygaster integriceps* Puton (Heteroptera: Scutellaridae). Munis Entomology & Zoology, 4 (2): 564-571**]**

ABSTRACT: Glutathione S-transferases (GSTs) from two populations (Tehran and Shiraz) of the sunn pest *Eurygaster integriceps* Puton (Heteroptera: Scutellaridae) were characterized through in vitro colorimetric assays. GSTs showed higher activity peaks at pH 5-6. The Km-values for GSTs were different between populations in which Shiraz population had higher *Vmax* and lower *Km* values when using 1-chloro-2,4-dinitrobenzene (CDNB) as substrate (and a fixed concentration of reduced glutathione—GSH). In addition, Native-PAGE electrophoresis showed a higher isoenzymatic patterns for Shiraz population compared with Tehran one. These results provide evidence of the involvement of enhanced GST activity as an additional organophosphorus-resistant mechanism in at least some sunn pest populations from Iran.

KEYWORDS: Metabolic detoxification, Enhanced glutathione conjugation, fenitrothione resistance

The sunn pest (*Eurygaster integriceps* Puton) (Heteroptera: Scutelleridae), is one of the most serious insect pests of wheat and barley in the wide area of the Near and Middle East, West Asia, and many of the new independent states of central Asia. It also is found in Eastern and South Europe and North Africa (Kazzazi et al., 2005). This insect has a monovoltine life cycle (one generation per year) with two different phases. The first phase (growth and development) occurs in the wheat field during the spring, whereas the second phase (diapause as an adult) usually occurs in the mountain area during the summer and winter. This pest feeds on various structures of the host plants e.g. leaves, stems and grains and as a consequence the nature of the injury that they cause is also variable. During feeding they enter their stylets into the host plant, inject their watery saliva which containing digestive enzymes, and sucking up the liquefied cells' contents (Boyd et al., 2002). Feeding punctures appeared as minute darkish spots on the seeds. Sunn pest feeding on different stages of developing seeds causes quantitative and qualitative damage because they inject enzymes into the grain that degrade gluten protein and cause rapid relaxation of dough which results in the production of bread with poor volume and texture. Most of economic loss attributed to this species is caused by nymphal and adult injury to the wheat kernels so that yield loss because of sunn pest outbreaks in some area is 100%. In Iran alone more than one million hectare of wheat field is sprayed with fenitrothione against this pest.

Since 1970's fenitrothion and sometime Cpermethrin, extensively used in order to control this insect in many countries. As a consequence of the intensive use of these pesticides, there are some complaints about the insecticide performance, especially in areas where spraying was used consistently for some years. Insects develop resistance to insecticides primarily though three mechanisms: decreased penetration, reduced target site sensitivity and enhanced metabolism (Plapp, 1976; Oppenoorth, 1984). Enhanced metabolism of insecticides decreases the attainment of the effective amount of insecticides that can kill insects. Thus, metabolic resistance may significantly decrease the susceptibility of insects to insecticides. Three major detoxifying enzymes are associated with insecticide resistance: cytochrome P450 monooxygenases, glutathione *S*-transferases and esterases (Bull, 1981; Oppenoorth, 1984).

Glutathione *S*-transferases (GSTs) are the multigenic family of multifunctional proteins that catalyze conjugation reactions of molecules having an electrophilic site, with reduced glutathione (GSH). The effect of GSTs is generally to convert a reactive lipophilic molecule into a water-soluble, non-reactive conjugate which may easily be excreted (Habig et al., 1974). In insects, increased levels of GSTs are associated with organochlorine and organophosphorus insecticide resistance (Motoyama and Dauterman 1975; Clark et al. 1984; Hemingway et al. 1985; Grant and Matsumura 1989; Fournier et al. 1992; Lagadic et al. 1993; Zibaee et al., 2008).

Recent efforts using canonical correlation analysis to establish preliminary relationships between insecticide resistance in two populations of *E.integriceps* and their activity levels of detoxification enzymes indicated the potential effect of GSTs as a organophosphorus-resistance mechanism (Alizadeh, 2006). In previous study, it was shown that resistant ratio was 2.37 *µg/adult* and esterases had a significant role in detoxifying of fenitrothione, an organophosphorus insecticide, in wheat fields of Iran. Based on these findings and the currently unclear involvement of GSTs in fenitrothione resistance, the present study was carried out to initially characterize the activity of this enzyme in two populations of the sunn pest.

MATERIAL AND METHODS

Insects

The insects were collected from Karadj and Shiraz wheat farms in Tehran and Fars provinces, respectively. The both populations were maintained and reared on wheat plants and wheat kernels in the laboratory at 25 ±2 °C under a 14 h light: 10 h dark (LD 14:10) photoperiod.

Chemicals

All chemicals including Tris-base, HCl, reduced glutathione (GSH), 1-chloro-2,4-dinitrobenzene (CDNB) and 1,2-dichloro-4-nitro-benzene (DCNB) were procured from Sigma-aldricht and Merc Companies, respectively.

Sample preparation

Bodies from 5 adults (0.490-0.589 gr) were homogenized and diluted with universal buffer containing succinate, glycine and 2-morpholinoethanesulfonic acid (pH=7.2) (Hosseinkhani and Nemat-Gorgani 2003) in weight to volume proportion and centrifuged for 10 min in 10000 *r/min*. The supernatant was transferred to new tubes and preserved at -20 °C until the onset of the experiments. Three replicates were provided for each biochemical analysis and activity of all enzymes were measured by kinetic analysis (Qu et al., 2003).

Assay of glutathione S-transferase

For glutathione *S*-transferase activity the method reported by Oppenorth (1985) was adopted. Twenty microliters CDNB (20 mM) or DCNB (40 mM) were pipetted into the microplate wells, and then 50 µL of enzyme solution was added. The OD value at 340 nm was recorded with an interval of 9 s in 5 min.

Determination of Vmax and Km values

To determine the kinetic parameters of GST, different concentrations of CDNB and DCNB (5-20 mM) were prepared and 50 μl of each substrate were mixed with 50 μl phosphate buffer (pH 7) and the reaction was initiated and monitored at 340 at 60 s intervals.

Effect of pH on GST activity

Optimal pH for their activities was determined using universal buffer with pH set at 3, 4, 5, 6, 7 and 8 in which 50 μl of each substrate added to different tubes containing 50 μl of enzyme and read at 340 nm.

Polyacrylamide Gel Electrophoresis (PAGE)

In order to determine the comparison of GST isienzymes in two population of *E.integriceps* native polyacrylamide disc-gel electrophoresis was carried out using the method of Parish and Marchalonis (1970) using 2.7% and 7.7% polyacrylamide for the stacking and resolving gels, respectively. The gel was stained with 1.5 % (w/v) Coomassie Brilliant Blue G-250 and distained in glacial acetic acidmethanol-water (7.5: 5.0: 87.5).

Protein determination

Protein concentrations were measured according to the method of Bradford (1976), using bovine serum albumin (Bio-Rad, München, Germany) as a standard.

Statistical analysis

For determination of mortality and lethal concentration, POLO-PC software (Leora, 1987) were used. All data were compared by one-way analysis of variance (ANOVA) followed by Tukey's studentisized test when significant differences were found at P=0.05 (SAS 1997). Differences between samplings were considered statistically significant at a probability more than 5% (p<0.05). Probability levels are specified in the text.

RESULTS

Glutathione S-transferase activity

Glutathione *S*-transferase activity showed a significant difference between two populations of *E. integriceps*. When CDNB was used as substrate, activity level in Tehran and Shiraz populations was evaluated 1.49 and 2.59 *µmol/min/mg protein*, respectively and by using DCNB as the substrate, it was measured 1.03 and 0.97 *µmol/min/mg protein*, respectively (Table 1). Glutathione *S*-transferase activities in two populations were significantly different when using CDNB and DCNB as the substrate (Table 1). So that by using CDNB, GST activity level in Shiraz population was higher than Tehran population and by using DCNB as substrate it was *Vise versa*.

Determination of V_{max} and K_m values

The Michaelis–Menten equation model was derived to account for the kinetic properties of enzymes. The Michaelis constant (K_m) and the maximal reaction velocity (V_{max}) are the kinetic constants of interest. The kinetic parameters K_m and V_{max} were therefore determined using the Lineweaver–Burk (double reciprocal) transformation and are presented in table 1 and figure 1. The GST K_m-value for Tehran population using CDNB and DCNB as substrates had a significant difference to the estimated K_m-value of Shiraz population and was higher than that (Table 1). The V_{max} for Shiraz population was higher than that of Tehran and showed a significant difference (Table 1).

Effect of pH on GST activity

The optimum pH for GST activity in Shiraz and Tehran populations were significantly different by using different substrates and universal buffer. In Shiraz population, the optimal pH value was 5.5 and 6 for CDNB and DCNB, respectively. There were different results for Tehran population when different substrate were used i.e. the optimal pH was 6 and 5 for CDNB and DCNB, respectively. The same results achieved with Shiraz population i.e. different pH obtained when different substrate used. The activity level of GST in different pH for Shiraz population by using both CDNB and DCNB was higher than that of Tehran population (Figure 2).

Polyacrylamide Gel Electrophoresis (PAGE)

GST electrophoresis profiles are shown in Fiure 3. GST isoenzyme patterns of Shiraz population showed darker bands than Tehran populations which could be due to higher activity of GST in Shiraz population and showed a significant difference.

DISCUSSION

The sunn pest, *Eurygaster integriceps* resistance to fenitrothione was correlated with enhanced detoxifying enzymes in a previous study (Alizadeh, 2006), and here further exploration was made to provide preliminary characterization of GST activity in two geographical populations of Sunn pest. GST activity levels towards the substrate CDNB were higher in the Shiraz population compared with the Tehran one. Zibaee et al. (2008) showed that the activity level of GST in four populations of rice striped stem borer (Chilo suppressalis) was different when CDNB used as substrate. Similar results were obtained by Qu et al. (2003).

The *Km*, is the substrate concentration that results in the filling of one-half of the enzyme's active sites (leading to an initial velocity of *Vmax*/2) and in the simplest case, K_m is equal to "the dissociation constant" of the enzyme substrate complex, Ks. *Ks* = [E][S]/ [ES] Therefore, lower Km value shows higher affinity of enzyme-substrate complex. The second kinetic constant, *Vmax*, is attained when all the enzyme's active sites are filled with substrate molecules and its importance lies in allowing the estimation of the number of substrate molecules converted into product by an enzyme in a unit of time, when the enzyme is fully saturated with substrate. By taking the reciprocal of both sides of the Michaelis–Menten equation, the disadvantages of nonlinear kinetic analysis are avoided converting it into the Lineweaver–Burk relationship, which is linear. Analysis of Lineweaver-Burk plots (Tables 1 and Figure 1) provide information regarding the mode of action of GST in *E. integriceps*. In the majority of enzymes, in the resistance population the value of V_{max} increased and K_m value decreased. Since the K_m has an inverse relationship with the substrate concentration required to saturate the active sites of the enzyme, this indicates increasing of enzyme affinity for substrate (Wilson, 1986). In other words, K_m is the measurement of the stability of the enzyme-substrate complex and a low K_m would indicate strong binding and a high K_m low binding (Stryer, 1995). Resistance also increased the V_{max} value which further indicates that they interfere with the rate of breakdown of the enzyme-substrate complex (Morris, 1978). In this study, CDNB appeared to be more favorable than DCNB for glutathione *S*-transferase of *E.integriceps*, having the lower *Km* and higher V_{max} values in Shiraz populations.

The optimum pH value observed for GST activity in the present study was lower than the pH values more frequently used for GST characterization in insects, which are around 7.0 (Grant and Matsumura, 1989; Reidy et al., 1990; Legacid et al., 1993; Yu, 1996), but it is still within the range reported for this group of enzymes (Commandeur et al., 1995; Yu, 2002). This could be due to the hemolymph pH of *E.integriceps* which is about 6.5 and showed a type of adaptation to higher activity.

The higher catalytic activity of GSTs, particularly from the Shiraz population provides support for the hypothesis of their involvement in the resistance to fenitrothione. GSTs may act as binding proteins increasing the activity of other organophosphorus detoxification enzymes such as esterases (Grant and Matsumura, 1989; Kostaropoulos et al., 2001; Alizadeh, 2006). An alternative explanation for the GST role as a binding protein is that the higher GST activity levels in Shiraz populations of *E.integriceps*, as reported here, may be favoring their direct catalytic activity over organophosphorus as earlier recognized (Zibaee et al., 2008), or their activity as antioxidant agents decreasing the oxidative stress initiated by organophosphorus as more recently suggested (References). Either way, there seems to be an involvement of enhanced GST activity in Shiraz population of sunn pest, but this resistance mechanism is apparently secondary in importance to the altered target site (AChE).

The presented data suggest that the greater sensitivity of Tehran population to fenitrothione than Shiraz population implies higher metabolic activities which either detoxify or limit the intoxicating ability of fenitrothion. So, the present study has provided some basic information on the GST activity of these two populations that will be useful to understand the mechanisms of insecticide resistance in the *Eurygaster integriceps*.

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Table 1. Activity (*μmol/min/mg protein*) and Kinetic parameters (V_{max} and K_m) of glutathione S-transferases in two populations of *E. integriceps* adults on two substrates (CDNB, DCNB) combined with the conjugating tripeptide glutathione (GSH).

Populations	CDNB (*μmol/min/mg protein*)	DCNB (*μmol/min/mg protein*)	V_{max} (*μmol/min/mgprotein*)		K_m (mM)	
			CDNB	DCNB	CDNB	DCNB
Shiraz	2.49±0.17a	0.97±0.017b	1.44±0.23b	7.19±1.48a	33.72±10.25b	41.42±5.17b
Tehran	1.59±0.026b	1.03±0.013a	1.78±0.19a	1.49±0.23b	68.71±23.36a	70.77±32.47a

*. Results are reported as means±standard error. Different letters indicate that the activity and kinetic parameter of the populations are significantly different from each other by Tukey's test (p<0:05).

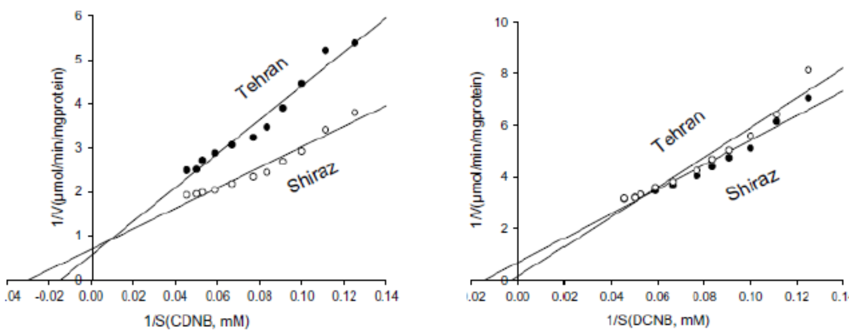

Figure 1. Lineweaver_Burk plots of CDNB and DCNB in two populations (Tehran and Shiraz) of *E. integriceps* adults. For measurements related to GSH and benzene substrates, CDNB or DCNB, varying concentrations of benzene substrates 5-20 mM. were used.

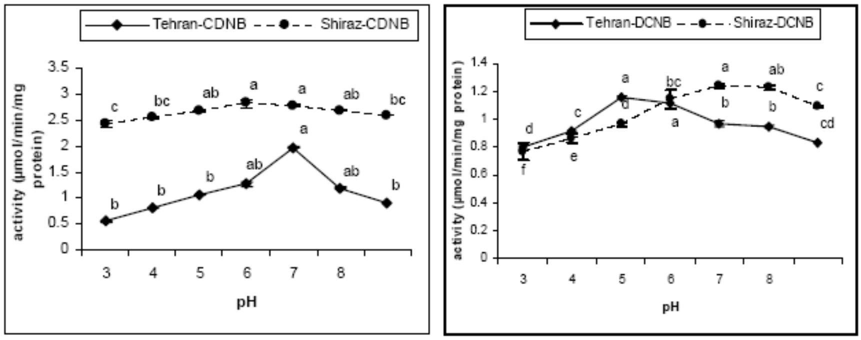

Figure 2. Effect of pH on activity of glutathione *S*-transferase extracted from *E. integriceps* adults.

Figure 3. Native-PAGE of whole insect homogenates from two populations (Tehran and Shiraz) of *E. integriceps* adults on 8% polyacrylamide gels.

DERMAPTERA FAUNA OF THE ECOLOGICALLY MANAGED CHERRY ORCHARDS IN WESTERN TURKEY

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[Tezcan, S. & Kocarek, P. 2009. Dermaptera fauna of the ecologically managed cherry orchards in western Turkey. Munis Entomology & Zoology 4 (2): 572-576**]**

ABSTRACT: Four species, *Forficula auricularia* Linnaeus, 1758, *F. lurida* Fischer, 1853, *F. smyrnensis* Serville, 1839 and *Guanchia hincksi* (Burr, 1947), belonging to family Forficulidae (Dermaptera) were recorded in ecologically managed cherry orchards (*Cerasus avium* (L.)) located in Muradiye (Manisa) and Oren (Izmir), western Turkey. Specimens were collected mainly by fermenting bait traps and pitfall traps, and beating of the vegetation. *Forficula smyrnensis* was the most abundant species. It was recorded for the first time Manisa province, and *Guanchia hincksi* was recorded for the first time from Izmir province.

KEY WORDS: *Forficula*, *Guanchia*, *Cerasus avium*, Forficulidae, Dermaptera, fauna, Turkey.

To prevent the side effects of conventional agriculture to human health and environment, ecological agriculture applications have been initiated all over the world. In the last decade, its importance improved in Turkey and the application of ecological cherry production methods has been studied in a project in the important cherry production areas of western Turkey, during the years 1998-2000 (Tezcan et al., 2001). In this project, different types of traps and different collection methods were used in both the monitoring and the control of insects in these orchards. Among different insect groups, Dermaptera species collected by diverse methods were evaluated in this study.

MATERIAL AND METHODS

Material were collected in two ecologically managed cherry orchards in western Turkey: Muradiye (Manisa-Central province, 38°39'N 27°20'E) having 550 cherry trees and Oren (Izmir-Kemalpasa, 38°28'N 27°36'E) having 160 trees (Tezcan et al., 2001). The insects were collected in 1998-1999. Sampling methods comprised A: beating (50 trees were beaten in each orchard) B: pitfall traps and C: fermenting bait traps were used.

Method A was repeated at one-week intervals. In the case of B, a total of 3 pitfall traps were placed in each orchard. Pitfall traps consisted of 250 ml cups buried in the soil in such a way that the lip of the trap would be at ground level. They were half filled with ethylen glycol and water mixture as 1:1 ratio. Traps were emptied in two weeks intervals from the beginning of April up to the end of October in 1998 and 1999, and in three weeks intervals from the beginning of November 1998 to the end of March 1999. In the case of C, a total of 9 fermenting bait traps were hung to the branches of trees in each orchard. The traps were charged with a mixture containing wine (100 ml), water (900 ml), sugar (25 gr) and vinegar (25 ml) (Ulu et al., 1995). The traps were checked for the presence of insects at two-weeks intervals starting from mid-April until the end of December.

All insects were collected by the first author and were determined by the second author. All the material mentioned in this work is deposited in the collection of the Prof. Dr. Niyazi Lodos Entomological Museum (LEMT), Plant Protection Department, Faculty of Agriculture, Ege University, Izmir, Turkey and in the collection of P. Kocarek, Ostrava, Czech Republic.

RESULTS AND DISCUSSION

During the course of this study, a total of four species of Forficulidae were captured in the ecologically managed cherry orchards (*Cerasus avium* (L.)) located in Muradiye (Manisa) and Oren (Izmir), western Turkey (Table 1).

As shown in Table 1, three species of Forficulidae were recorded in Muradiye and in Oren, the number of recorded species was four. Three species were recorded in all two study orchards.

Among those, one species, *Forficula smyrnensis* Serville, 1839 was recorded for the first time from Manisa province, while one species, *Guanchia hincksi* (Burr, 1947) was recorded for the first time from Izmir province. 172 specimens (82.30%) were recorded in Muradiye as well as 37 specimens (17.70%) from Oren.

The total number of the collected specimens was 209; 50 of which were collected in 1998, and 159 in 1999. Among *Forficula*, *F. smyrnensis* was the dominant species followed by *F. lurida* Fischer, 1853 and *F. auricularia* Linnaeus, 1758 with percent dominance values of 64.59; 18.18 and 16.27%, respectively. *Guanchia hincksi* was recorded in Oren with two specimens (0.96%) in this study.

Using fermenting bait traps 140 specimens (66.99%) belonging to three species were collected, 10 specimens (4.78%) belonging to three species were collected by pitfall traps, and 59 specimens (28.23%) belonging to four species were collected by beating vegetation. Collection by fermenting bait traps were the most effective method for monitoring especially for *F. smyrnensis* in cherry orchards.

The number of specimens and species during two years' period sampling are given in Figure 1.

Among those species, *F. auricularia* has been reported from conventional or integrated cherry orchards up to now by recent studies conducted by Ulu et al. (1995), Ulusoy et al. (1999) and Özder (1999). Dealing with insect fauna of ecologically managed cherry orchards in Turkey there was no record of Dermaptera.

Maher & Logan (2007) found that the European earwigs, *F. auricularia* are very sensitive to broad-spectrum insecticides and diazinon residues can kill earwigs for up to 17 days after spraying. Relatively high abundance of Dermaptera in ecologically managed cherry orchards probably depends on exclusion of any insecticides in these agroecosystems.

F. auricularia is one of the common and widely distributed species in Turkey, eurytopic with a strong tendency to synanthropy. The biology of this species is well known for a long time (see e.g. Behura, 1956). It has varied hosts consisting of plant and animal material. It is noted as both pest on cultural plants and also beneficial due to its carnivorous feeding habits. It is mentioned as predator on the larvae and eggs of some insect pests [e.g. *Chilo suppressalis* Walker, 1863 (Lepidoptera: Crambidae) (Moderraes Awal, 1997), *Cydia pomonella* (Linnaeus, 1758) (Lepidoptera: Tortricidae) (Glen, 1975), *Eriosoma lanigerum* (Hausmann, 1802) (Homoptera: Aphididae) (Helsen et al., 1998) or scale insects (Homoptera: Diaspididae) (Maher & Logan, 2007)]. The biology of *F. smyrnensis*, the most abundant species in this study, is less well known (Albouy & Caussanel, 1990; Kinal, 2006), but we can predict the similar feeding habits. Haas & Henderickx (2002) suggested that there are herbivorous feeding habits of the species, but their assumption is based on alimentary tract dissection of the only one specimen. *F. lurida* was observed as pest on many cultural plants (Moderraes Awal, 1997), but this finding contrasts with the results of Haas & Henderickx (2002) who suggested the carnivorous feeding habit is based on cuticle fragments of arthropods found in the gut contents of dissected of two specimens. The biology of *Guanchia hincksi*, species widely distributed through Turkey, is almost unknown due to small size and inconspicuous life. The feeding biology of these species needs further study.

Earwigs from the family Forficulidae are known to damage some cultural plants, but also have beneficial potential, because they are predators on some insect pests. The ecological function of earwigs in especially managed orchards is unknown, when according to current knowledge we can not determine the rate of their significance as predators of pests versus their own harmfulness. It is necessary to perform further study and experiment to uncover their importance in farming practise.

ACKNOWLEDGEMENTS

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Table 1. List of Forficulidae species collected in ecologically managed cherry orchards in 1998 and 1999: MD=Muradiye, OR=Oren; A: beating of vegetation, B: pitfall trap, C: fermenting bait trap.

Taxa	1998		1999		Collection methods			Sum	Dominance value (%)
	MD	OR	MD	OR	A	B	C		
Forficula auricularia Linnaeus, 1758	7	6	17	4	18	3	13	34	**16.27**
Forficula lurida Fischer, 1853	11	13	8	6	33	3	2	38	**18.18**
Forficula smyrnensis Serville, 1839 *	9	3	120	3	6	4	125	135	**64.59**
Guanchia hincksi (Burr, 1947) **	0	1	0	1	2	0	0	2	**0.96**
Total	**27**	**23**	**145**	**14**	**59**	**10**	**140**	**209**	**100.00**
%					**28.23**	**4.78**	**66.99**	**100.00**	
Number of species	**3**	**4**	**3**	**4**	**4**	**3**	**3**	**3**	

* The first record from Manisa province, ** the first record from Izmir province.

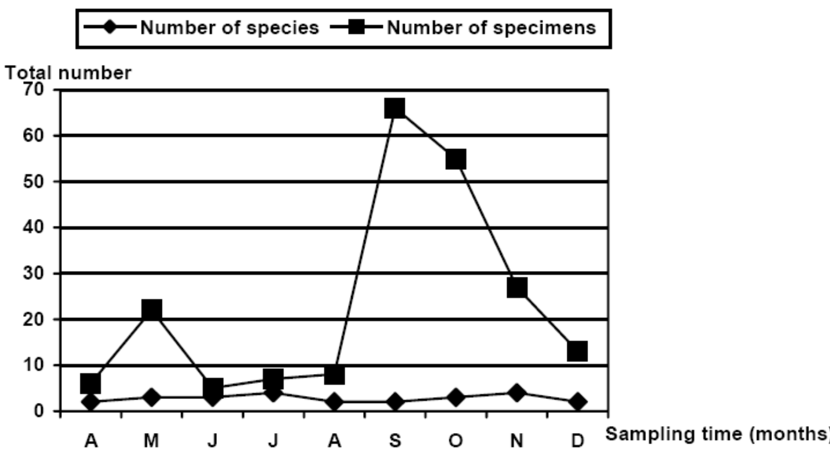

Figure 1. Total number of specimens and species during sampling period (A to D: April to December).

A SYNOPSIS OF TURKISH *CHLOROPHORUS* CHEVROLAT, 1863 WITH ZOOGEOGREPHICAL REMARKS (COLEOPTERA: CERAMBYCIDAE: CERAMBYCINAE)

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[Özdikmen, H. & Turgut, S. 2009. A synopsis of Turkish *Chlorophorus* Chevrolat, 1863 with zoogeogrephical remarks (Coleoptera: Cerambycidae: Cerambycinae). Munis Entomology & Zoology 4 (2): 577-595**]**

ABSTRACT: All taxa of the genus *Chlorophorus* Chevrolat, 1863 in Turkey are evaluated. The genus is also discussed in detail. The main aim of this work is to clarify current status of the genus in Turkey. New faunistical data are given in the text. A key for Turkish *Chlorophorus* species is also given.

KEY WORDS: *Chlorophorus,* Cerambycinae, Clytini, Cerambycidae.

Subfamily CERAMBYCINAE Latreille, 1802

Tribe CLYTINI Mulsant, 1839

= *Clytaires* Mulsant, 1839
= *Clytitae* Thomson, 1860
= *Clytides* Thomson, 1866
= *Clytina* Reitter, 1912

Type genus: *Clytus* Laicharting, 1784

They are small longhorn beetles (~ 10 - 15 mm). Adult characterized by elongate or moderaltely elongate body. Head is vertical or subvertical, ventral surface oblique at a point below lower eye lobe. Frons has smooth median longitudinal carinae or median flat and wide groove, which is sometimes longitudinal. Eyes have minute facets, notched in upper half. Antennae are relatively short, do not extend beyond middle of elytra, rarely extend beyond or reach apex of elytra. Pronotum is cydariform or sometimes elongated, side rounded, never tuberculate. Fore coxa usually rounded externally, its cavity open posteriorly. Mid coxal cavity open to epimeron. Scutellum pointed posteriorly, triangular or rounded. Elytra are more or less elongate, apically truncate and generally dark-colored with white or yellowish lines or bands produced by combination of pubescence and color on disc itself. Epimeron of metathorax angulated and produced over first abdominal segment and hind coxae. Episternum of metathorax is wide. Legs relatively long; hind femora thicken gradually distally, rarely appear almost clavate (Cherepanov, 1990).

Genus *CHLOROPHORUS* Chevrolat, 1863

= *Anthoboscus* Mulsant, 1863
= *Caloclytus* Fairmaire, 1864
= *Clytanthus* Lacordaire, 1869

Type species: *Callidium annulare* Fabricius, 1787 [=*Clytus annularis* (Fabricius, 1787)]

Body length is small generally. It is approximately between 10 and 15 mm.

Head very feebly elevated between antennal insertion; antennal insertion close approximate, distinctively narrower in width than lower eye lobe; Frons comparatively broad, flat, without carinae, with longitudinal smooth line or groove in middle part of posterior half, and produced tubercle near antennal base. Antennae shorter than the body, thicken slightly toward apex, rarely longer than body, thin, contiguous at base; space between antennae less than distance between upper lobes of eyes. Antennae not extended beyond half of elytra in both sexes. Pronotum laterally rounded, barely oblong or even transverse, disk uniformly convex, with dense punctuation, and dense adherent and setaceous erect hairs. Elytra truncate at apex or with truncate sharp outer angle, as an exception rarely rounded, with dark brown and light-colored adherent hairy coat forming characteristic pattern for each species, consisting of spots and transverse bands. Legs with femora gradually thickened towards apex. Mid femora are carinate along its length, sometimes the hind femora as well (Cherepanov, 1990).

Larval and pupal developments are in broadleaf trees (e.g. in Europe, *Prunus, Crateagus, Quercus, Ficus, Morus, Alnus, Fraxinus, Pistacia, Juglans, Ceratonia, Platanus, Fagus, Castanea, Tilia, Ulmus, Salix, Populus, Pistacia, Robinia, Malus, Pyrus, Vitis, Acer, Betula, Carpinus, Acacia, Eleagnus, Paliurus* etc. and e.g. in Turkey, *Ostrya, Carpinus, Crateagus, Quercus, Fagus, Castanea, Tilia, Ulmus, Pistacia, Pyrus* etc.), in herbaceous plants (*Salicornia, Achillea, Spartium*) and in woody legumes (*Ononis, Dorycnium*). Pupation is in the wood generally. Life cycle is about 2-3 years (Bense, 1995; Vives, 2000; Sama, 2002; Hoskovec & Rejzek, 2009).

The main aim of this work is to clarify current status of the genus in Turkey. The genus has about 200 species in the world fauna. At present, it probably will have to separate into other genera or different subgenera. It has many described species recently. It distributes in the whole world. So, it is a subcosmopolit or cosmopolit genus. In the Holarctic region (in America) and Neotropic region (in SE Brasil), however, the genus is represented by only one species as *Chlorophorus annularis* (Fabricius, 1787) that is the type species of the genus. For example, Monné & Bezark (2009) stated the species, *Chlorophorus annularis* (Fabricius, 1787) introduced in USA and SE Brasil. So, the genus *Chlorophorus* has the Palaearctic, Ethiopic and Oriental chorotypes in real. Distribution of the known species of this genus is not wide spread in the world generally.

In Palaearctic region, the genus is represented by over 50 species.

In Europe, this genus includes fourteen species as *C. aegyptiacus* (Fabricius, 1775); *C. convexifrons* Holzschuh, 1981; *C. elaeagni* Plavilstshikov, 1956; *C. faldermanni* (Faldermann, 1837); *C. figuratus* (Scopoli, 1763); *C. glabromaculatus* (Goeze, 1777); *C. glaucus* (Fabricius, 1781); *C. herbstii* (Brahm, 1790); *C. hungaricus* Seidlitz, 1891; *C. nivipictus* Kraatz, 1779; *C. ruficornis* (Olivier, 1790); *C. sartor* (Müller, 1766); *C. trifasciatus* (Fabricius, 1781); *C. varius* (Müller, 1766).

The genus *Chlorophorus* Chevrolat, 1863 is represented by sixteen species in Turkey as *Chlorophorus aegyptiacus* (Fabricius, 1775); *C. convexifrons* Holzschuh, 1981; *C. cursor* Rapuzzi & Sama, 1999; *C. dinae* Rapuzzi & Sama, 1999; *C. dominici* Sama, 1996; *C. figuratus* (Scopoli, 1763); *C. gratiosus* Marseul, 1868; *C. herbstii* (Brahm, 1790); *C. hungaricus* Seidlitz, 1891; *C. niehuisi* Adlbauer, 1992; *C. nivipictus* Kraatz, 1879; *C. robustior* Pic, 1900; *C. sartor* (Müller, 1766); *C. trifasciatus* (Fabricius, 1781); *C. varius* (Müller, 1766) and *C. wewalkai* Holzschuh, 1969. *Chlorophorus varius* (Müller, 1766) is represented by two subspecies in Turkey as *C. varius varius* (Müller, 1766) and *C. varius damascenus* (Chevrolat, 1854). Five species are endemic for Turkey as *Chlorophorus cursor* Rapuzzi & Sama, 1999; *C. dominici* Sama, 1996; *C. niehuisi* Adlbauer, 1992; *C. robustior* Pic, 1900 and *C. wewalkai* Holzschuh, 1969. The species, *Chlorophorus dinae* Rapuzzi & Sama, 1999 and *Chlorophorus gratiosus* Marseul, 1868 are known only from Turkey and Syria and *C. convexifrons* Holzschuh, 1981 that described from Anatolia was recently recorded by Dauber (2004) as a new record for Europe from Samos Island (Greece). Others have more or less distributional area.

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Vigna Taglianti et al. (1999). As far as possible as one chorotype description can be determined for each taxon in the text.

The Turkish *Chlorophorus* Chevrolat, 1863 taxa are presented as follows:

aegyptiacus Fabricius, 1775

Original combination: *Clytus aegyptiacus* Fabricius, 1775

Other names. *nigripes* Brullé, 1832; *magdalenae* Théry, 1895; *perfidus* Breit, 1915.

Records in Turkey: Hatay prov.: Akbez (Fairmaire, 1884); İstanbul prov.: Alem Mt. (Bodemeyer, 1906); Ankara prov.: around Central (Bodenheimer, 1958); Amasya prov. as *C. nigripes* Brullé, 1832 (Villiers, 1959); Çanakkale prov. as *C. nigripes* Brullé, 1832 (Demelt, 1963); Denizli prov.: Buldan (Gül-Zümreoğlu, 1972); Denizli prov.: Buldan, Çanakkale prov., İzmir prov.: Bornova as *C. nigripes* Brullé, 1832 (Ex. Gül-Zümreoğlu, 1975); Denizli prov.: Buldan, Muğla prov.: Bodrum (Gümbet), Çanakkale prov.: Lapseki, İzmir prov.: Çeşmealtı, Manisa prov.: Beydere as *C. nigripes* Brullé, 1832 (Gül-Zümreoğlu, 1975); İzmir prov. as *C. nigripes* Brullé, 1832 (Sama, 1982); Muğla prov.: Marmaris as *C. nigripes* Brullé, 1832 (Adlbauer, 1992); Turkey (Lodos, 1998); Turkey as *C. nigripes* Brullé, 1832 (Lodos, 1998); Muğla prov.: Central (Tozlu et al., 2002); Bolu prov.: Abant, Bursa prov.: from İnegöl to Bozüyük, Çanakkale prov.: Koru Mt., Balıkesir prov.: Edremit (Malmusi & Saltini, 2005).

Range: Europe (Macedonia, Greece, Crete, Bulgaria), Turkey.

Chorotype: Turano-Mediterranean (Balkano-Anatolian)

Remarks: The species is distributed rather widely in western half of Turkey. According to Pil & Stojanovic (2005), *Chlorophorus nigripes* (Brullé, 1832) is a synonym of *C. aegyptiacus* (Fabricius, 1775).

convexifrons Holzschuh, 1981

Original combination: *Chlorophorus convexifrons* Holzschuh, 1981

Records in Turkey: Type loc.: Samsun prov. (holotype), Manisa prov.: Gördes, İzmir prov.: Çeşme (paratypes) (Holzschuh, 1981); Turkey (Adlbauer, 1992).

Range: Turkey, Europe [Greece: Samos Island (Eastern Aegean Island)].

Chorotype: Anatolian; Anatolian + East Mediterranean (Aegean) or Turano-Mediterranean (Balkano-Anatolian).

Remarks: The species probably is distributed rather widely in western and northern Anatolia. The species is close to *C. trifasciatus* (Fabricius, 1781).

cursor Rapuzzi & Sama, 1999

Original combination: *Chlorophorus cursor* Rapuzzi & Sama, 1999

Records in Turkey: Type loc.: Bolu prov.: Abant lake (holotype and paratypes) (Rapuzzi & Sama, 1999); Ankara prov.: İncek (Özdikmen et al., 2009).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey. The species probably is only distributed in NC Anatolia. The species is close to *C. trifasciatus* (Fabricius, 1781).

dinae Rapuzzi & Sama, 1999

Original combination: *Chlorophorus dinae* Rapuzzi & Sama, 1999

Material examined: Konya prov.: Derebucak: Tekebeli pass env., 1224 m, N 37 14 E 31 45, 12.06.2007, 1 specimen; Bozkır: Dere, 1252 m, N 37 10 E 32 09, 13.06.2007, 1 specimen; Antalya prov.: Akseki-Güzelsu, 720 m, N 36 57 E 31 45, 11.06.2007, 1 specimen; Alanya, Karapınar village, 1154 m, N 36 36 E 32 25, 14.06.2007, 2 specimens. Antalya: Akseki, Murtiçi-Güzelsu, 977 m, N 36 54 E 31 49, 09.06.2008, 1 specimen.

Records in Turkey: Type loc.: Hatay prov.: Antakya, ŞenköyAbant lake (holotype and paratypes) (Rapuzzi & Sama, 1999); Osmaniye prov.: Yarpuz and Bahçe, Hatay prov.: Dörtyol (Özdikmen & Demirel, 2005).

Range: Turkey, Syria.

Chorotype: SW-Asiatic (Syro-Anatolian)

Remarks: The species probably is only distributed in S Anatolia in Turkey. The present materials are the first record for Konya and Antalya provinces. The species is close to *C. figuratus* (Scopoli, 1763). The record of Kahramanmaraş province of Özdikmen & Okutaner (2006) is wrong identification. This specimen belongs to *C. nivipictus* Kraatz, 1879.

dominici Sama, 1996

Original combination: *Chlorophorus dominici* Sama, 1996

Records in Turkey: Type loc.: Kastamonu prov.: Devrekani (holotype), Kastamonu prov.: Devrekani / Yaralıgöz, Sinop prov.: Çatalzeytin, Tokat prov., Gümüşhane prov.: Köse, Giresun prov.: Kümbet, Erzurum prov.: İspir (paratypes) (Sama, 1996).

Range: Turkey.

Chorotype: N-Anatolian

Remarks: It is endemic to Turkey. The species is only distributed in N Anatolia. The species is close to *C. nivipictus* Kraatz, 1879 and *C. figuratus* (Scopoli, 1763).

figuratus Scopoli, 1763

Original combination: *Cerambyx figuratus* Scopoli, 1763

Other names. *rusticus* Müller, 1776; *lambda* Schrank, 1776; *arietis* Voet, 1778; *plebejus* Fabricius, 1781; *funebris* Laicharting, 1784; *leucozonias* Gmelin, 1790; *cordiger* Aragona, 1830; *conglobatus* Fügner, 1898; *tapaensis* Pic, 1924; *latefasciatus* Fischer, 1932; *lateroreductus* Plavilstshikov, 1940; *humerolateralis* Plavilstshikov, 1940; *biinterruptus* Kudla; *persicus* Podany, 1960.

Records in Turkey: İstanbul prov.: Polonez village (Demelt & Alkan, 1962; Demelt, 1963); Zigana Mountains (?Trabzon prov. or ?Gümüşhane prov.) (Villiers, 1967); Gümüşhane prov.: Torul (Gfeller, 1972); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998); Trabzon prov.: Maçka (Öymen, 1987); Tokat prov.: Yakacık (Gökdere), Kastamonu prov.: Masruf pass (Adlbauer, 1992); European Turkey (Althoff & Danilevsky, 1997; Sama, 2002); Antalya prov.: Alanya (Kuşkayası place), Konya prov.: Taşkent (Beyreli village, Gevne valey), İçel prov.: Gözne, Gümüşhane prov.: Kelkit (Günyurdu village) (Özdikmen & Çağlar, 2004); Kocaeli prov.: İzmit (Beşkayalar Natural Park) (Özdikmen & Demirel, 2005); Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005).

Range: Europe (Portugal, Spain, France, Italy, Sardinia, Albania, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Luxembourg, Czechia, Slovakia, Poland, Estonia, Latvia, Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), Siberia, Caucasus, Azebaijan, Transcaucasia, Turkey, Iran.

Chorotype: Sibero-European

Remarks: The species distributes rather widely in Turkey.

gratiosus **Marseul, 1868**

Original combination: *Chlorophorus gratiosus* Marseul, 1868

Other names: *sparsus* Reitter, 1886; *muchei* Heyrovsky.

Material examined: Antalya prov.: Gündoğmuş road, 215 m, N 36 46 E 31 44, 10.06.2007, 1 specimen; İbradı, Koğulu village, Güvenli Beli pass, N 37 09 E 31 32, 1288 m, 11.06.2007, 1 specimen.

Records in Turkey: Turkey as *C. gratiosus* a. *sparsus* Reitter, 1886 (Winkler, 1924-1932); İçel prov.: Silifke as *Chlorophorus gratiosus* m. *muchei* Heyr. (Demelt, 1967); Antalya prov.: Ovacık, Manavgat (Şelale), Termessos, Alanya (Central, Gazipaşa, Güzelbağ), Dim stream, Kemer, İçel prov.: Anamur, Silifke (Gülnar), Erdemli, Kuzucubelen, Niğde prov.: Çiftehan (Adlbauer, 1988); Konya prov. (Tauzin, 2000); Turkey (Sama & Rapuzzi, 2000); İzmir prov.: Kemalpaşa (Armutlu) (Tezcan & Rejzek, 2002); Hatay prov.: Yayladağı, İçel prov.: Güzeloluk, Ortagören-Mut (Malmusi & Saltini, 2005).

Range: Turkey, Syria.

Chorotype: SW-Asiatic (Syro-Anatolian)

Remarks: The species probably is only distributed in S Anatolia in Turkey. It is in *C. figuratus*-group.

herbstii Brahm, 1790

Original combination: *Leptura herbstii* Brahm, 1790

Other names: *verbasci* Fabricius, 1775; *quinquemaculatus* Gebler, 1845; *sulfureus* Mulsant, 1862; *sulphureus* Schaum, 1862; *punctomaculatus* Pic, 1893; *caucasicus* Pic, 1897; *bistrisignatus* Klapalek, 1927; *olivithorax* Leiler, 1954; *duplex* Heyrovsky, 1955; *plavilscikovi* Podany, 1960; *nigroconjunctus* Slama, 1963; *lucidogriseus* Slama, 1963.

Records in Turkey: İstanbul prov.: Alem Mt. (Bodemeyer, 1906); İstanbul prov.: Polonez village (Demelt & Alkan, 1962; Demelt, 1963); Balıkesir prov.: Gönen, Çanakkale prov.: Biga (Gfeller, 1972); Turkey (Lodos, 1998; Sama, 2002); Bolu prov.: Abant (Malmusi & Saltini, 2005).

Range: Europe (Spain, France, Croatia, Bosnia-Herzegovina, Serbia, Bulgaria, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slovakia, Norway, Poland, Sweden, Finland, Estonia, Latvia, Lithuania, Belorussia, Ukraine, ?Crimea, Moldavia, European Russia), Siberia, Kazakhstan, Caucasus, Turkey.

Chorotype: Sibero-European

Remarks: The species distributes mostly in European Turkey (=Thracia) and neighbouring areas of European Turkey in Asian Turkey (=Anatolia).

hungaricus Seidlitz, 1891

Original combination: *Chlorophorus hungaricus* Seidlitz, 1891

Other names: *egyptiacus* Castelnau & Gory, 1837; *nigripes* Küster, 1848.

Material examined: Konya prov.: Hadim, Beyreli, 1524 m, N 36 49 E 32 23, 15.06.2007, 1 specimen.

Records in Turkey: Adana prov.: Nurdağı pass (Sama, 1982); Osmaniye prov.: Nurdağı pass, İçel prov.: Erdemli / Silifke (Mut) (Adlbauer, 1988); Turkey (Lodos, 1998; Sama, 2002); Kastamonu prov.: Araç (Central / Diphan village), Sivas prov.: Yıldızeli (Cumhuriyet village) (Özdikmen & Çağlar, 2004); Bolu prov.: Bolu Mountain, Bartın prov.: between Bartın-Amasra (Özdikmen et al., 2005); Kocaeli prov.: İzmit (Beşkayalar Natural Park), Gaziantep prov.: Kuşçubeli pass (Özdikmen & Demirel, 2005); İçel prov.: from Erdemli to Güzeloluk (Malmusi & Saltini, 2005); Ankara prov.: Kızılcahamam (Işık Mountain), Adana prov.: Pozantı (entry of Fındıklı), Niğde prov.: Gebere dam, İçel prov.: between Gözne-Mersin / entry of Çukurbağ / Mut-Karaman road (Değirmenbaşı) (Özdikmen, 2006); Kahramanmaraş prov.: Central (Tekir) / Kahramanmaraş-Andırın road (Başkonuş forest) / Andırın-Geben road (Özdikmen & Okutaner, 2006); Karabük prov.: Safranbolu, S of Küre Mountains (Yaylagöz pass), Küre, Şenpazar-Azdavay road, Bartın prov.: Kalecik village, Karabük prov.: Safranbolu (Özdikmen, 2007); Ankara prov.: İncek (Özdikmen et al., 2009).

Range: Europe (Albania, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, Romania, Hungary, Austria, Czechia, Slovakia), Turkey.

Chorotype: Turano-European (Ponto-Pannonian)

Remarks: It distributes rather widely in Turkey. The present material is the first record for Konya province.

niehuisi Adlbauer, 1992

Original combination: *Chlorophorus niehuisi* Adlbauer, 1992

Records in Turkey: Holotype: Muş prov.: Buğlan pass (Adlbauer, 1992); Bolu prov.: Abant (Malmusi & Saltini, 2005).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey. According to known records, probably the species distributes rather widely in Turkey. It is in *C. trifasciatus*-group.

nivipictus Kraatz, 1879

Original combination: *Chlorophorus nivipictus* Kraatz, 1879

Other names: *asellus* Thieme, 1881; *cinctiventris* Chevrolat, 1882; *splichali* Fleischer, 1908; *persicus* Breit, 1915.

Material examined: Konya prov.: Bozkır, Çağlayan, 1210 m, N 37 10 E 32 11, 11.06.2008, 1 specimen.

Records in Turkey: Type loc.: Turkey: İçel prov.: Külek (Gülek), Niğde prov.: Çamardı, Adana prov.: Pozantı (Bodemeyer, 1900); Taurus (Fleischer, 1908); Antalya prov.: Antitoros Mts. (Demelt & Alkan, 1962); Antalya prov.: Bey Mts., Alanya, İçel prov.: Namrun (Demelt, 1963); Van prov. (Sama, 1982); İçel prov.: Tarsus, Çamlıyayla, Erdemli, Kuzucubelen, Antalya prov.: Alanya, Akseki, Osmaniye prov.: Nurdağı pass, Adana prov.: Kozan (Adlbauer, 1988); İçel prov.: Gülek (Ex. Sama, 1994); İçel prov.: Gülek (Sama, 1996); Turkey (Lodos, 1998); Southeast Turkey (Ex. Rapuzzi & Sama, 1999); Osmaniye prov. (Tozlu et al., 2002); İçel prov.: Güzeloluk, Erdemli (Malmusi & Saltini, 2005).

Range: Turkey, Syria, Turkmenia, Iran, Europe [Greece: Samos Island (Eastern Aegean Island)].

Chorotype: SW-Asiatic

Remarks: It distributes rather widely only in S Turkey. It is in *C. figuratus*-group. The present material is the first record for Konya province.

pelletieri Castelnau & Gory, 1841

Original combination: *Clytus pelletieri* Castelnau & Gory, 1841
Other names: *pelleteri* Mulsant, 1846; *lepelletieri* Pic, 1891.

Records in Turkey: İstanbul prov.: Alem Mt. as *C. lepelletieri* (Bodemeyer, 1906).

Range: North Africa (Algeria, Tunisia, Morocco)

Chorotype: N-African

Remarks: It is impossible in Turkey. Apparently, this record should be a different taxon.

robustior Pic, 1900

Original combination: *Chlorophorus trifasciatus* ab. *robustior* Pic, 1900

Records in Turkey: Asia Minor as *C. trifasciatus* a. *robustior* Pic, 1900 (Winkler, 1924-1932); Tokat (Niksar) as the corrected record of *C. nigripes* in Fuchs et Breuning, 1971 (Holzschuh, 1980); Tokat prov.: Akbelen (Adlbauer, 1992); Erzurum prov.: Campus of Atatürk University (Tozlu & Hayat, 2000); Ağrı prov.: Balıklıgöl, Bilecik prov.: Central, Erzurum prov.: University Campus

/ Fourth Kuyu / Aşkale (Hacıhamza) / Kop Mt. / İspir (Madenköprübaşı), Gümüşhane prov.: Vauk Mt., Konya prov.: Güneysınır (Gürağaç) (Tozlu et al., 2002); Amasya prov.: İnegöl Mt. / Aydınca, Erzurum prov.: İspir, Sinop prov. (Malmusi & Saltini, 2005).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey. It distributes rather widely in N Turkey. It is in *C. trifasciatus*-group.

sartor Müller, 1766

Original combination: *Leptura sartor* Müller, 1766

Other names: *massiliensis* Linnaeus, 1767; *rusticus* Geoffroy, 1785; *lineola* Scopoli, 1787; *achilleae* Brahm, 1790; *angusticollis* Mulsant, 1862; *fulvicollis* Mulsant, 1862; *spinosulus* Mulsant, 1862; *corsicus* Chevrolat, 1882; *ruficollis* Bedel, 1889; *griseus* Gabriel, 1910; *infensus* Plavilstshikov, 1940; *progressivus* Plavilstshikov, 1940; *slovenicus* Podany, 1960; *straussi* Podany, 1960.

Material examined: Antalya prov.: Akseki-Manavgat road, 396 m, N 36 46 E 31 45, 15.05.2007, 1 specimen; Akseki-Güzelsu, 720 m, N 36 57 E 31 45, 11.06.2007, 1 specimen; İbradı, 908 m, N 37 04 E 31 36, 11.06.2007, 1 specimen; Alanya, Dikmetaş plateau, 1142 m, N 36 35 E 32 26, 14.06.2007, 1 specimen; Alanya: Sarımut-Karapınar, 1092 m, N 36 37 E 32 24, 09.07.2007, 22 specimens; Akseki-Manavgat road, 30 km to Gündoğmuş, 460 m, N 36 46 E 39 46, 11.07.2007, 1 specimen; Konya prov.: Taşkent-Alanya road, 80 km to Alanya, 1482 m, N 36 46 E 32 27, 18.07.2006, 2 specimens; Taşkent, Ilıcapınar, 1147 m, N 36 55 E 32 32, 19.07.2006, 66 specimens; between Hadim-Bozkır, 1000 m, N 36 59 E 32 21, 19.07.2006, 6 specimens; exit of Bozkır, 1175 m, N 37 10 E 32 12, 19.07.2006, 3 specimens; Hadim-Alanya road, 70 km to Alanya, 1298 m, N 36 45 E 32 27, 09.07.2007, 1 specimen; Bozkır-Hadim road, 1315 m, 37 01 N 32 19 E, 10.07.2007, 2 specimens; Bozkır, 1229 m, N 37 10 E 32 14, 10.07.2007, 1 specimen; Beyşehir, Üstünler env., 1150 m, N 33 35 E 31 34, 12.07.2007, 2 specimens; Osmaniye prov.: Yarpuz road, N 37 05 E 36 19, 273 m, 18.05.2006, 1 specimen; Zorkun road, Karacalar village, N 37 02 E 36 16, 381 m, 24.06.2006, 17 specimens; Arslantaş-Osmaniye road, Kazmaca village, N 37 11 E 36 11, 117 m, 28.06.2006, 3 specimens; Cebel road, Çürükarmut plateau, N 37 04 E 36 21, 911 m, 26.06.2006, 6 specimens; Yarpuz road, Yukarı Haraz plateau, N 37 04 E 36 22, 856 m, 26.06.2006, 2 specimens; Yarpuz road 8th km, N 37 04 E 36 20, 718 m, 26.05.2006, 1 specimen, 477 m, 13.07.2007, 1 specimen; Düziçi, Böcekli village, N 37 16 E 36 22, 273 m, 28.06.2006, 1 specimen; Bahçe, Kızlaç, N 37 10 E 36 37, 761 m, 19.05.2007, 1 specimen; Düziçi, Yarbaş, N 37 11 E 36 25, 376 m, 02.06.2007, 1 specimen; Bahçe, Kabacalı village, N 37 11 E 36 36, 722 m, 02.06.2007, 1 specimen; Hatay prov.: Sazlık, N 36 54 E 36 07, 15 m, 17.05.2006, 2 specimens; Samandağı, Kapısuyu village, N 36 07 E 35 57, 323 m, 04.06.2007, 2 specimens.

Records in Turkey: İstanbul prov.: Alem Mt. (Bodemeyer, 1906); Gümüşhane prov.: Torul, Amasya prov. (Villiers, 1959); Antalya prov., Isparta prov.: Eğirdir

(Demelt & Alkan, 1962; Demelt, 1963); Amasya prov., Samsun prov.: Köprübaşı (Havza), İçel prov.: Alata, Artvin prov.: Yusufeli, Tekirdağ prov. (Villiers, 1967); İçel prov.: Silifke (Tuatay et al., 1972); Isparta prov.: Atabey (İslamköy), Muğla prov.: Bodrum (Gümbet), İzmir prov.: Kemalpaşa / Tire / Çeşmealtı (Gül-Zümreoğlu, 1975); Gaziantep prov.: Fevzipaşa (Sama, 1982); Turkey (Danilevsky & Miroshnikov, 1985; Sama & Rapuzzi, 2000; Sama, 2002); Tekirdağ prov.: Malkara, Bursa prov.: Uludağ road, Samsun prov.: Vezirköprü (Öymen, 1987); Antalya prov.: Yeni Karaman / Alanya (Güzelbağ), Çanakkale prov.: Ayvacık, İzmir prov.: Selçuk, İçel prov.: Anamur, Osmaniye prov.: Nurdağı pass (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Tekirdağ prov., İstanbul prov., Balıkesir prov., Manisa prov., İzmir prov., Aydın prov., Muğla prov., Denizli prov., Isparta prov., Hatay prov.: Antakya (Lodos, 1998); Antalya prov.: Arapsuyu, Artvin prov.: Central / Ardanuç (Akarsu) / Şavşat (Çayağzı) / Yusufeli (Civnar) / Kınalıçam / Sarıgöl, Bilecik prov.: Central, Çankırı prov.: Eskipazar, Elazığ prov.: Halvillage, Erzurum prov.: University Campus / Palandöken / Aşkale / Oltu (Sütkans) / Tortum (Pehlivanlı) / Uzundere / Dikyar / Gölbaşı, Gümüşhane prov.: Kale, Konya prov.: Güneysınır (Gürağaç) (Tozlu et al., 2002); Isparta prov.: Yenişarbademli-Gedikli (near Beyşehir lake), Antalya prov.: Alanya (Gökbel plateau) (Özdikmen & Çağlar, 2004); İçel prov.: Silifke, Artvin prov.: Seyitler, Burdur prov.: Ağlasun / İnsuyu, Eskişehir prov.: Mihalgazi, Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen et al., 2005); Osmaniye prov.: Zorkun plateau road (Ürün plateau / Olukbaşı place) / Çulhalı village / Düziçi (Çamiçi village), Kahramanmaraş prov.: Türkoğlu (Doluca village), Gaziantep prov.: Nurdağı (plateau of Kazdere village), Hatay prov.: Hassa (Akbez, Geneluşağı village / Zeytinoba village, Aktepe) / Kırıkhan (Taşoluk village) / Belen (Güzelyayla road), Artvin prov., Yozgat prov.: Akdağmağdeni (Oluközü plateau road) (Özdikmen & Demirel, 2005); Adana prov., Amasya prov.: İnegöl Mt., Artvin prov.: Yusufeli / Şavşat / Artvin-Yusufeli, Bursa prov., Çanakkale prov.: Koru Mt., Kırklareli prov.: İslambeyli, İçel prov.: Mersin / Güzeloluk, Rize prov.: Şavşat-Çam pass, Samsun prov.: Kavak (Hacılar pass) (Malmusi & Saltini, 2005); Antalya prov.: Manavgat (Demirciler village) (Özdikmen & Demir, 2006); Ankara prov.: Kızılcahamam, Kayseri prov.: Yahyalı (Büyükçayır-Yeşilköy, Kapuzbaşı place), Samsun prov.: Havza (Kocapınar village), İçel prov.: exit of Fındıkpınarı (Özdikmen, 2006); Kahramanmaraş prov.: Pazarcık (Bağdınısağır / Sakarkaya village (Kısık env.) / Kahramanmaraş-Göksun road (entry of Tekir) / Andırın (Kahramanmaraş-Andırın road, Çuhadırlı village) (Özdikmen & Okutaner, 2006); Bursa prov.: Karacabey, Bartın prov.: Kalecik village, Karabük prov.: Bartın–Safranbolu road (Soğuksu place), between İsmet Paşa–Ovacık, Kastamonu prov.: between Taşköprü–Hanönü, Tosya–Kastamonu road (exit of Tosya), Sinop prov.: Durağan-Çerçiler road, Başağaç village (Özdikmen, 2007).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Sardinia, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Crete, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Luxembourg, Czechia, Slovakia, Poland, ?Lithuania, Belorussia, Ukraine, Crimea, Moldavia, European Russia, ?European Kazakhstan), ?Siberia, ?Far East Russia, Central Asia, Caucasus, Transcaucasia, Turkey, Iran, Palestina, Jordan, Syria, Lebanon.

Chorotype: Turano-European. According to Sama (2002), the records from Siberia not confirmed.

Remarks: It distributes widely in Turkey.

trifasciatus Fabricius, 1781

Original combination: *Callidium trifasciatum* Fabricius, 1781

Other names: *portugallus* Gmelin, 1790; *ferrugineus* Mulsant, 1839; *aegyptiacus* Ganglbauer, 1882 (nec Fabricius, 1775); *dispar* Pic, 1891; *intrifasciatus* Pic, 1902; *balearicus* Pic, 1908; *paradoxus* Dayrem, 1924; *chopardi* Lamontellerie, 1947.

Material examined: Konya prov.: Bozkır, Yalnızca, 1445 m, N 37 09 E 32 15, 12.06.2007, 7 specimens, 1460 m, N 37 08 E 32 15, 13.06.2007, 5 specimens, 1437 m, N 37 09 E 32 15, 13.06.2007, 12 specimens, Bozkır, 1229 m, N 37 10 E 32 14, 10.07.2007, 1 specimen, Hadim: Korualan env., 1648 m, N 36 58 E 32 24, 12.06.2008, 13 specimens; Osmaniye prov.: Karataş dam env., N 37 16 E 36 16, 143 m, 28.06.2006, 3 specimens, Zorkun road, Karacalar village, N 37 02 E 36 16, 381 m, 24.06.2006, 1 specimen.

Records in Turkey: İstanbul prov.: Polonez village, İçel prov.: Namrun (Demelt & Alkan, 1962; Demelt, 1963); Kütahya prov.: near Simav (Öymen, 1987); Turkey (Lodos, 1998; Sama, 2002); Kastamonu prov.: Araç (Diphan village), Konya prov.: Taşkent (Beyreli village, Gevne valley), Antalya prov.: Kemer (Olimpos Mt.) (Özdikmen & Çağlar, 2004); Kocaeli prov.: İzmit (Beşkayalar Natural Park) (Özdikmen & Demirel, 2005); Bilecik prov.: İnegöl-Bozüyük (Malmusi & Saltini, 2005); Kastamonu prov.: Pınarbaşı–Azdavay road (Karafasıl village), Küre–Seydiler road (Masruf pass), Devrekani–Çatalzeytin road, Doğanyurt-Şenpazar road, Doğanyurt-Dağyurdu, Araç-Kurşunlu road (Sümenler), Karabük prov.: Boduroğlu plateau (Özdikmen, 2007); Ankara prov.: Bağlum (Özdikmen et al., 2009).

Range: Europe (Portugal, Spain, France, Corsica, Italy, Sicily, Sardinia, Slovenia, Croatia, Bosnia-Herzegovina, Greece, Bulgaria, Romania, Hungary, ?Austria, Switzerland), North Africa (Tunisia, Algeria), Turkey, Syria, Israel.

Chorotype: Mediterranean

Remarks: It distributes rather widely in western half of Turkey. The present material is the first record for Osmaniye province.

***varius* Müller, 1766**
ssp. ***varius*** Müller, 1766
ssp. ***damascenus*** Chevrolat, 1854
ssp. ***pieli*** Pic, 1924

Original combination: *Leptura varia* Müller, 1766

Other names: *verbasci* Linnaeus, 1767; *nigrofasciatus* Goeze, 1777; *ornatus* Herbst, 1784; *gammoides* Geoffroy, 1785; *c-duplex* Scopoli, 1787; *strigosus*

Gmelin, 1790; *venustus* Gmelin, 1856; *ottii* Chevrolat, 1863; *viridicollis* Kraatz, 1870; *mixtornatus* Fleischer, 1908; *fontanae* Hubenthal, 1910; *clermonti* Pic, 1921; *paulojunctus* Pic, 1923; *incanus* Plavilstshikov, 1924; *bigeminatus* Roubal, 1929; *cejkai* Roubal, 1929; *kanabei* Roubal, 1929; *supertomentosus* Plavilstshikov, 1940; *vavrai* Jesatko, 1942; *ocellatus* Vet; *vosykai* Niedl, 1949; *kanabei* Heyrovsky, 1955; *scutellaris* Podany, 1960; *combinatus* Podany, 1960; *conjunctus* Podany, 1960; *dragicevici* Adamovic, 1965; *espanoli* Villiers, 1978.

Material examined: Antalya prov.: Alanya, Sarımut-Karapınar, 1092 m, N 36 37 E 32 24, 09.07.2007, 2 specimens; Akseki-Manavgat road, 30 km to Gündoğmuş, 460 m, N 36 46 E 39 46, 11.07.2007, 1 specimen; Hatay prov.: Yukarı Ekinci village, N 36 15 E 36 07', 178 m, 27.06.2006, 2 specimens; Kahramanmaraş prov.: Pazarcık, Bağdınısağır, N 37 35 E 36 46, 787 m, 29.06.2006, 1 specimen; Konya prov.: Taşkent-Alanya road, 80 km to Alanya, 1482 m, N 36 46 E 32 27, 18.07.2006, 2 specimens; between Hadim-Bozkır, 1000 m, N 36 59 E 32 21, 19.07.2006, 1 specimen; Taşkent, Ilıcapınar, 1147 m, N 36 55 E 32 32, 19.07.2006, 6 specimens; Hadim-Alanya road, 70 km to Alanya, 1298 m, N 36 45 E 32 27, 09.07.2007, 1 specimen; Bozkır, 1229 m, N 37 10 E 32 14, 10.07.2007, 1 specimen; Osmaniye prov.: Zorkun road, Ürün plateau, N 37 01 E 36 16, 870 m, 22.07.2006, 1 specimen; Zorkun road, Karacalar village, N 37 02 E 36 16, 381 m, 24.06.2006, 8 specimens; Arslantaş-Osmaniye road, Kazmaca village, N 37 11 E 36 11, 117 m, 28.06.2006, 4 specimens; Bahçe road, Çona village, N 37 07 E 36 19, 126 m, 28.06.2006, 1 specimen; Düziçi, Böcekli village, N 37 16 E 36 22, 273 m, 28.06.2006, 1 specimen; Düziçi, Böcekli village, N 37 18 E 36 20, 209 m, 28.06.2006, 2 specimens; Toprakkale, Antakya road, N 37 00 E 36 08, 75 m, 27.06.2006, 5 specimens; Zorkun, Çiftmazı, N 37 01 E 36 16, 725 m, 13.07.2007, 1 specimen; Zorkun, Mitisin plateau, N 36 58 E 36 20, 1387 m, 13.07.2007, 2 specimens; Zorkun road 8th km, N 37 02 E 36 16, 477 m, 13.07.2007, 8 specimens.

Records in Turkey: Niğde (Çamardı), Adana (Pozantı) as *ornatus*Herbst and Bilecik prov. (Bodemeyer, 1906); Denizli prov.: Menderes Valley (Schimitschek, 1944); Amasya prov., Gümüşhane prov.: Torul (Villiers, 1959); İzmir prov.: Bornova, Antalya prov.: Alanya as *C. varius damascenus* Chevrolat, 1854 (Demelt & Alkan, 1962; Demelt, 1963); Amasya prov. (Villiers, 1967); İzmir prov.: Torbalı (Tuatay et al., 1972); İzmir prov.: Bornova / Turgutlu, Manisa prov.: Demirci (Gül-Zümreoğlu, 1972); Ankara prov., İzmir prov. (İren & Ahmed, 1973); İzmir prov.: Bornova, Antalya prov.: Alanya (Ex. Gül-Zümreoğlu, 1975); Isparta prov.: Atabey (İslamköy), Muğla prov.: Köyceğiz / Fethiye (Kesikkapı) / Dalaman (Karaçalı) / Marmaris (Gökova), İzmir prov.: Kemalpaşa / Urla (Çıtlık village) / Bornova / Menemen / Çeşmealtı, Manisa prov.: Demirci / Turgutlu, Çanakkale prov.: Lapseki, Denizli prov.: Sarayköy / Central / Çivril, Balıkesir prov.: Manyas, Aydın prov.: Çine (Gül-Zümreoğlu, 1975); Erzurum prov. and near (Özbek, 1978); Trabzon prov.: Meryemana Forests (Sekendiz, 1981); Kırıkkale prov. (Sama, 1982); Turkey (Danilevsky & Miroshnikov, 1985; Önder et al., 1987; Sama & Rapuzzi, 2000; Sama, 2002; Özdikmen & Şahin, 2006); İstanbul prov.: Bahçeköy (Öymen, 1987); Antalya prov.: Alanya, İzmir prov.: Selçuk / Samsun Mountain (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Kırklareli prov., İstanbul prov., Çanakkale prov., Adana prov., Antalya prov., Şanlıurfa prov., Mardin prov., Aegean Region (Lodos, 1998); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Adana prov.: Balcalı, Ankara prov.: Central, Antalya prov.:

Kumluca / Manavgat / Serik, Artvin prov.: Yusufeli / Civnar / Demirkent / İşhan / Kınalıçam / Sarıgöl / Zeytinlik, Bilecik prov.: Central, Burdur prov.: Bucak (Çamlık), Erzincan prov.: Bahçe / Üzümlü / Karakaya, Erzurum prov.: University Campus / Palandöken / Oltu / Karakaban / Olur (Coşkunlar) / Tortum / Uzundere (Gölbaşı), Hatay prov.: İskenderun (Denizciler), Iğdır prov.: Central, Isparta prov.: Senirkent, İçel prov.: Tarsus, İstanbul prov.: Beykoz / Erenköy, Konya prov.: Central / Akşehir / Güneysınır (Gürağaç), Malatya prov.: Central / Akçadağ / Alişar, Muğla prov.: Central, Muş prov.: Central, Osmaniye prov.: Central / Kadirli (Kabayar), Tokat prov. (Tozlu et al., 2002); Manisa prov.: Muradiye, İzmir prov.: Kemalpaşa (Ören) (Tezcan & Rejzek, 2002); Zonguldak prov.: Safranbolu (Araç road), Bolu prov.: Yeniçağ (Avşar village), Van prov.: Edremit, Muğla prov.: Köyceğiz (Karaböğürtlen village, bank of Tahliye stream), Antalya prov.: Kaş (Gömbe, Sinekçi village, Sinekçibeli), Uşak prov.: Ulubey (Ovacık village, Gökgöz hill) (Özdikmen & Çağlar, 2004); İzmir prov.: Torbalı / Bornova / Kemalpaşa, Kocaeli prov.: İzmit, Muğla prov.: Köyceğiz / Fethiye / Dalaman (Karaçalı), Ankara prov.: Gölbaşı / Şereflikoçhisar / Çubuk, Şanlıurfa prov.: Ceylanpınar, Artvin prov., İstanbul prov., Kırşehir prov., Nevşehir prov.: Hacıbektaş / Gülşehir, Eskişehir prov.: Sarıcakaya (Mayıslar Farm) (Özdikmen et al., 2005); Kocaeli prov.: İzmit (Ballıkayalar Natural Park / Beşkayalar Natural Park), Osmaniye prov.: turn of Düziçi road, Gaziantep prov.: Nurdağı (plateau of Kazdere village) / Islahiye (Esenli village), Hatay prov.: Belen (Güzelyayla road), Artvin prov., Aksaray prov.: Sarıyahşi (Sipahiler village) / Ağaçören / Yaprakhisar (Ihlara valley), Niğde prov.: Tatlıca village / Halaç village / exit of Halaç village (turn of Karacaören road) / exit of Kürkçü village / between Çifteköy-Çanakçı villages / Mehmetli village, Nevşehir prov.: Alacaasar village / Ürgüp road (turn of Uçhisar road) / Avanos (turn of Özkaynak road), Kayseri prov.: Kırşehir road (turn of Boğazlayan road, Düğer village) (Özdikmen & Demirel, 2005); İzmir prov.: Selçuk (Meryemana), Antalya prov.: Lara, Çanakkale prov.: Koru Mt., Çankırı prov.: Çerkeş, İçel prov.: Uzuncaburç / from Erdemli to Güzeloluk, Adıyaman prov.: Nemrut Mt., Zoguldak prov.: from Karadere to Eğerci (Malmusi & Saltini, 2005); Niğde prov.: Ulukışla, Antalya prov.: Manavgat (Central / Demirciler village) (Özdikmen & Demir, 2006); Nevşehir prov.: Avanos, Niğde prov.: between Bor-Altınova / Bor (Balcı village), Adana prov.: Pozantı-İçel road, Karaman prov.: Karaman-Mut road, İçel prov.: exit of Atakent / Mut-Silifke road / Erdemli-Güzeloluk road / Mersin-Gözne road (Çukurkeklik) / Silifke-Mut road (Göksu bridge) (Özdikmen, 2006); Kahramanmaraş prov.: Pazarcık (Bağdınısağır / Aksu bridge / Sakarkaya village (Kısık)) / Çağlayancerit (Bozlar) / Kahramanmaraş-Andırın road (Körsülü bridge env.) / Afşin (Çardak-Afşin road) / Nurhak (Nurhak-Malatya road, Tatlar) / Andırın (Andırın-Çokak road, Çınar place / Parmaksız plateau) / Çağlayancerit (Ç.cerit-Düzbay road / Ç.cerit-Bozlar road) (Özdikmen & Okutaner, 2006); Hakkari prov.: Şemdinli, İstanbul prov.: Çatalca (Gökçeali), Bartın prov.: Kalecik village, Karabük prov.: Bartın–Safranbolu road (Soğuksu place), Kastamonu prov.: Küre Mountains National Park, between Taşköprü–Hanönü, Ilgaz–Kastamonu road (Kadın Çayırı village), between İsmet Paşa–Ovacık (Özdikmen, 2007); Ankara prov.: Beytepe, N Bağlum, Campus of ODTÜ, Polatlı, Şereflikoçhisar (Özdikmen et al., 2009).

Range: Europe (Spain, France, Corsica, Italy, Sicily, Sardinia, Malta, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Greece, Bulgaria, European Turkey, Romania, Hungary, Austria, Switzerland, Germany, Czechia, Slovakia, Poland, Sweden, Latvia, Belorussia, Ukraine, Crimea, Moldavia, European Russia, European Kazakhstan), North Africa (Egypt), Siberia, China, Vietnam, Caucasus, Transcaucasia, Turkey, Iran, Jordan, Iraq, Israel, Lebanon, Syria.

Chorotype: Palearctic

Remarks: It distributes widely in Turkey. The species is represented by two subspecies in Turkey. *C. varius damascenus* Chevrolat, 1854 occurs in S and SW Turkey and the nominative *C. varius varius* (Müller, 1766) occurs in other parts of Turkey. Known other subspecies *C. varius pieli* (Pic, 1924) occurs in Vietnam and China. *Clytanthus mixtornatus* **syn. n.** was described by Fleischer (1908) from Taurus (S Anatolia) from one locality. He separated it from *C. varius* and *C. arietis*. He also mentioned that *Clytanthus mixtornatus* is very similar to *C. varius* in points of habitus and is close to *C. arietis* in terms of elytral coloration. So, we think that it is a form of *Chlorophorus varius*. *Anthoboscus ottii* **syn. n.** was described by Chevrolat (1863) from Asia Minor (=Anatolia). He noted that this species probably is a variety of *Anthoboscus damascenus*Chevrolat, 1854 from Syria. So, we think that it is a form of *C. varius*.

wewalkai Holzschuh, 1969

Records in Turkey: Type loc.: Ankara prov.: Kızılcahamam (Holzschuh, 1969); Tunceli prov.: Pülümür (Adlbauer, 1992); Turkey (Lodos, 1998).

Range: Turkey.

Chorotype: Anatolian

Remarks: It is endemic to Turkey. The species probably distributes rather widely in Anatolia. It is close to *C. sartor* (Müller, 1976).

A short key for Turkish *Chlorophorus* species on the base of Adlbauer (1992) and Bense (1995)

1. Elytra with yellow, yellowish-green or grey pubescence and with a pattern of black spots or stripes...**2**
- Elytra black with a pattern of white stripes...**3**

2. Elytra with black transverse stripes that run uninterrupted across the suture..... ....***varius*** Müller, 1776
- Elytra with a pattern of irregular black spots or short transverse stripes that are interrupted at the suture...***herbsti*** Brahm, 1790

3. Head and pronotum uniformly black.. **4**
- Head and pronotum totally or partly red to reddish-brown................................**11**

4 Pronotum with black pubescence.......................................***dominici*** Sama, 1996
- Pronotum with paler pubescence...**5**

5 Pronotum with erect hairs; each elytron with a white spot at the shoulder.........**6**

- Pronotum with recumbent hairs; elytra without white spots at the shoulders...**10**

6 Dorsal transversal bands on the elytra reaching to the suture................................
....***figuratus*** Scopoli, 1763
- Dorsal transversal bands on the elytra not reaching to the suture........................7

7 Dorsal transversal bands and the others on the elytra broader..............................
....***nivipictus*** Kraatz, 1879
- Dorsal transversal bans and the others on the elytra more slender.........................
....***dinae*** Rapuzzi & Sama, 1999

8 Apex of each elytron rounded..................................***trifasciatus*** Fabricius, 1781
- Apex of each elytron extended into an angle on the outer edge.............................**9**

9 Legs black or petch-brown...**10**
- Legs paler..***gratiosus*** Marseul, 1868

10 Elytra with distinctly contrasting stripes, first and second stripes thin and uniformly white; second stripes run upwards on elytral suture.................................
....***sartor*** Müller, 1766
- Elytra with distinctly contrasting stripes, first stripes broader and second stripes do not run upwards on elytral suture...........................***wewalkai*** Holzschuh, 1969

11 Pronotum and base of elytra covered with erect hairs..
....***hungaricus*** Seidlitz, 1891
- Pronotum and base of elytra covered with recumbent hairs...............................**12**

12 Apex of each elytron extended into an angle on the outer edge; antennae long and slender, reaching beyond the middle of the elytra...
....***aegyptiacus*** Fabricius, 1775
- Apex of each elytron completely rounded; antennae short, not reaching the middle of the elytra **13**

13 Frons between the eyes clearly curved, dorsal transversal bands on the elytra convex at the front edge, more closely becoming to the sutur, almost interrupted. Pronotum rarely red colored uniformly, mostly more or less strongly pitch-brown; with more struppiger hairs; more or less clear transverse band of dark hairs in the middle on pronotum interrupted by whitish hairs...
....***convexifrons*** Holzschuh, 1981
- Frons between the eyes smooth, dorsal transversal bands on the elytra differently formed...**14**

14 On the frons a broad, shining longitudinal line, dorsal transversal bands to front edge concave..***niehuisi*** Adlbauer, 1992
- On the frons no smooth longitudinal line, dorsal transversal bands entire or convex at the front edge...**15**

15 Body compact, Pronotum more broadly than long, dorsal transversal bands almost even equivalent broadly at the front edge and surrounding of the scutellum covered without white hairs...***robustior*** Pic, 1900
- Body slender and longer...**16**

16 Pronotum about as long as wide, dorsal transversal bands at the front edge clearly convex, to the sutur narrowed........................***trifasciatus*** Fabricius, 1781
- Pronotum hardly wider than long, dorsal transversal bands almost even equivalent broadly at the front edge.........................***cursor*** Rapuzzi & Sama, 1999

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SUBSPECIFIC STRUCTURE OF *CARABUS (MORPHOCARABUS) CHAUDOIRI* GEBLER, 1847 (COLEOPTERA, CARABIDAE)

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[Obydov, D. 2009. Subspecific structure of *Carabus (Morphocarabus) chaudoiri* Gebler, 1847 (Coleoptera, Carabidae). Munis Entomology & Zoology, 4 (2): 596-605**]**

ABSTRACT: 7 subspecies of *Carabus (Morphocarabus) chaudoiri* are examined. The type localities and areas of some subspecies are specified.

KEY WORDS: Coleoptera, Carabidae, *Carabus (Morphocarabus) chaudoiri*, taxonomy, distribution, Siberia.

The species includes 7 subspecies: *Carabus (Morphocarabus) chaudoiri chaudoiri* Gebler, 1847; *Carabus (Morphocarabus) chaudoiri mongolorum* Csiki, 1927; *Carabus (Morphocarabus) chaudoiri czadanicus* Obydov, 1997; *Carabus (Morphocarabus) chaudoiri marusiki* Obydov, 1997; *Carabus (Morphocarabus) chaudoiri zaikai* Obydov, 1999; *Carabus (Morphocarabus) chaudoiri beladici* Obydov, 2001 and *Carabus (Morphocarabus) chaudoiri shilenkovi* O. Berlov, 1989.

The detailed morphological description of subspecies is omitted in this work and can be found in the literature cited.

Distribution of subspecies is given on collection materials. I have added also color photos of all subspecies.

Abbreviations of Institutes and Museums mentioned in the text.

MNHN = Muséum national d'Histoire naturelle (Paris)
ZIN = Zoological Institute of Russian Academy of Sciences (Sankt-Petersburg, Russia).
ZMMU =Zoological Museum of Moscow Lomonosov State University (Moscow, Russia).
DEI =Deutsches Entomologisches Institut (Eberswalde)
TMB =Timiryazev's State Museum of Biology (Moscow, Russia).
TINR =Tuvinian Institute for the Exploration of Natural Resources (Kyzyl, Tuva).

Carabus (Morphocarabus) chaudoiri Gebler, 1847

Carabus chaudoiri Gebler, 1847: 287 ("Kusnezkischen Gebirge; häufiger am Flusse Kan Ostsibiriens").
Carabus chaudoiri: Motschulsky, 1859: 221.
Carabus chaudoiri: Chaudoir, 1852: 98; 1877: 76.
Carabus (Carabus s. str., sect. Eucarabus) mongolorum: Breuning, 1932: 278 (part.).
Carabus (Carabus s. str., sect. Eucarabus) ?chaudoiri: Breuning, 1932: 278 (part.).
Carabus (in sp., sectio Diocarabus) chaudoiri: Jakobson, 1905: 251 (part.).
Carabus (Morphocarabus) chaudoiri: Deuve, 1991: 47; 1994: 106; Březina, 1994: 19; 1999: 15; Imura et Mizusawa, 1996: 10, 112 (part.); Obydov, 1997: 78; Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 22, 210.
Carabus (Morphocarabus) chaudori (error) = *chaudoiri*: Ghiretti, 1996: 70.
Carabus (Morphocarabus) odoratus chaudoiri: Shilenkov, 1996: 32, 58-59 (part.).
Morphocarabus chaudoiri: (Osawa et al.), 2002: 80.
Carabus (Morphocarabus) chaudoiri: Deuve, 2004: 145.

Type locality: The locality mentioned on the label of the lectotype is “Sibérie, Altaï”, but in the original description F. Gebler (1847) wrote “Sehr selten im Kusnezkischen Gebirge; häufiger am Flusse Kan Ostsibiriens”. Now Kuznetzky Alatau Mts do not belong to Altai mountain system, and Kan River (Krasnoiarsk Region) is also very far from Altai Mts, so the definition of type locality needs further study.

Remark: Now typical *C. chaudoiri* is known based on two type specimens only (MNHN).

Description. Body length is 18.2-24.2 mm.

Head not thickened; eyes strongly convex; mandibles relatively short, strongly curved and sharply pointed at the apex; retinaculum of right and left mandibles strongly prominent; surface of mandibles smooth. Frontal furrows relatively deep and long, inside smooth. Frons, vertex and neck with sparse and coarse punctures and wrinkles, laterally frons and vertex with more rough sculpture. Labrum wider than clypeus, moderately notched, with two lateral setae. Antennae long, protruding beyond the base of pronotum by four apical joints; palpi slightly dilated; penultimate joint of the maxillary palpi equal to last joint; penultimate joint of the labial palpi with two setae. Mentum tooth shorter than lateral lobes; submentum with two or four setae.

Prothorax transverse, broadest at about middle. Pronotum convex with dense coarse punctuation, laterally and posteriorly with coarse wrinkles. Median longitudinal line distinct; basal foveae shallow, inside coarsely-wrinkled. Sides of pronotum narrowly margined; lobes of hind angles short, evenly rounded, slightly bent downwards. Lateral margin with three setae: one setae before middle, one setae at about middle and one setae near hind angle or with two setiferous pores.

Elytra oval or oblong-oval, widest behind middle; shoulders slightly prominent; sides of elytrae broadly margined. Primary elytral interspaces a little more developed, interrupted into relatively long and short links; secondary and tertiary about equally developed, partially integral, partially interrupted into long and short links or all elytral interspaces interrupted into short and relatively long links, sometimes conjugated transversely. Primary foveoles distinct; striae coarsely punctured.

Metepisternum and abdominal sternites smooth, metepisternum longer than its width; sternal sulci absent.

Legs of normal length or short; sometimes femurs of fore legs slightly dilated, fore male tarsi with four dilated segments bearing hairy pads.

Aedeagus (Fig. 8) strongly curved near the basis, in distal part nearly straight, apical lamella narrow; endophallus (Fig. 9).

Body one-coloured black, black with bronze or green lustre, dark bronze, dark cooper, bronze, blackish bronze, green, greenish bronze; primary elytral foveoles sometimes bronze; mandibles and claws reddish brown; sometimes tibiae, and four basal antennae joints (apically) reddish brown; ventral body surface black or blackish brown.

Remark: The subspecies of *Carabus (Morphocarabus) chaudoiri* nearly do not differ by male genital structure.

Distribution: The species occur in the north-eastern Siberia (from Chukot Peninsula to Yakutia) and in the mountains of south-eastern Siberia. *Carabus* *chaudoiri* inhabits plain and mountain tundra, forest-tundra and mountain larch forests, at the altitudes from 1000 to 2600 m above sea level; spread over locally.

Carabus (Morphocarabus) chaudoiri chaudoiri Gebler, 1847 (Fig.1)

Carabus chaudoiri Gebler, 1847: 287 ("Kusnezkischen Gebirge; häufiger am Flusse Kan Ostsibiriens").
Carabus (Morphocarabus) chaudoiri chaudoiri: Deuve, 1991: 47; 1994: 106; Březina, 1994:19; 1999: 15; Imura et Mizusawa, 1996: 10, 112 (part.); Obydov, 1997: 78; Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 22, 210.
Carabus (Morphocarabus) chaudoiri chaudoiri: Deuve, 2004: 145.

Type locality: Western Siberia, ?Altai Mountains (see above).

Description. Body length is 22.0-22.8 mm. Pronotum broad, transverse. Elytra oblong-oval; primary elytral interspaces a little more developed, interrupted into the links of medium length; secondary and tertiary about equally developed, partially integral, posteriorly partially interrupted into the short and long links. Body dark bronze; margins of pronotum and elytra bronze; ventral body surface, mandibles and legs blackish brown.

Distribution: Western Siberia, ?Altai Mountains.

Type material examined: Lectotype of *Carabus chaudoiri* (Th. Deuve designation, 1991): female with two labels: "Sibérie, Altaï" and "Lectotypus" (MNHN); paralectotype of *Carabus chaudoiri* (Th. Deuve designation, 1991): female with two label: "Sibérie, Altaï" and "Paralectotypus" (MNHN).

Carabus (Morphocarabus) chaudoiri mongolorum Csiki, 1927 (Fig.2)

Carabus neglectus Lapouge, 1913: 16 (nec. Kraatz, 1887) ("Centre du triangle Minousinsk-Kobdo-Ourga; nord de la Mongolie").
Carabus mongolorum Csiki, 1927: 241 (nom. n. pro *C. neglectus* Lapouge, 1913) ("Tunkun, Sajan, N. Mongolie").
Carabus (Carabus s. str., sect. Eucarabus) mongolorum: Breuning, 1932: 278.
Carabus (Morphocarabus) chaudoiri: Brezina, 1994: 134 (part.).
Carabus (Morphocarabus) mongolorum: Obydov, 1997: 81.
Carabus (Morphocarabus) chaudoiri mongolorum: Deuve, 1991: 47; 1994: 106; Ghiretti, 1996: 70; Imura et Mizusawa, 1996: 10, 112 (part.); Březina, 1999: 15; Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 59, 210; Obydov, 1999: 107; 2001: 459.
Carabus (Morphocarabus) odoratus melleus: Shilenkov, 1994: 66 (part.); Kryzhanovskij et al., 1995: 39 (part.); Shilenkov, 1996: 58 (part).
Carabus (Morphocarabus) chaudoiri mongolorum: Deuve, 2004: 145.

Type locality: Tunkinskie Goltsy Mt Ridge (between Big Sajans Mt Ridge and Baikal Lake in Western Buryatia).

Description. Body length is 20.0 mm. Pronotum transverse; sides of pronotum narrowly margined, lobes of hind angles short. Elytra oblong-oval; primary and secondary elytral interspaces interrupted into the short links; tertiary partially integral; striae coarsely punctured. Body blackish bronze; ventral body surface, palpi, mandibles, antennae and legs brown.

Distribution: Western Buryatia: Tunkinskie Goltsy Mt Ridge; Northern Mongolia.

Type material examined: Lectotype of *Carabus mongolorum*: male with six labels: "Lectotypus", "Tunkun, Sajan", "Amorphocarabus neglectus 2 males 2 females", "Carabus neglectus mihi Types", "Muséum Paris Coll. G. Vacher de Lapouge", "C. neglectus hom. mongolorum 1913, p.16" (MNHN).

Carabus (Morphocarabus) chaudoiri czadanicus **Obydov, 1997 (Fig.3)**

Carabus (Morphocarabus) chaudoiri czadanicus Obydov, 1997: 79 ("W. Tuva, Chadan").
Carabus (Morphocarabus) chaudoiri czadanicus: Obydov, 1999: 107 ("Tuva: 60 km NW Kyzyl: Khadyn env".)
Carabus (Morphocarabus) chaudoiri czadanicus: Březina, 1999: 15 ("C. Tuva, Khadyn").
Carabus (Morphocarabus) chaudoiri czadanicus: Ghiretti, 1996: 80/A (supplement 3, 1999); Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 27, 210; Obydov, 2001: 459.
Carabus (Morphocarabus) chaudoiri czadanicus: Deuve, 2004: 145.

Type locality: Western Tuva Chadan (error); in fact: Central Tuva: Khadyn env., 60 km NW of Kyzyl.

Description. Body length is 19.0-24.2 mm. Pronotum broad, transverse; sides of pronotum broadely margined; lobes of hind angles evenly rounded. Elytra oblong-oval, primary elytral interspaces slightly broader, interrupted by rather deep and coarse foveoles into short links; secondary and tertiary about equally developed, integral, rarely partially interrupted into the long and short links. Striae coarsely punctured. Body black or blackish bronze; ventral body surface black.

Distribution: Central Tuva: Khadyn env., 60 km north-west of Kyzyl.

Type material examined: Holotype of *Carabus chaudoiri czadanicus*: male with two labels: "W. Tuva, Chadan, 28-30.VI.1994, P. Smrz leg." and "Holotypus, Carabus (Morphocarabus) chaudoiri czadanicus ssp. n., D. Obydov det., 1996" (TMB); 6 paratypes of *Carabus chaudoiri czadanicus*: 3 males, 3 females, each specimen with two labels: "W. Tuva, Chadan, 28-30.VI.1994, P. Smrz leg." and "Paratypus, Carabus (Morphocarabus) chaudoiri czadanicus ssp. n., D. Obydov det., 1996" (TMB, MNHN, coll. P. Smřz, Czech Republic, Prague).

Carabus (Morphocarabus) chaudoiri marusiki **Obydov, 1997 (Fig.4)**

Carabus (Morphocarabus) mongolorum marusiki Obydov, 1997: 83 ("SE Tuva, Sangilen Mt. Ridge, Kargy River").
Carabus (Morphocarabus) chaudoiri marusiki: Obydov, 1999: 107; 2001: 459.
Carabus (Morphocarabus) chaudoiri marusiki: Březina, 1999: 15; Ghiretti, 1996: 80 (supplement 3, 1999); Kleinfeld et Schütze, 1999: 11; Schütze et Kleinfeld, 1999: 55, 210.
Carabus (Morphocarabus) chaudoiri marusiki: Deuve, 2004: 145.

Type locality: South-eastern Tuva, Sangilen Mt. Ridge, Kargy River valley.

Description. Body length is 18.5-24.0 mm. Pronotum relatively small, transverse, sides of pronotum narrowly margined and slightly bent upwards; lobes of hind angles short, evenly rounded. Elytra oblong-oval; primary elytral interspaces a little more developed, interrupted into short links; secondary and tertiary about equally developed, secondary interspaces interrupted into long links, tertiary integral. Body blackish bronze, bronze, green, greenish bronze, rarely black, with metallic lustre; margins of pronotum and elytrae bronze, green, greenish bronze or blackish bronze. Ventral body surface black or blackish brown.

Distribution: South-eastern Tuva, Sangilen Mt. Ridge, Kargy River valley, Balyktyk-Khem River valley. The subspecies inhabits mountain larch forests, mountain tundra and forest-tundra at the altitudes from 1500 to 2600 m above the sea level.

Remark: In the some parts of the area the subspecies occurs sympatrically with other *Morphocarabus*: *C. henningi* and *C. odoratus*.

Type material examined: Holotype of *Carabus mongolorum marusiki*: male with two labels: "S-E Tuva, Sangilen Mts, valley of the Kargy river, 50°31'N97°01'E, 1600m, 4.VII.1996, D. Obydov leg." and "Holotypus, Carabus (Morphocarabus) mongolorum marusiki ssp. n., D. Obydov det., 1996" (TMB); 43 paratypes of *Carabus mongolorum marusiki*: male, female, same locality, 1.VII.1996, Yu. Marusik leg.; male, 4 females, same locality, 4.VII.1996, D. Obydov leg.; 3 males, 2 females, S-E Tuva, Sangilen Mts, valley of the Kargy river, 50°34'N 97°04'E, 1500m, 2-4.VII.1996, D. Obydov leg.; 14 males, 12 females, S-E Tuva, Sangilen Mts, upper part of Kargy river, 50°24'N 96°41'E, 2300m, 28.VI-4.VII.1996, D. Obydov leg.; male, S-E Tuva, Sangilen Mts, valley of the Balyktyk-Khem river, 50°17'N 96°39'E, 2100m, 26.VI-4.VII.1996, D. Obydov leg.; 2 females, S-E Tuva, near Balyktyk-Khem Pass, 50°17'N 96°23'E, 2300m, 27.VI-5.VII.1996, D. Obydov leg.; 2 females, S-E Tuva, Balyktyk-Khem Pass, 50°15'N 96°19'E, 2600m, 27.VI-5.VII.1996, D.Obydov leg.; each specimen with label: "Paratypus, Carabus (Morphocarabus) mongolorum marusiki ssp. n., D. Obydov det., 1996" (MNHN, DEI, ZIN, ZMMU, TMB, TINR).

Carabus (Morphocarabus) chaudoiri zaikai Obydov, 1999 (Fig.5)

Carabus (Morphocarabus) chaudoiri zaikai Obydov, 1999: 105 ("Tuva, Akademika Obrucheva Mt. Ridge").
Carabus (Morphocarabus) chaudoiri zaikai: Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 89, 210; Obydov, 2001: 459.
Carabus (Morphocarabus) chaudoiri zaikai: Deuve, 2004: 145.

Type locality: Tuva, Akademika Obrucheva Mt. Ridge, 2100 m.

Description. Body length is 18.2-21.9 mm. Pronotum transverse; sides of pronotum evenly rounded and broadly margined, its margin slightly bent upwards posteriorly; lobes of hind angles short, evenly rounded. Elytra oblong-oval, convex; primary elytral interspaces a little more developed, interrupted into relatively short links; secondary and tertiary about equally developed, interrupted into the short and long links, sometimes conjugated transverse. Primary foveoles distinct; striae coarsely punctured. Body black, bronze, blackish-bronze, green, greenish-bronze, with metallic lustre; palpi, antennae, femurs, tarsi and ventral body surface blackish-brown; mandibles, tibiae, claws and four basal segments of antennae (apically) reddish brown.

Distribution: Tuva, Akademika Obrucheva Mt Ridge. The subspecies inhabits mountain tundra, forest-tundra and mountain larch forests, at the altitudes from 1100 up to 2100 m above the sea level.

Remark: In its habitat in the mountain tundra the subspecies is sympatric with *C. (Morphocarabus) odoratus* and *C. (Diocarabus) slovtzovi*. In the larch forests occur sympatrically with *C. (Morphocarabus) henningi*, *C. (Diocarabus) loschnikovi* and *C. (Megodontus) schoenherri*.

Type material examined: Holotype of *Carabus chaudoiri zaikai*: male with two labels: “Tuva, Akademika Obrucheva Mt. Ridge, 2100 m, mountain tundra, N52°00’E095°34’, Sainak Pass, 2.VII.1998, D. Obydov leg.” and “Holotypus, Carabus (Morphocarabus) chaudoiri zaikai ssp. n., D. Obydov det., 1998” (TMB); 33 paratypes of *Carabus chaudoiri zaikai*: 9 males, 16 females, same date and same locality; 2 males, 6 females, Tuva, Akademika Obrucheva Mt. Ridge, 1100 m, N52°07’E096°00’, 3.VII.1998, D. Obydov leg.; each specimen with label: “Paratypus, Carabus (Morphocarabus) chaudoiri zaikai ssp. n., D. Obydov det., 1998” (MNHN, ZIN, ZMMU, TMB, TINR).

Carabus (Morphocarabus) chaudoiri beladici **Obydov, 2001 (Fig.6)**

Carabus (Morphocarabus) chaudoiri beladici Obydov, 2001: 460 (“Tuva, Eastern Tannu-Ola, Chongyz Tayga”).
Carabus (Morphocarabus) chaudoiri beladici: Deuve, 2004: 145.

Type locality: Tuva, East Tannu-Ola Mt. Ridge, Čongyz Tajga, 1500 m.

Description. Body length is 20.0-21.6 mm. Very dark coloration characterises this subspecies which is unlike that of any other subspecies of *C. chaudoiri* from mountains of southern Siberia. Pronotum convex, transverse; sides of pronotum narrowly margined; lobes of hind angles short, evenly rounded, slightly bent downwards. Elytra oval; primary elytral interspaces a little more developed, interrupted into relatively long and short links; secondary and tertiary about equally developed, partially integral, partially interrupted into long and short links. Primary foveoles distinct; striae coarsely punctured. Body one-coloured black; mandibles and claws brownish; sometimes tibiae, and four basal antennae joints (apically) reddish brown; ventral body surface black, rarely blackish brown.

Distribution: Tuva, East Tannu-Ola Mt. Ridge, Čongyz Tajga. The subspecies inhabits mountain forest-tundra and mountain larch forests, at the altitudes 1500 m above the sea level.

Type material examined: Holotype of *Carabus chaudoiri beladici*: male with two labels: “Russia, East Tannu-Ola, Čongyz Tajga, 1500 m, 1.VI.1997, M. Česánek leg.” and “Holotypus, Carabus (Morphocarabus) chaudoiri beladici ssp. n., D. Obydov det., 2000” (TMB); 9 paratypes, 3 males, 6 females of *Carabus chaudoiri beladici*, each specimen with two labels: “Tuva, East Tannu-Ola, Kara-Khol Lake, 29-31.V.2000, M. Beladič leg.” and “Paratypus, Carabus (Morphocarabus) chaudoiri beladici ssp. n., D. Obydov det., 2000” (coll. M. Beladič, Slovakia, Bratislava).

Carabus (Morphocarabus) chaudoiri shilenkovi **O. Berlov, 1989 (Fig.7)**

Carabus (Morphocarabus) shilenkovi O. Berlov, 1989: 151 (“Chukotka, Bilibinsky dist., Omolon Vill.”).

Carabus (Morphocarabus) shilenkovi: Deuve, 1991: 49; 1994: 109; Březina, 1994: 21; Shilenkov, 1994: 66; 1996: 34; Kryzhanovskij et al., 1995: 39; Ghiretti, 1996: 75.
Carabus (Morphocarabus) chaudoiri shilenkovi: Obydov, 1999: 107; 2001: 459; Březina, 1999: 15; Kleinfeld et Schütze, 1999: 10; Schütze et Kleinfeld, 1999: 74, 210.
Carabus (Morphocarabus) chaudoiri shilenkovi: Deuve, 2004: 145.

Type locality: Chukotka Peninsula, Bilibinsky dist., Omolon Village environs.

Description. Body length is 19.3-21.8 mm. Pronotum strongly convex, transverse; lobes of hind angles short, evenly rounded, slightly bent downwards. Elytra oval, convex; elytal sculpture triploid; all elytral interspaces about equally developed, primary elytral interspaces integral, secondary and tertiary interrupted into short links. Primary foveoles indistinct; striae coarsely punctured. Body one-coloured black, sometimes with weak violet or bronze lustre; mandibles, palpi, antennae, legs and ventral body surface black.

Distribution: North of Far East Russia and North Siberia: Chukotka Peninsula, Yakutia.

Type material examined: Holotype of *Carabus (Morphocarabus) shilenkovi*: male with two labels: "Chukotka Peninsula, Bilibinsky dist., Omolon Village, 8.VI.1969, Nikolaev leg." and "Carabus (Morphocarabus) shilenkovi sp. n., O. Berlov det." (ZIN).

Additional material examined: male and female with labels: "Yakutia, Oimyakon Mountain Plateau, 12-18.VII.1998, M. Česánek leg." (coll. M. Česánek, Slovakia, Bratislava).

Taxonomical remarks: For the long time, approximately since the beginning of XX century *Carabus (Morphocarabus) chaudoiri* Gebler, 1847 is considered as so-called "lost species".

Gebler's collection where there were type specimens of *Carabus (Morphocarabus) chaudoiri*, preserved in the Barnaul Museum of local study (western Siberia) by strange line of action has disappeared. Later some Gebler's type specimens including lectotype and paralectotype of *Carabus (Morphocarabus) chaudoiri* (Th. Deuve designation, 1991) have been found in the Laboratory of entomology of Muséum national d'Histoire naturelle (Paris). V.G. Shilenkov (1994, 1996) and some other authors are considered *Carabus (Morphocarabus) chaudoiri* as synonym of *Carabus (Morphocarabus) odoratus* Motschulsky, 1846. However studying of a type material has allowed confirming specific status of *Carabus (Morphocarabus) chaudoiri* (D. Obydov, 1997). Studying of the holotype of *Carabus (Morphocarabus) shilenkovi* O. Berlov, 1989 has shown that this taxon is subspecies of *Carabus (Morphocarabus) chaudoiri* (D. Obydov, 1999). Thus *Carabus (Morphocarabus) chaudoiri* is widespread polymorphic species which occupies all suitable biotopes of the north of Far East and east Siberia and mountains of the south of the central and east Siberia gravitate, however, to steppe sites of tundra and forest-tundra. The greatest polymorphism the species demonstrate in the south of the area, whence has been described six subspecies.

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Obydov, D. 2001. Notes on Carabus from Tuva Republic "Carabus odoratus" species group (Coleoptera, Carabidae). Lambillionea, CI, 3: 459-464.

Osawa, S., Su, Z-H. & Imura, Yu. 2002. Molecular Phylogeny and Evolution of the Carabid Ground Beetles of the World. Chiyodaku Tokyo: 264 pp. [in Japanese].

Schütze, H. & Kleinfeld, F. 1999. Carabusformen Sibiriens und Zentral-Asiens, 2. Auflage: 242 pp.

Shilenkov, V. G. 1994. Catalogue of the Carabus species from Siberia with preliminary notes to the taxonomical revision (Coleoptera, Carabidae). Carabid Beetles: Ecology and Evolution, Kluwer Academic Publishers: 63-69.

Shilenkov, V. G. 1996. [The ground beetles of the genus Carabus L. (Coleoptera, Carabidae) of South Siberia. Irkutsk State University Publ]. Irkutsk: 73 pp. [in Russian].

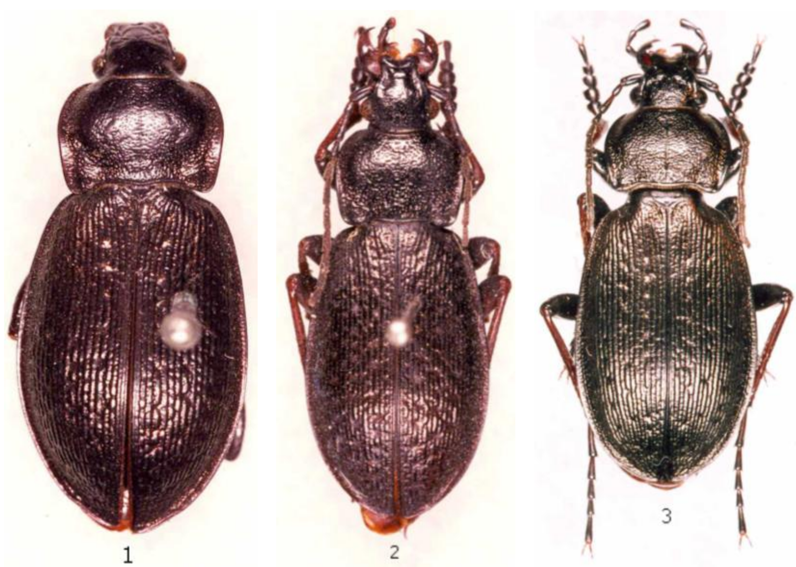
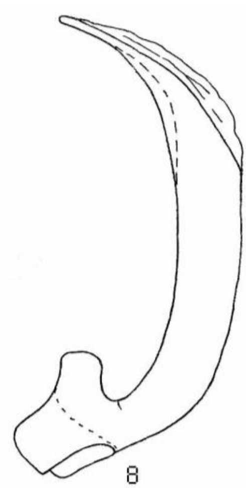


Fig.1. *Carabus (Morphocarabus) chaudoiri chaudoiri* (lectotype)
Fig.2. *Carabus (Morphocarabus) chaudoiri mongolorum* (lectotype)
Fig.3. *Carabus (Morphocarabus) chaudoiri czadanicus* (holotype)

Fig.4. *Carabus (Morphocarabus) chaudoiri marusiki* (holotype)
Fig.5. *Carabus (Morphocarabus) chaudoiri zaikai* (paratype)
Fig.6. *Carabus (Morphocarabus) chaudoiri beladici* (paratype)



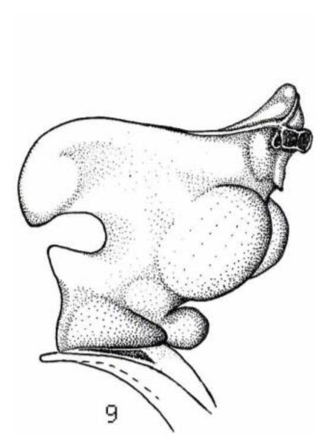


Fig.7. *Carabus (Morphocarabus) chaudoiri shilenkovi* (from Yakutia)
Figs 8-9: male genital structure of *Carabus (Morphocarabus) chaudoiri marusiki*. 8. Aedeagus, 9. endophallus in complete extension.

SCIENTIFIC NOTE

SUBSTITUTE NAMES FOR TWO PREOCCUPIED GENERA (ORTHOPTERA: ACRIDIDAE AND TETTIGONIIDAE)

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[Özdikmen, H. 2009. Substitute names for two preoccupied genera (Orthoptera: Acrididae and Tettigoniidae). Munis Entomology & Zoology, 4 (2): 606-607**]**

Family ACRIDIDAE
Genus *CARYANDOIDES* Zheng & Xie, 2007

Yinia Liu & Li, 1995. Entomol Sin 2 (2): 104. (Insecta: Orthoptera: Caelifera: Acridoidea: Acrididae: Catantopinae). Preoccupied by *Yinia* Li, Fasheng, 1994. Wuyi Sci J 11, December: 76. (Insecta: Psocoptera: Troctomorpha: Amphientomidae: Amphientominae).

Remarks: Liu & Li (1995) described the genus *Yinia* with the type species *Yinia hunanica* Liu & Li, 1995 by original designation and by monotypy in Orthoptera. It is still used as a valid genus name. According to Huang et al. (2009), *Caryandoides* Zheng & Xie, 2007 is a synonym of the genus *Yinia* Liu & Li, 1995.

Then, the genus name *Yinia* was proposed by Sun Shichun & Lu Jingrang (1998) with the type species *Yinia pratensis* Sun Shichun & Lu Jingrang, 1998 by original designation and by monotypy in Heteronemertea (Nemertea).

Unfortunately, the generic names were already preoccupied by Li Fasheng (1994), who had erected the genus *Yinia* with the type species *Yinia capitinigra* Li Fasheng, 1994 in Psocoptera.

Thus, the genus group names *Yinia* Liu & Li, 1995 (Orthoptera) and *Yinia* Sun Shichun & Lu Jingrang, 1998 (Nemertea) are junior homonyms of the genus *Yinia* Li Fasheng, 1994 (Psocoptera). So, *Yinia* Liu & Li, 1995 (Orthoptera) should be replaced with the junior synonym genus name *Caryandoides* Zheng & Xie, 2007 and I propose a new replacement name *Novoyinia* **nom. nov.** for *Yinia* Sun Shichun & Lu Jingrang, 1998 (Nemertea). The name is from the Latin prefix "novo" (meaning "new" in English).

Summary of nomenclatural changes:

For Orthoptera

Caryandoides Zheng & Xie, 2007

pro *Yinia* Liu & Li, 1995 (non Li Fasheng, 1994; nec Sun Shichun & Lu Jingrang, 1998)

Caryandoides hunanica (Liu & Li, 1995) **comb. nov.**

from *Yinia hunanica* Liu & Li, 1995

Oxyoides bamianshanensis Fu & Zheng, 1999

Oxyoides longianchorus Huang, Fu & Zhou, 2007

Caryandoides maguas Zheng & Xie, 2007

For Nemertea

Novoyinia **nom. nov.**

pro *Yinia* Sun Shichun & Lu Jingrang, 1998 (non Li Fasheng, 1994; nec Liu & Li, 1995)

Novoyinia pratensis (Sun Shichun & Lu Jingrang, 1998) **comb. nov.**
from *Yinia pratensis* Sun Shichun & Lu Jingrang, 1998

Family TETTIGONIIDAE
Genus *CHINENSIS* nom. nov.

Shennongia Liu, 1997. Insects of the Three Gorge Reservoir area of Yangtze river. Part 1. Chongqing Publishing House Chongqing: 147. (Insecta: Orthoptera: Ensifera: Tettigonioidea: Tettigoniidae: Phaneropterinae). Preoccupied by *Shennongia* Zhu, 1992. Acta Palaeontol. Sin. 31 (1): 83. (Cnidaria: Anthozoa).

Remarks: The name *Shennongia* was initially introduced by Zhu, 1992 for a fossil anthozoon (with the type species *Shennongia solida* Zhu, 1992 in Cnidaria.

Subsequently, Liu, 1997 described a new orthopter genus (with the type species *Shennongia inermis* Liu, 1997 by original designation from China) under the same generic name. It is a valid genus name.

Thus, the genus *Shennongia* Liu, 1997 is a junior homonym of the genus *Shennongia* Zhu, 1992. So I propose a new replacement name *Chinensis* **nom. nov.** for *Shennongia* Liu, 1997. The name derived from the type locality, China.

Summary of nomenclatural changes:
Chinensis **nom. nov.**
pro *Shennongia* Liu, 1997 (non Zhu, 1992)
Chinensis inermis (Liu, 1997) **comb. nov.**
from *Shennongia inermis* Liu, 1997

LITERATURE CITED

Huang, J., Zheng, Z., Huang, Y. & Zhou, Z. 2009. New synonymies in Chinese Oxyinae (Orthoptera: Acrididae). Zootaxa, 1976: 39-55.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Li, F. 2002. Psocoptera of China. Vol. I. [in Chinese]. Science Press, Beijing, China, 1092 pp.

Lienhard, C. 2009. Classification of Psocoptera with checklist of genera (including Cenozoic and Cretaceous fossils, in amber). According to Lienhard, C. & Smithers, C. N. 2002. Psocoptera (Insecta): World Catalogue and Bibliography. Instrumenta Biodiversitatis, vol. 5. Muséum d'histoire naturelle, Genève. . [http://www.ville-ge.ch/musinfo/mhng/page-e/p-psoco.htm]

Liu, Xiangwei. 1997. Orthoptera: Tettigonioidea: Phaneropteridae, Pseudophyllidae, Meconematidae, Conocephalidae and Tettigoniidae. In Yang, Xingke [Ed.]. Insects of the Three Gorge Reservoir area of Yangtze river. Part 1: 145-171

Liu, Z. & Li, B. 1995. A new genus and two new species of Catantopidae from Hunan Province, China. (Orthoptera: Acridoidea). Entomologia Sinica, 2 (2): 104-110.

Shichun, S. & Jingrang, L. 1998. A new genus and species of heteronemertean from the Changjiang (Yangtze) River Estuary. Hydrobiologia, 367: 175-187.

SCIENTIFIC NOTE

A NEW NAME, *MIROBLATTITES* FOR THE PREOCCUPIED GENUS *MIROBLATTA* LAURENTIAUX-VIEIRA & LAURENTIAUX, 1987 (BLATTODEA: ARCHIMYLACRIDAE)

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[Özdikmen, H. 2009. A new name, *Miroblattites* for the preoccupied genus *Miroblatta* Laurentiaux-Vieira & Laurentiaux, 1987 (Blattodea: Archimylacridae). Munis Entomology & Zoology 4 (2): 608**]**

Family ARCHIMYLACRIDAE
Genus *MIROBLATTITES* nom. nov.

Miroblatta Laurentiaux-Vieira & Laurentiaux, 1987. Ann Soc Geol Nord 106 (1): 38. (Insecta: Blattodea: Mylacroblattina: Archimylacridae). Preoccupied by *Miroblatta* Shelford, 1906. Trans. ent. Soc. London, 1906, 271. (Insecta: Blattodea: Blaberoidea: Blaberidae: Epilamprinae).

Remarks: The genus *Miroblatta* was described by Shelford, 1906 with the type species *Miroblatta petrophila* Shelfor, 1906. It is still used as a valid genus name.

Later, the genus *Miroblatta* was established by Laurentiaux-Vieira & Laurentiaux, 1987 for a pennsylvanian fossil taxon with the type species *Miroblatta costalis* Laurentiaux-Vieira & Laurentiaux, 1987 from Belgium. It is also a valid genus name.

However, the name *Miroblatta* Laurentiaux-Vieira & Laurentiaux, 1987 is invalid under the law of homonymy, being a junior homonym of *Miroblatta* Shelford, 1906. So I propose to substitute the junior homonym name *Miroblatta* Laurentiaux-Vieira & Laurentiaux, 1987 for the nomen novum *Miroblattites*. The name is derived from the Latin suffix "ites" that can be used only fosil taxa under the CODE).

Summary of nomenclatural changes:

Miroblattites **nom. nov.**

pro *Miroblatta* Laurentiaux-Vieira & Laurentiaux, 1987 (non Shelford, 1906)

Miroblattites costalis (Laurentiaux-Vieira & Laurentiaux, 1987) **comb. nov.**

from *Miroblatta costalis* Laurentiaux-Vieira & Laurentiaux, 1987

LITERATURE CITED

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Laurentiaux-Vieira, F. A. & Laurentiaux, D. 1987. Un remarquable Archimylacride du Westphalien inferieur belge. Anciennete du dimorphisme sexuel des Blattes. Ann. Soc. Geol. Nord, 106: 37-47.

Shelford, R. W. C. 1906. Studies of the Blattidae. I. Remarks on the sub-families Ectobiinae and Phyllodromiinae. Transactions of the Entomological Society of London, 54**:** 231–279.

SCIENTIFIC NOTE

KINZELBACHUS NOM. NOV., A NEW NAME FOR THE PREOCCUPIED STYLOPID GENUS *ULRICHIA* KINZELBACH, 1971 (STREPSIPTERA: STYLOPIDAE)

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[**Özdikmen, H.** 2009. *Kinzelbachus* nom. nov., a new name for the preoccupied stylopid genus *Ulrichia* Kinzelbach, 1971 (Strepsiptera: Stylopidae). Munis Entomology & Zoology 4 (2): 609-610]

One proposed genus name in the family Stylopidae is nomenclaturally invalid, as the genus group name has already been used by a different author in Ostracoda. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a substitute name for this genus name.

Family STYLOPIDAE
Genus *KINZELBACHUS* nom. nov.

Ulrichia Kinzelbach, 1971. Zoologica. Stuttg. 41 (119): 170. (Insecta: Strepsiptera: Stylopidia: Stylopidae: Stylopinae). Preoccupied by *Ulrichia* Jones, 1890. Quart. J. geol. Soc., 46, 544. (Crustacea: Ostracoda: Beyrichiacea: Drepanellidae).

Remarks on nomenclatural change: Kinzelbach (1971) described the genus *Ulrichia* with the type species *Stylops friesei* Hofeneder, 1949 by original designation. It is still used as a valid genus name. It is a monotypic genus which occurs in France, Hungary, Italy and Near east according to Pohl (2007).

Unfortunately, the generic name was already preoccupied by Jones (1890), who had erected the genus *Ulrichia* for a fossil ostracod with the type species *Ulrichia conradi* Jones, 1890 by original designation. It is still used as a valid genus name (e. g. Dojen et al., 2007). In this genus, many species has been described by various authors until now.

Thus, the genus group name *Ulrichia* Kinzelbach, 1971 is a junior homonym of the generic name *Ulrichia* Jones, 1890. So I propose a new replacement name *Kinzelbachus* **nom. nov.** for *Ulrichia* Kinzelbach, 1971. The name is dedicated to R. K. Kinzelbach who is current author of the preexisting genus *Ulrichia*.

Summary of nomenclatural changes:

Kinzelbachus **nom. nov.**

pro *Ulrichia* Kinzelbach, 1971 (non Jones, 1890)

Kinzelbachus friesei (Hofeneder, 1949) **comb. nov.**
from *Stylops friesei* Hofeneder, 1949
Ulrichia friesei (Hofeneder, 1949)

LITERATURE CITED

Dojen, C., Valenzuela-Ríos, J. I. & Carls, P. 2007. Lochkovian to Pragian (Lower Devonian) neritic Ostracodes from Nigüella (Zaragoza, Iberian Chains, NE Spain). Revista Española de Paleontología, 22 (2), 105-113.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Jones, T. R. 1890. On some Devonian and Silurian Ostracoda from North America, France, and the Bosphorus. Quarterly Journal of the Geological Society of London, 46: 534-556.

Kathirithamby, J. 2009. The Biodiversity and Systematics of the entomophagous parasitoid Strepsiptera (Insecta). From: http://atbi.eu/summerschool/files/summerschool/Kathirithamby _ Syllabus.pdf

Kinzelbach, R. K. 1971. Morphologische Befunde an Fächerflügern und ihre phylogenetische Bedeutung (Insecta: Strepsiptera). Zoologica, 119 (1&2): 256 pp.

Pohl, H. 2007. Fauna Europaea. Available from: http://www.faunaeur.org/full_results.php?id=170851

SCIENTIFIC NOTE

A NEW NAME, *SMENISPA* FOR THE PREOCCUPIED ISOPOD GENUS *ENISPA* SCHIOEDTE & MEINERT, 1884 (ISOPODA: CYMOTHOIDAE)

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[Özdikmen, H. 2009. A new name, *Smenispa* for the preoccupied isopod genus *Enispa* Schioedte & Meinert, 1884 (Isopoda: Cymothoidae). Munis Entomology & Zoology 4 (2): 611-612**]**

Family CYMOTHOIDAE
Genus *SMENISPA* nom. nov.

Enispa Schioedte & Meinert, 1884. Naturh. Tidsskr., (3) 14, 292-297. (Crustacea: Iopoda: Cymothoida: Cymothooidea: Cymothoidae). Preoccupied by *Enispa* Walker, 1866. List Specimens Lep. Ins. Brit. Mus., 34, 1275. (Insecta: Lepidoptera: Noctuoidea: Noctuidae: Eustrotiinae).

Remarks on nomenclatural change: The genus *Enispa* was erected by Walker (1866) with the type species *Enispa eosarialis* Walker, 1866 in Lepidoptera. It is still used as a valid genus name. Pole (1989) included 58 species in this genus.

Subsequently, the genus *Enispa* was described by Schioedte & Meinert (1884) with the type species *Enispa irregularis* (Bleeker, 1857) in Isopoda.

Thus the isopod genus name *Enispa* Schioedte & Meinert, 1884 is a junior homonym of the valid genus name *Enispa* Walker, 1866. So I propose here that *Enispa* Schioedte & Meinert, 1884 should be replaced with the new name *Smenispa*, as a replacement name.

Etymology: The name is derived from the capital letters of the current authors of the genus name.

Summary of nomenclatural changes:

Smenispa **nom. nov.**
pro *Enispa* Schioedte & Meinert, 1884 (non Walker, 1866)

Smenispa irregularis (Bleeker, 1857) **comb. nov.**
from *Enispa irregularis* (Bleeker, 1857)
Smenispa convexa (Richardson, 1905) **comb. nov.**
from *Enispa convexa* (Richardson, 1905)

LITERATURE CITED

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Poole, R. W. 1989. Lepidopterum Catalogus Noctuidae Part1-2. Systematic Entomology Laboratory USDH clo U.S. National Museum of Natural History Washington D.C., 1013 pp.

Schioedte, J. C. & Meinert, F. 1884. Symbolae ad monographiam Cymothoarum Crustaceorum Isopodum familiae. IV. Cymothoidae, Trib. II. Cymothoinae. Trib. III. Livonecinae. Naturhistorisk Tidsskrift, 14: 221-454.

Walker, F. 1866. List of the Specimens of Lepidopterous Insects in the Collection of the British Museum. Vol. 34. 1121–1533 pp.

SCIENTIFIC NOTE

PSOCOPSYLLA NOM. NOV., A NEW NAME FOR THE PREOCCUPIED PSOCID GENUS *EOPSYLLA* VISHNIAKOVA, 1976 (PSOCODEA: PSOCIDIIDAE)

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[**Özdikmen, H.** 2009. *Psocopsylla* nom. nov., a new name for the preoccupied psocid genus *Eopsylla* Vishniakova, 1976 (Psocodea: Psocidiidae). Munis Entomology & Zoology 4 (2): 613]

Family PSOCIDIIDAE
Genus *PSOCOPSYLLA* nom. nov.

Eopsylla Vishniakova, 1976. Paleont.Zh. 1976 (2): 78. (Insecta: Psocodea: Psocodiidae). Preoccupied by *Eopsylla* Argyropulo, 1946. Med. Parasitol., Moscow, 15 (4), 90. (Insecta: Siphonaptera: Hystrichopsylloidea: Hystrichopsyllidae).

Remarks on nomenclatural change: Vishniakova (1976) proposed the genus *Eopsylla*. According to Huang et al. (2008), Vishniakova attributed it to the family Archipsyllidae Handlirsch, 1906–1908. Then Rasnitsyn (2002) indicated that it belongs to the family Psocidiidae Tillyard, 1926.

Unfortunately, the generic name was already preoccupied by Argyropulo (1946), who had described the genus *Eopsylla* for a sphonepter. It is still used as a valid genus name and it occurs in Central Asiatic region.

Thus, the genus name *Eopsylla* Vishniakova, 1976 is a junior homonym of the genus name *Eopsylla* Argyropulo, 1946. So, in accordance with Article 60 of the International Code of Zoological Nomenclature, I propose a new replacement name *Psocopsylla* **nom. nov.** for *Eopsylla* Vishniakova, 1976.

LITERATURE CITED

Huang, D-Y., Nel, A., Azar, D. & Nel, P. 2008. Phylogenetic relationships of the Mesozoic paraneopteran family Archipsyllidae (Insecta: Psocodea). Geobios, 41 (4): 461-464.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Ioff, I. G., Tiflova, V. E., Argyropulo, A. I., Fedina, O. A., Dudolkina, L. A. & Shiranovich, P. I. 1946. News species of fleas (Aphaniptera). Med. Parasitol., 15: 85–94.

Rasnitsyn, A. P. 2002. Superorder Psocidea Leach, 1815. In: A. P. Rasnitsyn and D. L. J. Quicke, Editors, History of insects, Kluwer Academic Publishers, Dordrecht, Boston, London, pp. 125–142.

Vishniakova, V. N. 1976. Relict Archipsyllidae (Insecta: Psocoptera) in the Mesozoic fauna, Paleontological Journal, 10 (1976): 180–188.

SCIENTIFIC NOTE

SUBSTITUTE NAMES FOR TWO GENERA OF OSTRACODA (CRUSTACEA)

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[**Özdikmen, H.** 2009. Substitute names for two genera of Ostracoda (Crustacea). Munis Entomology & Zoology 4 (2): 614-615**]**

Order METACOPIDA
Genus *KESLINGOLOPHIA* nom. nov.

Endolophia Kesling, 1954. Contr. Mus. Paleont. Univ. Mich., 11, 174. (Crustacea: Ostracoda: Metacopida). Preoccupied by *Endolophia* Hampson, 1899. Proc. zool. Soc. London, 1899, 233. (Insecta: Lepidoptera: Pyraloidea: Crambidae: Odontiinae).

Remarks on nomenclatural change: Firstly, the moth genus *Endolophia* was erected by Hampson (1899). It is still used as an available valid genus name in Lepidoptera.

Subsequently, the ostracod genus *Endolophia* was established by Kesling (1954). Also, it is still used as a valid generic name.

Thus the genus *Endolophia* Kesling, 1954 is a junior homonym of the valid genus name *Endolophia* Hampson, 1899. So I propose here that *Endolophia* Kesling, 1954 should be replaced with the new name *Keslingolophia*, as a replacement name.

Etymology: The name is dedicated to H. U. Dahms and M. Pottek who are current authors of the preexisting genus *Talpina*.

Family HEMICYTHERIDAE
Genus *HARTMANNOSA* nom. nov.

Palaciosa Hartmann, 1959. Kieler Meeresforsch. 15: 230. (Ostracoda: Cytheracea: Hemicytheridae: Hemicytherinae: Orioninini). Preoccupied by *Palaciosa* Bolivar, 1930. Eos, 6, 375. (Insecta: Orthoptera: Caelifera: Acridoidea: Acrididae: Calliptaminae).

Remarks on nomenclatural change: The Oriental genus *Palaciosa* was described by Bolivar (1930). It is a monotypic genus which is endemic to India.

Subsequently, the genus *Palaciosa* was erected by Hartmann (1959) for a fossil ostracod.

Thus the genus name *Palaciosa* Hartmann, 1959 is a junior homonym of the valid genus name *Palaciosa* Bolivar, 1930. So I propose here that *Palaciosa* Hartmann, 1959 should be replaced with the new name *Hartmannosa*, as a replacement name.

Etymology: The name is dedicated to G. Hartmann who is the current author of the preexisting genus *Palaciosa*.

LITERATURE CITED

Bolivar, C. 1930. Un nuevo genero de Calliptamini de la India (Orth. Acrid.). Eos, Revista española de Entomología, 6: 375-380.

Hampson, G. F. 1899. A revision of the moths of the subfamily Pyraustinae and family Pyralidae. Part 2. Proc. Zool. Soc. London, 1899: 172-291.

Hartmann, G. 1959. Zur Kenntnis der lotischen Lebensbereiche der pazifischen Küste von El Salvador unter besonderer Berücksichtigung seiner Ostracoden fauna. (III. Beitrag zur Fauna El Salvador). Kieler Meeresforsch., 15 (2): 187-241.

International Comission of Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.

Kesling, R. V. 1954. Ostracods from the Middle Devonian Dundee Limestone in Northwestern Ohio. Museum of Paleontology, The University of Michigan, 11 (8): 167-186.

SCIENTIFIC NOTE

TEXASENSIS NOM. NOV., A NEW NAME FOR THE PREOCCUPIED FOSSIL FISH GENUS *CALLODUS* THURMOND, 1974 (OSTEICHTHYES: PYCNODONTIFORMES)

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[**Özdikmen, H.** 2009. *Texasensis* nom. nov., a new name for the preoccupied fossil fish genus *Callodus* Thurmond, 1974 (Osteichthyes: Pycnodontiformes). Munis Entomology & Zoology 4 (2): 616**]**

Family PYNODONTIDAE
Genus *TEXASENSIS* nom. nov.

Callodus Thurmond, 1974. Ceosci. Man 8: 112. (Osteichthyes: Pycnodontiformes: Pycnodontidae). Preoccupied by *Callodus* Hustache, 1932. Sborn. ent. odd. Národ. Mus. Praze, 10, 40. (Insecta: Coleoptera: Curculionoidea: Erirhinidae).

Remarks on nomenclatural change: Thurmond (1974) described the genus *Callodus* for a fosil fish with the type species *Callodus coronatus* Thurmond, 1974 from the lower Cretaceous of Texas (USA). It is stil used as a valid genus name (e.g. Shimada et al., 2006).

Unfortunately, the generic name was already preoccupied by Hustache (1932), who had described the genus *Callodus* for a beetle with the type species *Callodus costipennis* Hustache, 1932 by monotypy. It is still used as a valid genus name in the family Erirhinidae.

Thus, the genus name *Callodus* Thurmond, 1974 is a junior homonym of the genus name *Callodus* Hustache, 1932. So I propose a new replacement name *Texasensis* **nom. nov.** for *Callodus* Thurmond, 1974.

Summary of nomenclatural changes:

Texasensis **nom. nov.**

pro *Callodus* Thurmond, 1974 (non Hustache, 1932)

Texasensis coronatus (Thurmond, 1974) **comb. nov.**

from *Callodus coronatus* Thurmond, 1974

LITERATURE CITED

Hustache, A. 1932: Curculionides nouveaux de l'Afrique Équatoriale (IIe partie). Sborník entomologického oddelení Národního muzea v Praze, 10: 28-109.

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