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AN OVERVIEW ON THE W-PALAEARCTIC SUBGENUS *PHYTOECIA* (*HELLADIA*) FAIRMAIRE, 1864 WITH A NEW SUBSPECIES *PHYTOECIA* (*HELLADIA*) *HUMERALIS CANERI* SSP. N. FROM TURKEY (COLEOPTERA: CERAMBYCIDAE: LAMIINAE)

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ABSTRACT: All taxa of the subgenus *Helladia* Fairmaire, 1864 in Turkey and the world fauna are evaluated and summarized. A new subspecies, *Phytoecia* (*Helladia*) *humeralis caneri* ssp. n. is described from Turkey. *Musaria testaceovittata* Pic, 1934 is regarded as a subspecies of *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878 as the form *Phytoecia* (*Helladia*) *armeniaca testaceovittata* (Pic, 1934) stat. n.. Also, *Phytoecia* (*Helladia*) *natali* Lobanov, 1994 is accepted as a synonym of *Musaria testaceovittata* Pic, 1934 and placed in the other names of *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878 as syn. n.. Besides, *Phytoecia insignata* Chevrolat, 1854 is ranked as a subspecies of *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838) as the form *Phytoecia* (*Helladia*) *humeralis insignata* Chevrolat, 1854 stat. n.. Some new faunistical data are also given for Turkey in the text. Short descriptions and a short identification key are also given for Turkish species in the text.

KEY WORDS: *Helladia, Phytoecia,* Saperdini, Lamiinae, Cerambycidae, Coleoptera.

The main aim of this work is to clarify current status of the subgenus *Phytoecia* (*Helladia*) Fairmaire, 1864 in Turkey and the world fauna.

Subfamily LAMIINAE Latreille, 1825

Tribe SAPERDINI Mulsant, 1839

= Phytoeciaires Mulsant, 1839
= Saperdina Thomson, 1859
= Saperditae Thomson, 1860
= Saperdites Fairmaire, 1864
= Phytoecites Fairmaire, 1864
= Obereini Thomson, 1864
= Obereitae Thomson, 1864
= Phytoeciini Pascoe, 1864
= Saperdides Lacordaire, 1872
= Glénéides Lacordaire, 1872
= Gleneini Lacordaire, 1872
= Obereini Sama, 2008

Type genus: *Saperda* Fabricius, 1775

Vitali (2010) stated that "Saperdini, Phytoecini, Obereini and Gleneini are characterised by mutual characters that do not allow considering them as separated tribes. Breuning's systematics, the only world-wide revision, is adopted here". We agree with Vitali's approach now. In fact that Ohbayashi & Niisato

(2007) accepted Saperdini = Gleneini = Phytoeciini. We agree with these approaches and prefer now to return to Breuning's position.

Genus *PHYTOECIA* Dejean, 1835

= *Cardoria* Mulsant, 1863
= *Opsilia* Mulsant, 1863
= *Pilemia* Fairmaire, 1864
= *Helladia* Fairmaire, 1864
= *Musaria* Thomson, 1864
= *Blepisanis* Pascoe, 1866
= *Hoplotoma* Perez, 1874
= *Semiangusta* Pic, 1892
= *Pygoptosia* Reitter, 1895
= *Pseudomusaria* Pic, 1900
= *Fulgophytoecia* Pic, 1900
= *Neomusaria* Plavilstshikov, 1928
= *Cinctophytoecia* Breuning, 1947
= *Pseudoblepisanis* Breuning, 1950
= *Mimocoptosia* Breuning & Villiers, 1972

Type species: *Saperda cylindrica* Fabricius, 1775 = *Cerambyx cylindricus* Linnaeus, 1758

Now, we think that the presence of mixed characters in the whole genus does not allow us to consider the subgenera as valid genera as stated by some authors. Therefore, Breuning's (1951) systematics is adopted here chiefly.

In this case, the genus includes at least 15 subgenera as *Blepisanis* Pascoe, 1866; *Cardoria* Mulsant, 1863; *Cinctophytoecia* Breuning, 1947; *Fulgophytoecia* Pic, 1900; *Helladia* Fairmaire, 1864; *Mimocoptosia* Breuning & Villiers, 1972; *Musaria* Thomson, 1864; *Neomusaria* Plavilstshikov, 1928; *Opsilia* Mulsant, 1863; *Phytoecia* Dejean, 1835; *Pilemia* Fairmaire, 1864; *Pseudoblepisanis* Breuning, 1950; *Pseudomusaria* Pic, 1900; *Pygoptosia* Reitter, 1895 and *Semiangusta* Pic, 1892.

Subgenus *HELLADIA* Fairmaire, 1864

Fairm. Gen. Col. d'Eur. IV, 1864, p. 176, 201. — Ganglb. Best.-Tab. VIII, 1884, p. 122 (556), nota 1. — Pic, Bull. Soc. Ent. France 1900, p. 139. — Pic, Longic. IV, 2, 1903, p. 11—17 (Synopsis). — Aurivillius, Col. Cat., pars 73, 1921, p. 550. — Breuning, Ent. Arb. Mus. G. Frey, 2(1), 1951, p. 50. — Breuning, Cat. Lam. Monde, 9, 1966, p. 744. — Sama, Biocosm. Més.., 11(2), 1994, p 31. — Özdikmen, Mun. Ent. Zool., 2(2), 2007, p. 331.

Type species: *Saperda flavescens* Brullé, 1832

This subgenus was described by Fairmaire (1864) with the type species *H. flavescens* (Brullé, 1832) as a genus. The original description of Fairmaire (1864) as follows:

> *Corps oblong, déprimé en dessus, très-pubescent. Tété un peu plus étroite que le prothorax, médiocrement convexe, finement carénée entre les yeux. Yeux presque complétement divisés par l'échancrure. Labre tronqué, replié à l'extrémité. Mâchoires des Phyloecia. Palpes maxillaires à dernier article presque deux fois aussi long que le 5e. Menton court, fortement arrondi sur les côtés. Languette ovoï le, largement sinuée en avant, à peine rétrécie à la base, bordée de longues soies au bord antérieur, semi-membraneuse. Palpes labiaux allongés, à dernier article fusiforme, atténué, pas plus long que le 2e (Pl. 54, fig. 255 bis, H. orbicollis]. Antennes à peine plus courtes que le corps, cylindriques, assez épaisses, légèrement comprimées vers l'extrémité, les 3e et 4e articles un peu atténués à la base, 1er article épais, rétréci vers la base, plus court que le 3e.*

Prothorax transversal, fortement arrondi sur les côtés. Ecusson en carré fortement arrondi. Elytres un tiers plus larges à la base que lé prothorax, à épaules fortement marquées, se rétrécissant de là jusqu'à l'extrémité, qui est obliquement tronquée, planes sur la partie dorsale, perfiendiculaires sur les côtés. Prosternum très-étroit, mais séparant les hanches antérieures. Mésosternum assez large, parallèle, tronqué. Pattes de grandeur et de grosseur médiocre; tarses non comprimés; crochets à lobe interne large, très-court. — Grèce.
Ce genre ne renferme que deux ou trois espèces propres à la Grèce et à l'Asie-Mineure, et qui diffèrent beaucoup du g. Mallosia, où on en a placé une.

Ganglbauer (1884) accepted it as a subgenus of *Phytoecia* Dejean, 1835 and mentioned four species in the part of "Europaische Arten" as *Phytoecia flavescens* Brullé, 1832, *Phytoecia humeralis* (Waltl, 1838), *Phytoecia millefolii* (Adams, 1817), *Phytoecia praetextata* (Steven, 1817); five species in the part of "Caucasisch-persische Arten" as *Phytoecia armeniaca* Frivaldsky, 1878, *Phytoecia diadematа* (Faldermann, 1837), *Phytoecia fatima* Ganglbauer, 1884, *Phytoecia plasoni* Ganglbauer, 1884, *Phytoecia pretiosa* (Faldermann, 1837); and three species in the part of "Kleinasiatich-syrische Arten" as *Phytoecia ferrugata* Ganglbauer, 1884, *Phytoecia pontica* Ganglbauer, 1884, *Phytoecia scapulata* Mulsant, 1851 [= *Phytoecia humeralis* (Waltl, 1838)].

Pic (1900a,b and 1903), Aurivillius (1921), Breuning (1951 and 1966) also accepted it as a subgenus of *Phytoecia* Dejean, 1835. Then some authors (e.g., Sama, 1994; Özdikmen, 2007) used it as a separate genus.

Aurivillius (1921) stated seventeen species in the subgenus *Phytoecia* (*Helladia*) as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *diadematа* Faldermann, 1837; *Phytoecia* (*Helladia*) *dilaticollis* Pic, 1900 [now *Phytoecia* (*Helladia*) *ferrugata dilaticollis* Pic, 1900]; *Phytoecia* (*Helladia*) *edessensis* Reitter, 1898 [=*Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886]; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *flavescens* (Brullé, 1832); *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *infernalis* Pic, 1904 [= *Thyestilla gebleri* (Faldermann, 1835)]; *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817); *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837; *Phytoecia scapularis* Chevrolat, 1882 [= *Phytoecia humeralis* (Waltl, 1838)]*Phytoecia scapulata* Mulsant, 1851 [= *Phytoecia humeralis* (Waltl, 1838)]; *Phytoecia* (*Helladia*) *schmiedeknechti* Pic, 1899 [= *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858]. So the real number of mentioned species in Aurivillius (1921) is twelve.

Breuning (1951) placed eleven species and Breuning (1966) also placed twelve species (plus *Phytoecia iranica* Villiers, 1960) under the subgenus as *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *diadematа* Faldermann, 1837; *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *flavescens* (Brullé, 1832); *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858; *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *pontica* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837.

Then some new species was added by some authors as *Phytoecia* (*Helladia*) *paulusi* Holzschuh, 1971; *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia*

(*Helladia*) *imperialis* (Sama & Rejzek, 2001) and *Phytoecia* (*Helladia*) *demelti* (Sama, 2003).

Besides, *Phytoecia circumdata* was described by Kraatz (1882) from Samarkand (Kazakhstan). Ganglbauer (1884) gave it in the part of Turkestanische Arten as *Phytoecia circumdata* Kraatz, 1882. Pic (1903) described a subgenus of *Phytoecia* for this species as *Phytoecia* (*Fulgophytoecia*). Aurivillius (1921) placed it under the subgenus *Phytoecia* (*Fulgophytoecia*) Pic, 1903. Winkler (1924-1932) regarded the subgenus *Phytoecia* (*Fulgophytoecia*) Pic, 1903 as a synonym of *Phytoecia* (*Helladia*) Fairmaire, 1864 and placed the species *Phytoecia circumdata* Kraatz, 1882 under the subgenus *Phytoecia* (*Helladia*) Fairmaire, 1864. However, Breuning (1951) gave it in the nominotypical subgenus *Phytoecia* (s.str.). Breuning (1966) placed it under the subgenus *Phytoecia* (*Blepisanis*) Pascoe, 1866. Then some authors regarded it as a member of the subgenus *Phytoecia* (*Helladia*) Fairmaire, 1864. Finally Danilevsky (2010) placed it in the subgenus *Phytoecia* (*Fulgophytoecia*) Pic, 1903 again. Now we agree with the approach of Danilevsky (2010). So we regarded the species *Phytoecia circumdata* Kraatz, 1882 as a member of the subgenus *Phytoecia* (*Fulgophytoecia*) Pic, 1903, not *Phytoecia* (*Helladia*) Fairmaire, 1864.

The original description of Kraatz (1882) ex Ganglbauer, 1884 for *Phytoecia circumdata* Kraatz, 1882 as follows:

> *Schwarz, ziemlich glänzend, die Flügeldecken gelb, mit gemeinschaftlicher, weder die Basis noch die Spitze berührender schwarzer Makel. Der Kopf verhältnissmässig klein, fein, massig dicht punktirt, abstehend behaart. Halsschild fast doppelt so lang als breit, mit erhabener, glatter Mittellinie, jederseits in der Mitte undeutlich erhaben, dicht und deutlich punktirt. Flügeldecken ohne Rippen, ziemlich glänzend, vorne stark, nach hinten allmälig schwächer, ziemlich dicht punktirt, abstehend schwarz behaart. Unterseite bis auf die Mittelbrust beinahe glatt, greis pubescent. Long. 10 mm. — Samarkand (ex Kraatz).*

Therefore, the W-Palaearctic subgenus *Phytoecia* (*Helladia*) Fairmaire, 1864 includes seventeen species in the world fauna as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *demelti* (Sama, 2003); *Phytoecia* (*Helladia*) *diademata* Faldermann, 1837; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *flavescens* (Brullé, 1832); *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *imperialis* (Sama & Rejzek, 2001); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858; *Phytoecia* (*Helladia*) *paulusi* Holzschuh, 1971; *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *pontica* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837. Moreover seven species have the subspecies as *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878 [*Phytoecia* (*Helladia*) *armeniaca armeniaca* Frivaldsky, 1878 and *Phytoecia* (*Helladia*) *armeniaca testaceovittata* (Pic, 1934) stat. n.], *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884 [*Phytoecia* (*Helladia*) *ferrugata ferrugata* Ganglbauer, 1884 and *Phytoecia* (*Helladia*) *ferrugata dilaticollis* Pic, 1900], *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838) [*Phytoecia* (*Helladia*) *humeralis humeralis* (Waltl, 1838), *Phytoecia* (*Helladia*) *humeralis insignata* Chevrolat, 1854 stat. n. and *Phytoecia* (*Helladia*) *humeralis caneri* ssp. n.], *Phytoecia* (*Helladia*) *imperialis* (Sama & Rejzek, 2001) [*Phytoecia* (*Helladia*) *imperialis imperialis* (Sama & Rejzek, 2001)

and *Phytoecia* (*Helladia*) *imperialis dorud* (Sama et al., 2007)], *Phytoecia* (*Helladia*) *paulusi* Holzschuh, 1971 [*Phytoecia* (*Helladia*) *paulusi paulusi* Holzschuh, 1971 and *Phytoecia* (*Helladia*) *paulusi bludanica* (Sama, 2000)], *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) [*Phytoecia* (*Helladia*) *praetextata praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *praetextata nigricollis* Pic, 1891] and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837 [*Phytoecia* (*Helladia*) *pretiosa pretiosa* Faldermann, 1837 and *Phytoecia* (*Helladia*) *pretiosa nigroapicalis* Breuning, 1944].

The subgenus is distributed from Europe (Balkans) to European Russia and Turkmenia [**Europe** (Bulgaria, Romania, Macedonia, Greece (Rhodos Is., Crete), Ukraine, Crimea, European Russia), **Turkmenia**, **Caucasus** (Georgia, Armenia, Azerbaijan), Transcaucasia, **Turkey**, Cyprus, **Middle East** (Syria, Iran, Iraq, Palestina, Lebanon, Jordan, Israel)]. So, the subgenus has W-Palaearctic chorotype.

In Europe, this subgenus includes five species as *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia* (*Helladia*) *flavescens* (Brullé, 1832); *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817) and *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817).

In the Middle East, it includes ten species as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858; *Phytoecia* (*Helladia*) *paulusi* Holzschuh, 1971; *Phytoecia* (*Helladia*) *pontica* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837.

In Caucasus, it includes nine species as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *diademata* Faldermann, 1837; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837. *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886 was never mentioned by Danilevsky & Miroshnikov (1985).

In Iran, it includes eight species as *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *diademata* Faldermann, 1837; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *imperialis* (Sama & Rejzek, 2001); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884 and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837.

Also, it is represented only by *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884 for Turkmenia.

The subgenus has been represented by thirteen species in Turkey as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *demelti* (Sama, 2003); *Phytoecia* (*Helladia*) *diademata* Faldermann, 1837; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817); *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *pontica* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817) and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837. In addition to this, some Turkish species are represented by subspecies as

Phytoecia (*Helladia*) *armeniaca armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *ferrugata dilaticollis* Pic, 1900; *Phytoecia* (*Helladia*) *humeralis humeralis* (Waltl, 1838), *Phytoecia* (*Helladia*) *humeralis caneri* **ssp. n.**; *Phytoecia* (*Helladia*) *praetextata praetextata* (Steven, 1817); *Phytoecia* (*Helladia*) *praetextata nigricollis* Pic, 1891 and *Phytoecia* (*Helladia*) *pretiosa pretiosa* Faldermann, 1837. So the Turkish *Phytoecia* (*Helladia*) Fairmaire, 1864 comprises of fifteen taxa (thirteen species + two subspecies).

Zoogeographical Analysis

The world fauna of *Phytoecia* (*Helladia*) consist of seventeen species. Six species, namely 35 % of the species have SW-Asiatic chorotype as *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886; *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878; *Phytoecia* (*Helladia*) *diademata* Faldermann, 1837; *Phytoecia* (*Helladia*) *fatima* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *plasoni* Ganglbauer, 1884 and *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837. Six species, namely 35 % of the species have E-Mediterranean or SW-Asiatic chorotype as *Phytoecia* (*Helladia*) *alziari* (Sama, 1992); *Phytoecia* (*Helladia*) *ferrugata* Ganglbauer, 1884; *Phytoecia* (*Helladia*) *humeralis* (Waltl, 1838); *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858; *Phytoecia* (*Helladia*) *paulusi* Holzschuh, 1971 and *Phytoecia* (*Helladia*) *pontica* Ganglbauer, 1884. Thus, it can be stated that 70 % of the species related to the SW-Asiatic chorotype. Two species, namely 12 % of the species has Turano-Mediterranean (Turano-Balkan) chorotype as *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817) and *Phytoecia* (*Helladia*) *praetextata* (Steven, 1817). Each of the remaining species has a different chorotype. One species is endemic to Turkey, namely 6 % of the species has Anatolian chorotype as *Phytoecia* (*Helladia*) *demelti* (Sama, 2003). One species is endemic to Balkans, namely 6 % of the species has Balkanian chorotype as *Phytoecia* (*Helladia*) *flavescens* (Brullé, 1832). And one species is endemic to Iran, namely 6 % of the species has Iranian as *Phytoecia* (*Helladia*) *imperialis* (Sama & Rejzek, 2001) (Fig. 1).

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Taglianti et al. (1999). As far as possible as one chorotype description can be determined for each taxon in the text.

The all known taxa of *Phytoecia* (*Helladia*) Fairmaire, 1864 in the world fauna are presented in the following text:

Phytoecia (*Helladia*) *adelpha* Ganglbauer, 1886

Orig. comb.: *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886
Type loc.: Syria.
Other names: *Phytoecia edessensis* Reitter, 1898; *Phytoecia edessensis* var. *scapipicta* Reitter, 1898; *Phytoecia edessensis* var. *urfanensis* Reitter, 1898; *Phytoecia* (*Helladia*) *damascena* Pic, 1899; *Phytoecia adelpha* ab. *chtaurensis* Heyrovsky, 1937; *Phytoecia adelpha* ab. *spaceki* Heyrovsky, 1937; *Phytoecia adelpha* ab. *strandi* Heyrovsky, 1937; *Phytoecia* (*Helladia*) *orbicollis* m. *adanensis* Breuning, 1947; *Phytoecia orbicollis* m. *nigrofemorata* Breuning, 1947; *Phytoecia* (*Helladia*) *orbicollis* m. *atrofemorata* Breuning, 1951 (replacement name for *Phytoecia orbicollis* m. *nigrofemorata* Breuning, 1947); *Phytoecia* (*Helladia*) *orbicollis* m. *maraschensis* Breuning, 1951; *Phytoecia* (*Helladia*) *orbicollis cyprica* Breuning, 1968.

Phytoecia edessensis var. *scapipicta* Reitter, 1898 was firstly given by Pic (1900) as a variety of this species into the form *Phytoecia adelpha* v. *scapipicta* Reitter, 1898. Therefore, Aurivillius (1921) mentioned it as an aberration of *Phytoecia adelpha*. However, Breuning (1951) placed it as a morpha with m. *adelpha,* m. *edessensis,* m. *urfanensis* etc. under the species *Phytoecia* (*Helladia*) *orbicollis* Reiche et Saulcy, 1858. Besides, *Phytoecia* (*Helladia*) *orbicollis cyprica* Breuning, 1968 was stated by Sama & Rejzek (2001) as a form or a simple synonym of *Phytoecia adelpha*.

Danilevsky (2010) stated that "*according to Danilevsky and Kadlec (1990) 3 ex. of Ph. (Helladia) orbicollis were collected near Biurakan. S. Kadlec accepted (2002) the opinion of G. Sama and P. Rapuzzi (2000: 20) that Helladia orbicollis is endemic of Liban. From Turkey to Armenian Republic it is replaced by Helladia adelpha (Gangl.). According to Rejzek, Sama and Alziar (2001: 279), it is a subspecies H. orbicollis adelpha (Ganglb., 1885), but according to Sama and Rejzek (2001: 242) it is a separate species Helladia adelpha (Ganglb., 1884)*". However, Sama & Rapuzzi (2000) gave the specific epithet as *Helladia orbicollis* (Pic, 1899) wrongly. The author of this species is Reiche & Saulcy, 1858. Pic is the author of *Phytoecia* (*Helladia*) *schmiedeknechti* that Beitmeri (Lebanon) is the type locality. They also mentioned the species is endemic to Lebanon with question mark. *Phytoecia orbicollis* was described by Reiche & Saulcy (1858) from Nablus (=Naplouse) in Palestina. So the species can not be endemic to Lebanon. Nevertheless, *Phytoecia orbicollis* Reiche & Saulcy, 1858 should be distributed only in Palestina and Lebanon. From Syria and Turkey to Armenia, it is replaced by *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886. Therefore, all the infrasubspecific taxa given under the species *Phytoecia* (*Helladia*) *orbicollis* by Breuning (1951 and 1966) should be forms of *Phytoecia* (*Helladia*) *adelpha* Ganglbauer, 1886. So, all old records from Turkey of *P. orbicollis* belong to *P. adelpha*.

Ganglbauer stated that the species is very close to *Phytoecia ferrugata*. Original description of Ganglbauer (1886) as follows:

> *Nigra, prothorace macula media rufa, angulo elytrorum epipleurali, pedibus anticis, femorum basi tarsisque exceptis, et abdominis apice flavis; fronte, vittis duabus verticis, vitta media prothoracis scutelloque albido-, lateribus prothoracis flavescenti-tomentosis. Proihorace longitudine duplo latiore, lateribus valde rotundato-dilatato; elytris pube tenui grisea dense vestitis. Long. 10.5-11 mm. Syria.*

The type locality of this species was mentioned by Rejzek et al. (2001) as Syrien, Akbes (= SE Turkey). It probably is distributed only in eastern half of Anatolia for Turkey.

Material examined: Osmaniye prov.: Hasanbeyli, N 37°07′ E 36°32′, 711 m, 21.04.2007, 2 specimens; Hatay prov.: Akbez, N 36°51′ E 36°32′ 514 m, 31.03.2007, 1 specimen, 464 m, 22.04.2007, 1 specimen.

Records in Turkey: Hatay prov.: Akbez, İçel prov. (Pic, 1900a); Hatay prov.: Akbez as *Phytoecia edessensis* Reitter, 1898 (Aurivillius, 1921); Anatolia as *Phytoecia* (*Helladia*) *adelpha* (Winkler, 1924-1932); Turkey (Breuning, 1951 and 1966); Mardin prov.: Sultan (Fuchs et Breuning, 1971 ex Holzschuh, 1980); Gaziantep prov. as *P. orbicollis* Reiche et Saulcy, 1858 (Demelt, 1963 ex Öymen, 1987); Adana prov.: Misis and Feke as *P. orbicollis* Reiche et Saulcy, 1858

(Adlbauer, 1992); Turkey (Lodos, 1998); İçel prov.: Gülek and Namrunkale (Çamlıyayla, Sebil village) (Rejzek et al., 2001).

Distribution: Syria, Turkey, Armenia.
Chorotype: SW-Asiatic.

Phytoecia (*Helladia*) *alziari* (Sama, 1992)

Orig. comb.: *Helladia millefolii alziari* Sama, 1992
Type loc.: Cyprus.
Other names: Absent.

This species was described by Sama (1992) from Cyprus and S Turkey as a subspecies of *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817). Sama (2003) ranked it as a separate species. So, some old Turkish records of *Phytoecia* (*Helladia*) *millefolii* (Adams, 1817) should be belonging to it. These are: Hatay record of Fuchs et Breuning (1971) and Öymen (1987), Osmaniye record of Adlbauer (1988) and Kahramanmaraş records of Özdikmen & Okutaner (2006).

This species probably is distributed only in C and SE parts of S Turkey.

Material examined: Osmaniye prov.: Bahçe, Kızlaç village, Aslanlı, N 37 10 E 36 38, 768 m, 21.04.2007, 2 specimens; Hatay prov.: Harbiye, N 36 07 E 36 08, 273 m, 30.03.2007, 2 specimens; Harbiye-Yayladağı road, N 36 07 E 36 08, 275 m, 30.03.2007, 1 specimen; Akbez, N 36 50 E 36 32, 464 m, 22.04.2007, 1 specimen.

Records in Turkey: Hatay prov.: Arsuz (Fuchs et Breuning, 1971); Hatay prov.: İskenderun – Demelt, 1963 (Ex. Öymen, 1987); Osmaniye prov.: Nurdağı pass (Adlbauer, 1988); South-East Anatolia as *H. millefolii alziari* (Sama & Rapuzzi, 2000); South-eastern Mediterranean Region as *H. millefolii alziari* (Tozlu et al., 2003); Kahramanmaraş prov.: Nurhak (Alçiçek village) / Ekinözü (Aşağıörten / 1th Source env.) / Göksun (Mehmetbey / Kireçköy / Göksun-Çardak yolu) / Pazarcık (Aksu bridge / Kocalar village) / Çağlayancerit / Andırın-Çokak road (Özdikmen & Okutaner, 2006).

Distribution: Crete, Turkey, Cyprus, Syria, Lebanon, Jordan, Israel.
Chorotype: E-Mediterranean or SW-Asiatic.

Phytoecia (*Helladia*) *armeniaca* Frivaldsky, 1878

Orig. comb.: *Phytoecia armeniaca* Frivaldsky, 1878
Type loc.: Diyarbakır prov. (SE Turkey).
Other names: *Phytoecia iranica* Villiers, 1960; *Phytoecia* (*Helladia*) *natali* Lobanov, 1994 **syn. n.**; *Phytoecia* (*Helladia*) *armeniaca holzschuhi* Özdikmen, 2008 (unavailable name).
Ssp.:
Phytoecia (*Helladia*) *armeniaca armeniaca* Frivaldsky, 1878
Phytoecia (*Helladia*) *armeniaca testaceovittata* (Pic, 1934) **stat. n.**

We think that the species has two subspecies as the nominotypical subspecies and *Phytoecia* (*Helladia*) *armeniaca testaceovittata* (Pic, 1934) stat. n.. The later was

described by Pic (1934) from Transcaucasia ("ins Kojun, lac Urmia") in the original combination *Musaria testaceovittata* Pic, 1934. Breuning (1951) gave it as a species incertae sedis after the subgenus *Pseudoblepisanis* Breuning, 1950 at the end of his work with the species *luteovittigera* Pic, 1906. Breuning (1966) placed these species under the subgenus *Pseudoblepisanis* Breuning, 1950. In 1960, Villiers described the species *Helladia iranica* from Iran (Kurdistan). Breuning (1966) also gave it as a separate species. Danilevsky (2010) stated that he examined both of their type specimens and so he decided *Helladia iranica* Villiers, 1960 is a synonym of *Phytoecia* (*Helladia*) *testaceovittta* (Pic, 1934). Danilevsky regarded *Phytoecia* (*Helladia*) *testaceovittta* (Pic, 1934) and *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878 as separate species. Moreover, he placed *Phytoecia* (*Helladia*) *natali* Lobanov, 1994 that described from Azerbaijan (W of Kilyazi) as a subspecies of *Phytoecia* (*Helladia*) *testaceovittta* (Pic, 1934). Danilevsky (2010) gave the photos of type specimens of *Musaria testaceovittata* Pic, 1934; *Helladia iranica* Villiers, 1960 and *P. (H.) natali* Lobanov, 1994 in "Gallery" in www.cerambycidae.net. According to the photos of Danilevsky (2010) and our specimens, it is clear that these taxa should be belonging to one species, *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878. Thus, *Musaria testaceovittata* Pic, 1934 should be an eastern subspecies of *Phytoecia* (*Helladia*) *armeniaca* Frivaldsky, 1878 in the combination *Phytoecia* (*Helladia*) *armeniaca testaceovittata* (Pic, 1934) stat. n.. This subspecies is distributed only in S Caucasus (Azerbaijan) and Iran (Iranian Azerbaijan, Kurdistan, Tabriz, Hamadan). *Helladia iranica* Villiers, 1960 and *Phytoecia* (*Helladia*) *natali* Lobanov, 1994 are synonyms of *Phytoecia* (*Helladia*) *armeniaca testaceovittata* (Pic, 1934).

The original description of Frivaldsky (1878) ex Ganglbauer (1884) as follows:

> *Nigra, brevis, latiuscula, dense cinereo pubescens; pronoto rufo, magrine antico anguste, postico late nigro-cinctis, punctis quatuor transverse positis lineaque ante scutellum elevata nigris, nitidis; elytris flavidorufis, nigro-holosericeo maculatis et punctatis; tibiis rufis apice nigris. Long. 11 mm. — Diarbekir, Elisabeththal (ex Friv.).*

This species is distributed mostly in eastern half of Anatolia for Turkey. It is represented only by the nominotypical subspecies in Turkey. It was recently reported by Sama et al. (2010) as the first record to Israel.

Material examined: Konya: Derebucak, N 36 22 E 31 29, 1221 m, 16.05.2007, 3 specimens, 1217 m, 20.05.2008, 3 specimens.

Records in Turkey: Type loc.: Turkey: Diyarbakır prov. (Frivaldszky, 1878 ex Ganglbauer, 1884); Malatya prov. (Heyden,1888); Antalya prov.: Toros Mts., Niğde prov.: Çamardı, Konya prov. (Bodemeyer, 1900); Anatolia: Diyarbakır prov. (Winkler, 1924-1932; Breuning, 1951 and 1966; Rejzek et al., 2001; Sama et al., 2010); Niğde prov.: Çiftehan (Demelt, 1967; Adlbauer, 1988); Erzurum prov. and near (Özbek, 1978); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998); Adıyaman prov.: Nemrut Mt. (Rejzek & Hoskovec, 1999); Erzurum prov., Kars prov. (Tozlu et al., 2003); Muş prov.: Buğlan pass (Rejzek et al., 2003); Kahramanmaraş prov.: Ekinözü (Özdikmen & Okutaner, 2005); Bitlis prov. (Hoskovec & Rejzek, 2010).

Distribution: Transcaucasia, Turkey, Iran, Syria, Israel.
Chorotype: SW-Asiatic.

Phytoecia (*Helladia*) *demelti* (Sama, 2003) stat. n.

Orig. comb.: *Helladia demelti* Sama, 2003
Type loc.: Turkey.
Other names: *Phytoecia* (*Helladia*) *millefolii* m. *obscuripennis* Demelt, 1963.

This species was described by Sama (2003) from Turkey (İçel prov.: Silifke). It was named by Sama (2003) as *Helladia demelti*. He stated that the name *Phytoecia* (*Helladia*) *millefolii* m. *obscuripennis* Demelt, 1963 is not available according to ICZN as an infrasubspecific (not subspecific) name after 1960. It is close to the species, *P. millefolii* and *P. alziari*. It can be easily distinguished from them by dark bronze coloration with green or reddish lustre.

This species is endemic to central parts of S Turkey.

Records in Turkey: İçel prov.: Silifke, Kahramanmaraş prov., Hatay prov.: Akbez (in Turkey, not Syria) (Demelt, 1963b; Sama, 2003).

Distribution: Turkey.
Chorotype: Anatolian.

Phytoecia (*Helladia*) *diademata* Faldermann, 1837

Orig. comb.: *Phytoecia diademata* Faldermann, 1837
Type loc.: Transcaucasia.
Other names: Absent.

The original description of Faldermann (1837) ex Sama (1994) as follows:

> *Brevis, parallela, atra, sub-glabra; capite, thorace pedibusque luteis, nigro maculatis; antennis bi-coloribus; elytris testaceis, disco obsolete bicarinatis, apice late nigris. Longit. 4 lin. Antennae corporis dimidio paullo longiores, lineares, crassiusculuae, nigrae, latere interiori testaceae; articulo basali luteo, superne vitta angutsa nigra notato. Thorax brevissimus... nitidus, plaga dorsali manga quadrata nigra lucida antice profunde divisa decoratus; elytra... estacea, apice late nigra... segmento anali toto luteo. Pedes mediocres, lutei, nitidi, parce pilosi; femoribus quatuor posterioribus ad apicem nigris; femorum basi, tibiis posticis apice tarsique nonnihil infuscatis.*

According to Ganglbauer (1884), "*Long. 10-11 mm. — Caucasus, Elisabeththal*".

This species is distributed only in E Anatolia for Turkey.

Records in Turkey: Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998); Hakkari prov. (Sama, 1994; Hoskovec & Rejzek, 2010); Muş prov.: Buğlan pass (Rejzek et al., 2003).

Distribution: Transcaucasia, Georgia (Elizabeththal), Armenia (Erivan), Iran, Turkey.
Chorotype: SW-Asiatic.

Phytoecia (*Helladia*) *fatima* Ganglbauer, 1884

Orig. comb.: *Phytoecia fatima* Ganglbauer, 1884
Type loc.: Iran.

Other names: Absent.

This species was originally described by Ganglbauer (1884) as a separate species. Then Pic (1903: p. 61), Aurivillius (1921: p. 552) and Winkler (1924-1932: p. 1222) gave it as a species. Later Breuning (1951) placed it as a morpha under the species *Phytoecia* (*Helladia*) *pretiosa* and the same position of the taxon was remained by Breuning (1966). In recent times, the authors gave it as a subspecies of *Phytoecia* (*Helladia*) *pretiosa* (e.g., Sama, 1994; Rejzek et al., 2003). However, *Phytoecia fatima* Ganglbauer, 1884, *Phytoecia* (s.str.) *nigroapicalis* Breuning, 1944 of which type locality is Baghdad (Iraq) and *Helladia pretiosa ninives* Sama, 1994 of which type locality is Mossul (Iraq) were synonymized with *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837 by Sama et al. (2007). Danilevsky (2010) stated that "*as far as the type locality of Ph. pretiosa as "Transcaucasia" (Sama et al., 2007) is accepted, the new synonyms are totally out of the reality. In Transcaucasia both species Ph. (Helladia) pretiosa and Ph. (Helladia) fatima differs not only by color, but also by the presence of numerous erected setae near scutellum in Ph. pretiosa, by totally different character of thoracic and elytral punctation and many other characters. The areas of both taxa in Transcaucasia are rather distant and both are very common inside known localities. Both taxa are rather constant in all characters without any intermediate forms. So, until new investigations it is possible to accept now only one pair of synonyms: Phytoecia (H.) nigroapicalis Breuning, 1944 = H. pretiosa ninives Sama, 1994. Ph. pretiosa ninives Sama, 1994 was described from Irak (Mossul)*". Now we agree with the approach of Danilevsky (2010).

Ganglbauer (1884) separated this species from *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837 on the base of the coloration of elytra and legs. The original description of Ganglbauer (1884) as follows:

> *"Der vorigen mir unbekannten Art, wie es scheint, sehr nahestehend, von ihr aber durch die Färbung der Flügeldecken und Beine verschieden. Schwarz, eine grosse querovale Makel auf der Scheibe des Halsschildes gelbroth, die Flügeldecken mit Ausnahme der Mitte des Basalrandes und des letzten Viertels, die Apicalhälfte der Vorderschenkel und die Vorderschienen röthlichgelb. Kopf vorne und an den Seiten dicht goldgelb tomentirt, auf dem Scheitel mit zwei ebenso tomentirten Längsbinden überdies abstehend behaart. Halsschild an der Basis etwa eineinhalbmal so breit als lang, an den Seiten stark gerundet, vor der Mitte querwulstig erhoben, an den Seiten mit runden, ziemlich dicht gedrängten, auf der grossen rothen Medianmakel mit weitläufig stehsnden Punkten. Flügeldecken gegen die Basis ziemlich dicht, nach hinten feiner und weitläufiger punktirt, äusserst fein und nur auf der schwarzen Spitze erkennbar anliegend grau behaart und überdies mit kurzen, niederliegenden schwarzen Härchen besetzt. Unterseite schwarz, mit äusserst feiner und dünner, weisslichgrauer anliegender Behaarung und langabstehenden weisslichen Härchen, die Hinterecken der Abdominalsegmente dicht grau-gelb tomentirt. Long. 11 mm. — Persien".*

This species probably is distributed only in eastern half of Anatolia (especially SE Anatolia) for Turkey. SE Anatolian records of Sama et al. (2007) very likely belong to this species.

Records in Turkey: Mardin prov.: Hop pass, Batman prov.: Gercüş (Rejzek et al., 2003); Siirt prov. (Özdikmen et al., 2005); Mardin prov., Siirt prov., Şanlıurfa prov. as *Helladia pretiosa* (Sama et al., 2007).

Distribution: Caucasus (Armenia, Azerbaijan), Iran, Turkey.
Chorotype: SW-Asiatic.

Phytoecia (*Helladia*) *ferrugata* Ganglbauer, 1884

Orig. comb.: *Phytoecia ferrugata* Ganglbauer, 1884
Type loc.: Syria (Chaifa).
Other names: *Phytoecia* (*Helladia*) *ferrugata* ab. *houskai* Heyrovsky, 1948.
Ssp.:
Phytoecia (*Helladia*) *ferrugata ferrugata* Ganglbauer, 1884
Phytoecia (*Helladia*) *ferrugata dilaticollis* Pic, 1900

This species has two subspecies as the nominotypical subspecies and *Phytoecia* (*Helladia*) *ferrugata dilaticollis* Pic, 1900 of which original combination is *Phytoecia* (*Helladia*) *dilaticollis* Pic, 1900. The later was originally described by Pic (1900b) as a species from Asia Minor. He separated it from *P. adelpha*. Then, Pic (1903: p. 15), Aurivillius (1921: p. 552) and Winkler (1924-1932: p. 1222) gave it as a separate species. Later, Breuning (1951: p. 55) placed it as a morpha under the species *Phytoecia* (*Helladia*) *ferrugata*. Finally, Breuning (1966) stated that this taxon is a subspecies of *Phytoecia* (*Helladia*) *ferrugata*.

The original description of *P. ferrugata* of Ganglbauer (1884) as follows:

> *Schwarz, die Apicalhälfte der Vorderschenkel und die Vorderschienen, beim ♂ auch das letzte Abdominalsegment röthlichgelb, die Spitze der Mittelschenkel und die Wurzel der Mittelschienen röthlich durchschimmernd. Die Stime, zwei Längsbinden auf dem Scheitel, eine Mittelbinde und die Seiten des Halsschildes, das Schildchen, die Aussenecke der Flügeldecken und die Seiten der Brust und des Abdomens dicht rostroth tomentirt. Das rostrothe Toment des Abdomens bildet an den Seiten der Segmente dreieckige Makeln. Flügeldecken durch sehr feine anliegende Behaarung grauschwarz, dicht punktirt. Halsschild beim ♂ an der Basis doppelt so breit als lang, an den Seiten sehr stark gerundet erweitert, auf der Scheibe glänzend, mit einzelnen erhabenen, schwarze abstehende Haare tragenden Körnchen. Halsschild des ♀ weniger breit, an den Seiten etwas weniger gerundet erweitert, auf der Scheibe glanzlos, dicht punktirt. Long. 11-12 mm. — Syrien (Chaifa).*

The original description of *Phytoecia* (*Helladia*) *dilaticollis* of Pic (1900b) as follows:

> *Niger, robustus, postice attenuatus; thorace macula media rufo-testacea; angulo elytrorum epipleurali, abdomine, antennis pedibusque pro parte testaceis; thorace latiore, lateribus valde rotundato dilatato et dense luteo-fulvescente tomentoso; scutello luteo-tomentoso; elytris pube tenui cinerea dense vestitis. L. 13 mm. Asia minor (coll. Pic).*

This species probably is distributed only in central parts of S Anatolia for Turkey (probably in Amanos Mts.). It probably is represented only by the subspecies *Phytoecia* (*Helladia*) *ferrugata dilaticollis* Pic, 1900 in Turkey.

Records in Turkey: Anatolia as the type locality of *Phytoecia* (*Helladia*) *dilaticollis* (Pic, 1900b); Hatay prov.: İskenderun (Sama & Rejzek, 2001).

Distribution: Syria, Turkey, Israel, Palestina, Lebanon, Jordan.
Chorotype: E-Mediterranean or SW-Asiatic.

Phytoecia (*Helladia*) *flavescens* (Brullé, 1832)

Orig. comb.: *Saperda flavescens* Brullé, 1832
Type loc.: Morea (Greece).
Other names: *Phytoecia fumigata* Küster, 1848.

This species was described by Brullé (1832) from Morea. In 1848, Küster described a new species of *Phytoecia* as *P. fumigata*. Ganglbauer (1884) gave it as a synonym of *P. flavescens*.

The description of *P. flavescens* of Mulsant (1863) as follows:

> *Antennes revêtues d'un duvet cendré blanchâtre. Tète noire. Paré sur le vertex de deux bandes, et couvert en devant d'un duvet flavescent légèrement verdâtre. Prothorax un peu dilaté ou subarrondi vers le milieu de ses côtés; noir, paré d'une bande médiane de duvet blanchâtre, et de chaque côté d'une bande roussâtre. Ecusson pubescent, blanchâtre. Elytres revêtues d'un duvet flavescent verdâtre; tronquées en angle rentrant à l'extrémité; planiuscules; assez finement ponctuées; chargées chacune de deux ou trois faibles nervures longitudinales; à rebord sutural postérieurement saillant. Dessous du corps et pieds revêtus d'un duvet fiavescent verdâtre. — Patrie: la Morée.*

Also, the description of *P. flavescens* of Ganglbauer (1884) as follows:

> *Halsschild an den Seiten stark gerundet erweitert, beim ô vor der Mitte am breitesten, auf der Scheibe glänzend, fein und weitläufig gekörnt, beim ♀ in der Mitte am breitesten, glanzlos, dicht gedrängt punktirt. Schwarz, die Stirne, zwei Längsbinden auf dem Scheitel, eine Mittelbinde und zwei Seitenbinden auf dem Halsschilde und das Schildchen dicht gelblichweiss oder graugelblich tomentirt. Flügeldecken und Unterseite mit feinerem, gelblichgrauem Toment bekleidet; Flügeldecken bei beiden Geschlechtern, besonders aber beim ♀ ziemlich dicht gedrängt punktirt. Long. 11.5-15 mm.* Syn. *Ph. orbicollis* Reiche, *fumigata* Küst. *— Griechenland.*

This species is endemic to Balkans. It does not occur in Turkey.

Distribution: Greece, Macedonia.
Chorotype: Balkanian.

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

Orig. comb.: *Saperda humeralis* Waltl, 1838
Type loc.: Turkey.
Other names: *Phytoecia scapulata* Mulsant, 1851; *Phytoecia scapularis* Chevrolat, 1882; *Phytoecia frontalis* Chevrolat, 1882; *Helladia scapulata* var. *mersinensis* Pic, 1900; *Phytoecia* (*Helladia*) *humeralis* var. *bethaniensis* Pic, 1900; *Phytoecia humeralis* ab. *bytinskii* Heyrovsky, 1948; *Phytoecia* (*Helladia*) *humeralis* m. *flavoreducta* Breuning, 1951.
Ssp.:

Phytoecia (*Helladia*) *humeralis humeralis* (Waltl, 1838)
Phytoecia (*Helladia*) *humeralis insignata* Chevrolat, 1854 **stat. n.**
Phytoecia (*Helladia*) *humeralis caneri* **ssp. n.**

Until now, it has been known that the species regarded as without subspecies. Our work seems that it includes at least three subspecies in the world fauna as the nominotypical subspecies that occurs in Turkey and Iran, *Phytoecia* (*Helladia*)

humeralis insignata Chevrolat, 1854 that occurs in S Syria, Lebanon, Jordan, Israel. The new subspecies *Phytoecia* (*Helladia*) *humeralis caneri* **ssp. n.** is distributed only in S Turkey (especially in Amanos Mts. and its North parts).

Phytoecia insignata was originally described by Chevrolat (1854) from Israel (Saida = Sidon). He separated it from *P. humeralis* and *P. scapulata* and stated this species approaches enough the *P. humeralis* and *P. scapulata*, but it is much smaller. Breuning (1951 and 1966) gave it as a morpha of *P.* (*H.*) *humeralis*. In recent times, it regarded as a separate species in such the original description by the authors (e.g., Sama & Rapuzzi, 2000; Rejzek et al., 2001; Sama et al., 2010). According to Sama et al. (2007), all specimens of *H. humeralis* from Iran differ from typical form and probably constitute a distinct taxon that distinguishable by some characters given in their work. They also mentioned that Iranian population resembles *H. insignata*. So according to our approach, probably this Iranian population should be represented another subspecies of *P.* (*H.*) *humeralis*.

The original description of Chevrolat (1854) for *Phytoecia insignata* as follows:

> *Punctato, plumbeo-grisea. Capite rotundato magno, pube albida vestito, in vertice nigro-nitido, sal crebre punctato, pilis nigris hirsuto, supra oculos albido-supercilioso; thorace rotundato, nigro, nitido, cum macula orbiculatim signato rubra; scutello albo; elylris planis, versus apicem paululum attenuatis, subtruncatis, indumento griseo tectis, minute punctatis, in humero rubidis; femoribus anticis apice, tibiisque rufis. Long. 7 mill. — Saida (Israel)*

Consequently, we regarded that *P. insignata* should be a subspecies of *P.* (*H.*) *humeralis*.

Sama et al. (2010) gave *Phytoecia* (*Helladia*) *humeralis* var. *bethaniensis* Pic, 1900 as a synonym of *Phytoecia* (*Helladia*) *insignata*. The original description of *Phytoecia* (*Helladia*) *humeralis* var. *bethaniensis* Pic (1900b) as follows:

> *Niger, subelongatus, pedibus anticis pro parte flavis; elytris pube tenui grisescente vestitis; pygidio nigro. L. 8-9 mm. -Palästina: Bethania.*

This species is distributed rather widely in Anatolia for Turkey. It is represented by the nominotypical subspecies and *Phytoecia* (*Helladia*) *humeralis caneri* **ssp. n.** in Turkey.

Material examined: Antalya prov.: Akseki-Manavgat road, Gündoğmuş return 5th km, N 36 46 E 31 45, 396 m, 15.05.2007, 1 specimen; Akseki, Güzelsu village N 36 53 E 31 50, 1154 m, 09.06.2008, 1 specimen; Akseki, Mahmutlu village env., N 36 55 E 31 47, 1054 m, 19.05.2008, 1 specimen; Hatay prov.: Kırıkhan–Belen road, Kıcı, N 36 28 E 36 16, 481 m, 31.03.2007, 8 specimens; Hassa–Kırıkhan road, 10 km to Kırıkhan, N 36 33 E 36 23, 135 m. 31.03.2007, 6 specimens; Serinyol, N 36 21 E 36 13, 115 m, 30.03.2007, 1 specimen; Alahan castle, N 36 19 E 36 11, 147 m, 30.03.2007, 3 specimens; Akbez, N 36 50 E 36 32, 464 m, 22.04.2007, 7 specimens; Gaziantep prov.: Fevzipaşa–Islahiye road, N 37 05 E 36 38, 542 m, 31.03.2007, 6 specimens.

Records in Turkey: Konya prov.: Meram (Bodemeyer, 1900); Turkey (Aurivillius, 1921; Winkler, 1924-1932; Breuning, 1951 and 1966; Danilevsky & Miroshnikov, 1985; Lodos, 1998; Sama & Rapuzzi, 2000); İzmir prov.: Bornova / Efes (Demelt & Alkan, 1962); Amasya prov., Edirne prov. (Breuning et Villiers, 1967); Hakkari prov.: Yüksekova, Hatay prov.: Yenişehir / Antakya (Reyhanlı)

(Fuchs et Breuning, 1971); İzmir prov.: Bornova, Eskişehir prov. (Gül-Zümreoğlu, 1972); Eskişehir prov., İçel prov.: Anamur (Ex. Gül-Zümreoğlu, 1975); Ankara prov.: near Eymir lake, Isparta prov.: Kovada, İzmir prov.: Bornova (Doğanlar village) / Tire / Gümüşsu / Kuşadası / Menemen (Aliağa) / Torbalı (Pamukyazı) / Selçuk (Efes), Denizli prov.: Central / Buldan / Sarayköy, Manisa prov.: Salihli (Gökköy), Aydın prov.: Nazilli (Gül-Zümreoğlu, 1975); Konya prov.: Beyşehir, Adana prov.: Misis, Hatay prov.: Topboğazı, Osmaniye prov.: Fevzipaşa, Burdur prov.: Bucak, İçel prov.: Silifke (Mut) (Adlbauer, 1988); Adıyaman prov.: Karadut village env. (Rejzek & Hoskovec, 1999); Antalya prov.: Gündoğmuş / Perge env., İçel prov.: Namrunkale (Çamlıyayla, Sebil village) (Rejzek et al., 2001); Manisa prov.: Muradiye (Tezcan & Rejzek, 2002); Adana prov.: Central, Diyarbakır prov.: Silvan (Tozlu et al., 2003); Şanlıurfa prov.: Halfeti, Gaziantep prov., Mardin prov.: Hop pass (Rejzek et al., 2003); Uşak prov.: Ulubey (Ovacık village, Gökgöz hill) (Özdikmen & Hasbenli, 2004); Hatay prov.: İskenderun (Topboğazı), İzmir prov.: Kuşadası / Bornova (Doğanlar) / Central / Torbalı, Manisa prov.: Salihli (Özdikmen et al., 2005); Niğde prov.: Çamardı (Dikilitaş), Kahramanmaraş prov.: Çakalçullu road (Özdikmen & Demirel, 2005); Ankara prov.: Şereflikoçhisar, Aksaray prov.: exit of Ankara (Ekecik stream), Niğde prov.: between Araplı-Höyük (Özdikmen, 2006); Konya prov.: Beyşehir (Özdikmen, 2007).

Distribution: Greece (Rhodos Is.), Turkey, Syria, Palestina, Israel, Lebanon, Jordan, Caucasus (Azerbaijan), Iran.
Chorotype: SW-Asiatic or E-Mediterranean.

Phytoecia (*Helladia*) *humeralis caneri* ssp. n.

Material examined: Osmaniye prov.: Yaylalık-Türkoğlu road, N 36 17 E 36 37, 701 m, 18.05.2006, 1 specimen; Zorkun road, Çiftmazı, N 37 01 E 36 17, 223 m, 20.05.2006, 1 specimen; Entry of Yarpuz, N 37 03 E 36 25, 930 m, 18.05.2006, 5 specimens; Hasanbeyli, N 37 07 E 36 32, 711 m, 21.04.2007, 3 specimens; Toprakkale, N 37 03 E 36 08, 107 m, 23.04.2007, 3 specimens; Bahçe, Kızlaç village, Aslanlı, N 37 10 E 36 38, 768 m, 21.04.2007, 1 specimen; Hatay prov.: Kırıkhan–Belen road, Kıcı, N 36 28 E 36 16, 481 m, 31.03.2007, 8 specimens; Hassa–Kırıkhan road, 10 km to Kırıkhan, N 36 33 E 36 23, 31.03.2007, 5 specimens; Hassa–Kırıkhan road 20th km, N 36 35 E 36 24, 145 m, 31.03.2007, 1 specimen; Serinyol, N 36 21 E 36 13, 115 m, 30.03.2007, 2 specimens; Alahan castle, N 36 19 E 36 11, 147 m, 30.03.2007, 7 specimens; Akbez, N 36 50 E 36 32, 464 m, 22.04.2007, 9 specimens; Akbez, Gülpınarı plateau, N 36 51 E 36 30, 617 m, 19.05.2006, 1 specimen; Samandağı, Hüseyinli village, N 36 09 E 36 04, 149 m, 20.04.2007, 1 specimen; Samandağı, Üzengili village, N 36 09 E 36 04, 141 m, 20.04.2007, 1 specimen; Gaziantep prov.: Fevzipaşa–Islahiye road, N 37 05 E 36 38, 542 m, 31.03.2007, 26 specimens.

Differential diagnosis: Mainly, the new subspecies *Phytoecia* (*Helladia*) *humeralis caneri* is a color form of *Phytoecia* (*Helladia*) *humeralis*. It is close to the nominotypical subspecies by reddish-yellow pubescence and to the subspecies *Phytoecia* (*Helladia*) *humeralis insignata* Chevrolat, 1854 by coloration of the legs.

The new subspecies, *Phytoecia* (*Helladia*) *humeralis caneri* can be easily distinguished from *Phytoecia* (*Helladia*) *humeralis humeralis* (Waltl, 1838), which is widely distributed in SW-Asiatic area by following characters: Middle

and hind tibiae are reddish entirely (Fig. 2B). Sometimes, middle and hind femora in the exception of their black colored inner parts are reddish. The apexes of middle femora are also reddish.

Also the new subspecies, *Phytoecia* (*Helladia*) *humeralis caneri* can be easily distinguished from *Phytoecia* (*Helladia*) *humeralis insignata* Chevrolat, 1854, which is distributed in S Syria, Israel, Lebanon and Jordan by following characters: Head, pronotum and scutellum have reddish-yellow pubescence like nominotypical subspecies (Fig.). In ssp. *insignata*, they have white pubescence.

The new subspecies probably distributes only in Central parts of Southern Anatolian region [Hatay to Adıyaman provinces (especially in Amanos Mountains and its northern parts] of Turkey. The hybridization areas of the new subspecies observed as Gaziantep and Hatay provinces. According to present materials, 5 different localities which are in S, SE and E of Amanos Mountains are determined for the hybridization areas of the new subspecies as Hatay prov.: Kırıkhan–Belen road, Kıcı, N 36 28 E 36 16; Serinyol, N 36 21 E 36 13; Alahan castle, N 36 19 E 36 11; Akbez, N 36 50 E 36 32 and Gaziantep prov.: Fevzipaşa–Islahiye road, N 37 05 E 36 38. All specimens from Osmaniye province belong to the new subspecies only.

It is clear that the picture of *H. humeralis* from Adıyaman prov. (Turkey) given by Hoskovec & Rejzek (2010) and the Adıyaman record of Rejzek & Hoskovec (1999) should be belong to the new subspecies, *Phytoecia* (*Helladia*) *humeralis caneri*. Kahramanmaraş records of Özdikmen & Okutaner (2006) belong to the new subspecies. Besides, status of the old Turkish records of *Phytoecia* (*Helladia*) *humeralis* from near Amanos Mountains need to be clarified. So now, according to the present data, *Phytoecia* (*Helladia*) *humeralis caneri* ssp. n. is distributed in Hatay, Osmaniye, W Gaziantep, Kahramanmaraş and Adıyaman provinces as its distribution area.

On the other side, some color forms of *Phytoecia* (*Helladia*) *humeralis* have been described by different authors (Mulsant, Pic, Heyrovsky and Breuning). Two of them, *Helladia scapulata* var. *mersinensis* Pic, 1900 and *Phytoecia* (*Helladia*) *humeralis* m. *flavoreducta* Breuning, 1951, were described from Anatolia. However, the closest forms to coloration of the new subspecies among them are *Phytoecia scapulata* Mulsant, 1851 that described from Syria and *Helladia scapulata* var. *mersinensis* Pic, 1900. *Phytoecia humeralis* ab. *bytinskii* Heyrovsky, 1948 that described from Israel (Jerusalem) and *Phytoecia* (*Helladia*) *humeralis* m. *flavoreducta* Breuning, 1951 are less resemble to the new subspecies.

According to Pic (1900a), Mulsant stated that first 2 (print error, should be 4) segments of antennae black and middle femora dark or almost dark, etc. as the distinguishing characters in the description of *P. scapulata* from Syria. Pic (1900a) mentioned that "*I captured a variety of this species with the 4 (print error, should be 2) hind legs more or less clear and first segment of antennae testaceous in Mersin (=İçel) and Karaman provinces (long. 9-10 mm.); I shall indicate it under the name of var. mersinensis var. nov.. This variety corresponds almost in var. scapipicta Reitt. of adelpha Ganglb.*".

The description of *P. scapulata* of Ganglbauer (1884) as follows:

> *Der Ph. humeralis Waltl. ebenfalls sehr nahe stehend, aber die Stirne, die zwei Längsbinden auf dem Scheitel, das Schildchen und überdies noch die vier ersten Fühlerglieder lebhaft roth tomentirt, die grosse rothe Medianmakel auf dem Halsschilde vorne winkelig erweitert, an den Beinen auch die Spitze der Mittelschenkel und die Mittelschienen mit Ausnahme ihrer Kante und Spitze röthlichgelb. Long. 9-11 mm. — Syrien.*

Finally, the new subspecies clearly differs from other described infrasubspecific taxa of *Phytoecia* (*Helladia*) *humeralis*.

Variations: The new subspecies is characterized by reddish middle and hind femora and tibiae chiefly. Middle and hind femora has usually reddish area in all examined specimens. At least middle femora has always reddish area in all specimens. The reddish area of middle tibiae and hind femora and tibiae variable. The variation observed from the most parts reddish of middle and hind legs to hind legs black completely.

Etymology: The new name "*caneri*" is dedicated to Caner Gören (Turkey) who collected some specimens of the new subspecies.

A short key for related taxa on the base of Breuning (1951)

1. Pygidium black.....**2**
- Pygidium red.....**4**

2. The subhumeral spot is very large. It stretches over the disc of the elytron and exceeds behind the basal one third of elytra.....
.....***Phytoecia humeralis* ab. *bytinskii* Heyrovsky, 1948**
- The subhumeral spot is smaller. It barely reach the disc of elytra.....**3**

3. The design of head, pronotum and scutellum white.....
.....***Phytoecia* (*Helladia*) *humeralis insignata* Chevrolat, 1854**
- The design of head, pronotum and scutellum yellow or ocraceous-red.....
.....***Phytoecia frontalis* Chevrolat, 1882**

4. First four antennal segments black.....**5**
- First four antennal segments red.....**7**

5. Middle and hind tibiae always black.....**6**
- Middle and hind tibiae usually at least partly red.....
.....***Phytoecia* (*Helladia*) *humeralis caneri* ssp. n.**

6. Frons and vertex with clear drawings.....
.....***Phytoecia* (*Helladia*) *humeralis humeralis* (Waltl, 1838)**
- Frons and vertex without clear drawings.....
.....***Phytoecia* (*Helladia*) *humeralis* m. *flavoreducta* Breuning, 1951**

7. Hind tibiae black.....***Phytoecia scapulata* Mulsant, 1851**
- Hind tibiae red.....***Helladia scapulata* var. *mersinensis* Pic, 1900**

Phytoecia (*Helladia*) *imperialis* (Sama & Rejzek, 2001)

Orig. comb.: *Helladia imperialis* Sama & Rejzek, 2001
Type loc.: Azarbaygan-e-Garbi (Iran).
Other names: Absent.
Ssp.
Phytoecia (*Helladia*) *imperialis imperialis* (Sama & Rejzek, 2001)
Phytoecia (*Helladia*) *imperialis dorud* (Sama et al., 2007)

This species was originally separated by Sama & Rejzek (2001) from *P.* (*H.*) *ferrugata* and *P.* (*H.*) *adelpha*. It has two subspecies as the nominotypical subspecies and *Phytoecia* (*Helladia*) *imperialis dorud* (Sama et al., 2007). The later was described by Sama et al. (2007) from Lorestan (Iran).

This species is endemic to Iran. It does not occur in Turkey.

Distribution: Iran.
Chorotype: Iranian.

Phytoecia (*Helladia*) *millefolii* (Adams, 1817)

Orig. comb.: *Saperda millefolii* Adams, 1817
Type loc.: Russia (Georgievsk = Stavropol).
Other names: *Saperda azurea* Steven, 1817; *Phytoecia excelsa* Stierlin, 1876.

The original description of Adams (1817) as follows:
Cyanea, femoribus tibiisque rubris, antennis nigris. - Georgievsk.

This species is distributed rather widely in Anatolia for Turkey.

Material examined: Antalya prov.: Gündoğmuş-Akseki road, N 36 47 E 31 45, 410 m, 22.04.2008, 1 specimen.

Records in Turkey: Turkey (Aurivillius, 1921; Winkler, 1924-1932; Breuning, 1951; Danilevsky & Miroshnikov, 1985; Lodos, 1998); Kocaeli prov., Yalova prov. (Gfeller, 1972); Adıyaman prov.: plateaus under the peak region of Nemrut Mountain (Rejzek & Hoskovec, 1999); Erzurum prov.: Körsu 27 km N Hınıs, İstanbul prov.: Kumburgaz (Rejzek et al., 2001); Erzurum prov.: Ilıca (Atlıkonak), Kars prov.: Sarıkamış (Karakurt, Şeytangeçmez) (Tozlu et al., 2003); Konya prov.: Sultanhanı (Özdikmen, 2006); Kastamonu prov.: Ilgaz-Tosya road (Özdikmen, 2007).

Distribution: Europe (Bulgaria, Crimea, European Russia), Caucasus, Transcaucasia, Turkey, Iran.
Chorotype: Turano-Mediterranean (Turano-Balkan).

Phytoecia (*Helladia*) *orbicollis* Reiche et Saulcy, 1858

Orig. comb.: *Phytoecia orbicollis* Reiche et Saulcy, 1858
Type loc.: Naplouse (Nablus, Palestina).
Other names: *Phytoecia* (*Helladia*) *schmiedeknechti* Pic, 1899.

The original description of Reiche et Saulcy (1858) as follows:

Long. 10 mill. {4 1/2 lin.), lat. 3 1/4 mill. (1 1/2 lin.}. Linearis, picea, pilis fuscis parce hirta, Phyt. scutellata Fabricius vicina. Caput latum subrolundum, tomento griseo luteo dense vestitum, spatio longitudinale inter oculos subnudo; oculis mediocribus; antennis corpore brevioribus. Thorax transversus, subglobosus, medio capite paulò latior, latitudine tertia parte brevior, a latere valde rotundatus, subaeneus, punctatus, utrinque dense griseo-luteo tomentosus, medio tomenti pallidiori linea longitudinali ornatus. Scutellum semi circulare, transversum, tomento albido-Iuteo dense vestitum. Elytra basi thoracis medio vix latiora, indè usque ad apicem attenuata, thorace plus triplo longiora, subseriatim sat crebre punctata, tomento brevissimo dense vestita. Subtus dense griseo tomentosa. – Naplouse.

This species does not occur in Turkey (see *P. adelpha* for remarks). The old Turkish records belong to *P. adelpha*. Sama et al. (2010) stated that "*although described from Nablus (= Shekhem), this species, currently only known from northern and central Lebanon, southern Syria and Jordan, has never been recorded again from Israel or Palestine. We therefore think it does not live in Israel*".

Distribution: Palestina, Syria, Lebanon, Jordan.
Chorotype: E-Mediterranean or SW-Asiatic.

Phytoecia (*Helladia*) *paulusi* Holzschuh, 1971

Orig. comb.: *Phytoecia paulusi* Holzschuh, 1971
Type loc.: Libanongebirge, Mdeirej bei Sofar.
Other names: Absent.
Ssp.:
Phytoecia (*Helladia*) *paulusi paulusi* Holzschuh, 1971
Phytoecia (*Helladia*) *paulusi bludanica* (Sama, 2000)

This species has two subspecies as the nominotypical subspecies occurs only in Lebanon and *P.* (*Helladia*) *paulusi bludanica* occurs only in Syria. The later was described by Sama (2000) from Syria (Bludan) into the original combination *Helladia paulusi bludanica*.

This species does not occur in Turkey.

Distribution: Syria, Lebanon.
Chorotype: E-Mediterranean or SW-Asiatic.

Phytoecia (*Helladia*) *plasoni* Ganglbauer, 1884

Orig. comb.: *Phytoecia plasoni* Ganglbauer, 1884
Type loc.: Iran.
Other names: *Phytoecia* (*Helladia*) *plasoni* m. *invitticollis* Breuning, 1951.

The original description of Ganglbauer (1884) as follows:

Schwarz, die Fühler, die Apicalhälfte der Vorderschenkel, die Vorderschienen und die Wurzel der Mittelschienen bräunlichroth oder gelblichroth. Der Kopf, der Halsschild, das Schildchen und die Aussenecke der Flügeldecken sehr dicht bräunlichroth oder feurigroth sammtig tomentirt. Halsschild kurz, an der Basis doppelt so breit als lang, an den Seiten stark gerundet erweitert, auf der Scheibe vor der Mitte jederseits der Mittellinie mit einem Querhöcker, hinter

dem Vorderrande ringsum gleichmassig tief eingeschnürt. Ist das sammtartige Toment abgerieben, so erscheint der Kopf schwarz, der Halsschild bis auf den Vorder- und Hinterrand gelbroth. Flügeldecken bis auf die Aussenecke dünn schwarz tomentirt, an den Seiten vor der Mitte, sowie der Kopf und Halsschild und die Unterseite mit abstehenden schwarzen Härchen besetzt. Unterseite mit Ausnahme der Seiten des Halsschildes, der Spitze der Vorderschenkel, der Vorderschienen und der Wurzel der Mittelschienen schwarz, nur sehr dünn anliegend schwarz behaart. Mit der griechischen Ph. Flavescens Brüll, und der syrischen Ph. ferrugata m. zunächst verwandt. Long. 15 bis 17 mm. — Persien.

This species probably is distributed only in E Anatolia for Turkey. *Phytoecia* (*Helladia*) *plasoni* m. *invitticollis* was described by Breuning (1951) from Turkmenia.

Records in Turkey: Turkey (Danilevsky & Miroshnikov, 1985); Muş prov.: Buğlan pass (Rejzek et al., 2001; Rejzek et al. (2003).

Distribution: Turkmenia, Caucasus (Armenia), Turkey, Iran.
Chorotype: SW-Asiatic.

Phytoecia (*Helladia*) *pontica* Ganglbauer, 1884

Orig. comb.: *Phytoecia pontica* Ganglbauer, 1884
Type loc.: Pontus (N Turkey).
Other names: *Phytoecia* (*Helladia*) *pontica* m. *discomaculata* Breuning, 1947.

The original description of Ganglbauer (1884) as follows:

Mit Ph. humeralis äusserst nahe verwandt, aber die Hinterecken der vier ersten Abdominalsegmente und die Seiten des letzten, sowie die Spitze der Episternen der Hinterbrust dicht graugelb tomentirt, der Halsschild mit querovaler, viel grösserer rother Makel auf der Scheibe, die Flügeldecken mit grösserer, am Seitenrande nach hinten erweiterter Humeralmakel. Im Uebrigen von humeralis nur durch etwas dichtere Granulirung der Halsschildseiten verschieden. Long. 11.5-13.5 mm. — Pontus, Caucasus.

This species probably is distributed in Central parts of Anatolia from north to south for Turkey. Breuning (1951) and Danilevsky & Miroshnikov (1985) never mentioned it for Caucasus.

Records in Turkey: Anatolia as *Heladia humeralis* a. *pontica* (Winkler, 1924-1932); Kastamonu prov. (Breuning, 1951); Turkey (Breuning, 1951 and 1966; Lodos, 1998; Sama et al., 2010).

Distribution: Turkey, Syria, Jordan, Israel.
Chorotype: E-Mediterranean or SW-Asiatic.

Phytoecia (*Helladia*) *praetextata* (Steven, 1817)

Orig. comb.: *Saperda praetextata* Steven, 1817
Type loc.: Pontus (N Turkey).
Other names: *Phytoecia* (*Helladia*) *praetextata* var. *implagiata* Reitter, 1898
Ssp.:
Phytoecia (*Helladia*) *praetextata praetextata* (Steven, 1817)

Phytoecia (*Helladia*) *praetextata nigricollis* Pic, 1891

This species has two subspecies as the nominotypical subspecies and *Phytoecia* (*Helladia*) *praetextata nigricollis* Pic, 1891 occurs only in S Turkey (probably only in Amanos Mts.). The later was described by Pic (1891) from Hatay Prov. (Akbez) in the original combination *Phytoecia praetextata* var. *nigricollis* Pic, 1891. It easily distinguishes from the nominative subspecies by entirely black pronotum.

The description of Ganglbauer (1884) as follows:

> *Schwarz, die Flügeldecken gelbroth mit einer gemeinschaftlichen, breiten, vor der Spitze abgekürzten schwarzen Nahtbinde und mit je zwei runden schwarzen Makeln, von denen sich die eine auf der Schulter, die andere hinter derselben näher dem Seitenrande befindet. Halsschild mit einer grossen, über die Scheibe ausgedehnten, vorne jederseits erweiterten gelbrothen Makel und zwei schwarzen glänzenden Punkten in der Mitte derselben, auf der Scheibe bei beiden Geschlechtern seicht und sehr weitläufig punktirt, an den Seiten beim ♂ sehr fein gekörnt, beim ♀ ziemlich weitläufig punktirt. Kopf, Halsschild und Unterseite mit längeren abstehenden Haaren. Flügeldecken ziemlich tief punktirt. Long. 7-9 mm. — Krim.*

This species is distributed rather widely in Anatolia for Turkey. It is represented by both subspecies in Turkey.

Records in Turkey: Turkey: Hatay prov.: Akbez as the type loc. of *H. praetextata nigricollis* Pic, 1891; Hatay prov.: Akbez as *Phytoecia* (*Helladia*) *praetextata* var. *nigricollis* (Aurivillius, 1921); Cilicia: Adana prov. (Breuning, 1951 and 1966); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998); İçel prov. as *H. praetextata nigricollis* – Demelt, 1963 (Ex. Öymen, 1987); İçel prov.: Tarsus (Çamlıyayla) (Adlbauer, 1988); İçel prov.: Namrunkale (Çamlıyayla, Sebil village) as *H. praetextata nigricollis* (Rejzek et al., 2001); Bayburt prov.: Maden, Erzurum prov.: Karagöbek Mts. / Palandöken / Aşkale (Bozburun) / Kop Mt. / Ilıca (Rizelikent) / Narman (Kireçli pass) / Oltu (Sütkans) / Pasinler / Çalıyazı / Uzundere (Gölbaşı) (Tozlu et al., 2003); Gümüşhane prov.: Kelkit (Günyurdu village), Sivas prov.: İmranlı (Kasaplı village) (Özdikmen & Hasbenli, 2004); Ankara prov.: Kızılcahamam (Soğuksu National Park) (Özdikmen & Demir, 2006; Özdikmen,2006); Düzce prov.: Akçaören village, Yığılca, Zonguldak prov.: Devrek-Ereğli road, Kastamonu prov.: Şenpazar-Azdavay road (Özdikmen, 2007).

Distribution: Europe (Bulgaria, Romania, Ukraine, Crimea), Caucasus, Transcaucasia, Turkey, Syria.
Chorotype: Turano-Mediterranean (Turano-Balkan).

Phytoecia (*Helladia*) *pretiosa* Faldermann, 1837

Orig. comb.: *Phytoecia pretiosa* Faldermann, 1837
Type loc.: Transcaucasia.
Other names: *Phytoecia* (*Helladia*) *pretiosa* m. *nigroconjuncta* Breuning, 1947; *Phytoecia* (*Helladia*) *pretiosa* m. *basiimmaculata* Breuning, 1947; *Phytoecia* (*Helladia*) *pretiosa* m. *nigrobasireducta* Breuning, 1958; *Helladia pretiosa ninives* Sama, 1994.
Ssp.:
Phytoecia (*Helladia*) *pretiosa pretiosa* Faldermann, 1837
Phytoecia (*Helladia*) *pretiosa nigroapicalis* Breuning, 1944

We think that this species has two subspecies as the nominotypical subspecies and *Phytoecia* (*Helladia*) *pretiosa nigroapicalis* Breuning, 1944 occurs only in Iraq. The later was described by Breuning (1944) from Baghdad (Iraq) in the original combination *Phytoecia* (*Phytoecia*) *nigroapicalis* Breuning, 1944. According to Sama et al. (2007), *Phytoecia fatima* Ganglbauer, 1884 of which type locality is Iran, *Phytoecia* (*Phytoecia*) *nigroapicalis* Breuning, 1944 and *Helladia pretiosa ninives* Sama, 1994 of which type locality is Mosul (Iraq) are synonyms of *Phytoecia* (*Helladia*) *pretiosa* Faldermann, 1837. Now we agree with the approach of Danilevsky (2010) (see *P. fatima* for remarks). Therefore, we regarded as *Helladia pretiosa ninives* Sama, 1994 is a synonym of *Phytoecia* (*Helladia*) *pretiosa nigroapicalis* Breuning, 1944.

The original description of Faldermann (1837) ex Ganglbauer (1884) as follows:

> *Brevis, parallela, nigra, subglabra; fronte dense flavo-lanuginosa; vertice bivittato; thorace macula magna dorsali rufa; elytris testaceis, macula triangolari basali apiceque nigris. Pedibus nigris, tibiis anticis mediisque ad "apicevi nec non femorum quatuor anticorum apicibus rufo-testaceis. Long. 5 ¼ lin. — Transcaucasien (ex Falderm.).*

This species is distributed only in E Anatolia for Turkey. It is represented only by the nominotypical subspecies in Turkey.

Records in Turkey: Turkey: Anatolia: Erzurum prov. (Breuning, 1951; Sama, 1994); Turkey (Breuning, 1966; Danilevsky & Miroshnikov, 1985; Lodos, 1998).

Distribution: Caucasus, Transcaucasia, Turkey, Syria, Iran, Iraq.
Chorotype: SW-Asiatic.

A short identification key for Turkish *Phytoecia* (*Helladia*) taxa on the base of Breuning (1951)

1 Elytra unicolor.....**2**
1" Elytra not unicolor.....7

2 Elytra metallic.....**3**
2" Elytra not metallic.....**5**

3 Antennae completely dark colored (at least first segment completely).....
.....***millefolii* Adams, 1817**
3" Antennae partly red.....**4**
dark bronze coloration with green or reddish lustre

4 Upper surface of the body with dark bronze coloration with green or reddish lustre.....***demelti* Sama, 2003**
4" Upper surface of the body with dark metallic blue coloration.....
.....***alziari* Sama, 1992**

5 Middle and hind femora at least partly red.....
.....***ferrugata dilaticollis* Pic, 1900**
5" Middle and hind femora black.....**6**

6 Pronotum with a larger reddish spot enlarged to anterior and posterior edges.....***plasoni* Ganglbauer, 1884**

6" Pronotum with much smaller median reddish spot.....
.....***adelpha* Ganglbauer, 1886**

7 Elytral coloration reddish in major part **8**
7" Elytral coloration black in major part **13**

8 Apical one third of elytra black.....**9**
8" Apical one third of elytra different colored.....**11**

9 Head red.....***diademata* Falderman, 1837**
9" Head black.....**10**

10 Elytra with a large postscutellar triangular black spot together in the suture.....
.....***pretiosa pretiosa* Falderman, 1837**
10" Elytra without such spot, each elytron with basal black spot.....
.....***fatima* Ganglbauer, 1884**

11 Elytra with small numerous black spots in disc.....
.....***armeniaca armeniaca* Frivaldsky, 1878**
11" Elytra without such spots.....**12**

12 Pronotum partly red.....***praetextata praetextata* Steven, 1817**
12" Pronotum entirely black.....***praetextata nigricollis* Pic, 1891**

13 Head without reddish-yellow pubescence.....***pontica* Ganglbauer, 1884**
13" Head with reddish-yellow pubescence **14**

14 Middle and hind tibiae always black.....***humeralis humeralis* Waltl, 1838**
14" Middle and hind tibiae usually at least partly red.....
.....***humeralis caneri* ssp. n.**

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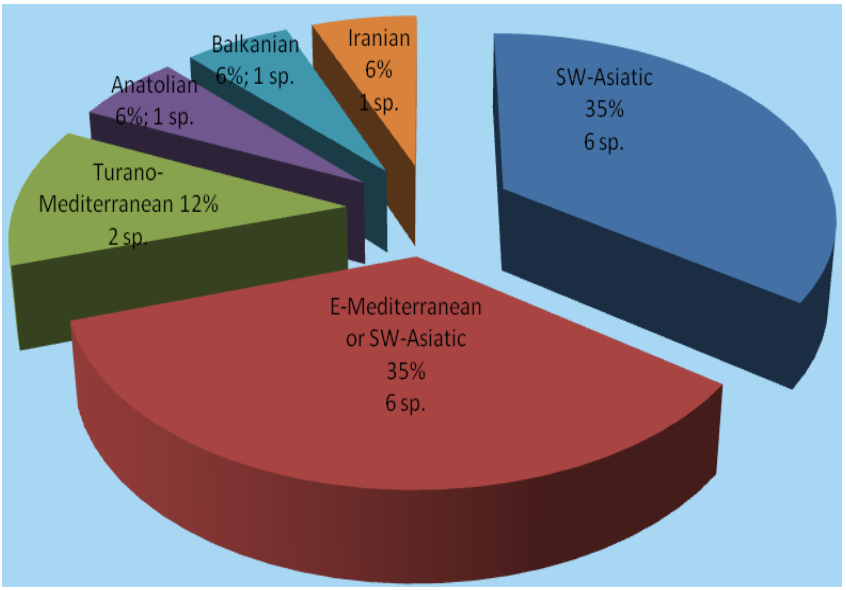

Figure 1. Zoogeographical composition of the subgenus *Phytoecia* (*Helladia*) Fairmaire, 1864.

A **B**

Figure 2. A. Habitus of *Phytoecia* (*Helladia*) *humeralis humeralis* (Waltl, 1838), B. Habitus of *Phytoecia* (*Helladia*) *humeralis caneri* ssp. n..

A NEW SPIDER GENUS OF THE TRIBE SMODICININI (ARANEAE: THOMISIDAE) FROM INDIA

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[Sen, S., Saha, S. & Raychaudhuri, D. 2010. A new spider genus of the tribe Smodicinini (Araneae: Thomisidae) from India. Munis Entomology & Zoology, 5 (2): 344-349**]**

ABSTRACT: A new supra specific taxa *Indosmodicinus* is proposed to accommodate a new species *I. bengalensis*. It is here described and illustrated. This is the first record of Smodicinini from India.

KEY WORDS: Thomisidae, Smodicinini, *Indosmodicinus,* new genus, *I. bengalensis*, new species, India.

The tribe Smodicinini Ono includes 3 genera, *Smodicinus* Simon, 1895; *Parasmodix* Jézéquel, 1966 and *Smodicinodes* Ono, 1993. Of these the genera *Smodicinus* Simon (Dippenaar-Schoeman, 1980) and *Parasmodix* Jézéquel are monotypic and known from Africa. On the other hand 3 Asian species *Smodicinodes kovaci* Ono, 1993, *S. schwendingeri* Benjamin, 2002 and *S. hupingensis* Tang et al., 2004 are the only members of the genus *Smodicinodes* Ono. So far not a single smodicinine spider is known from India (Platnick, 2009; Sebastian & Peter, 2009).

The most typical character of Smodicinini is the prosomal crest with 4 or 6 tubercles furnished with strong setae at each tip (Ono, 1993).

Recently a spider species resembling both African and Asian Smodicinini is recorded from India. The individuals are collected from the two Reserve Forests of North Bengal, namely Jaldapara Wildlife Sanctuary and Mahananda Wildlife Sanctuary. Having prosomal crest formed by 3 pairs of tubercles, the spiders undoubtedly belong to the tribe Smodicinini. This smodicinine spider shows close resemblance to the prosomal crest of *Smodicinus coroniger* Simon and the opisthosoma of *Smodicinodes hupingensis* Tang et al.. But it is considerably different from both the species and all other known species as well. It can sharply be distinguished from all smodicinine genera by the differently shaped and length of prosomal tubercular projections, opisthosomal shape, caudal hump and as well as female genitalia. A new genus is proposed to accommodate the present species.

MATERIALS AND METHODS

Spiders were collected and preserved following Tikader (1987).The materials were studied using Stereo Zoom Binocular Microscope, model Zeiss SV- 11. The measurements indicated in the text are in millimeters, made with an eye piece graticule.

Abbreviations: AME= anterior median eyes, ALE= anterior lateral eyes, PME= posterior median eyes, PLE= posterior lateral eyes.

TAXONOMY

Indosmodicinus gen. nov.

Diagnosis: Prosomal crest long, tubercular projections of the crest long, pointed, extending much beyond the prosomal margin, anterior pair finger like, broad at base, median pair outwardly and downwardly curved, posterior pair extending up to basal 1/3 of opisthosoma, bifurcate apically, inner one further bifid, distinct neck region between median and posterior pair; anterolateral clypeal tubercular projections much long, strong, claw like; legs moderately long, not slender, each femora with a small dorsal spine; opisthosoma long, pentagonal, with a distinct caudal hump; spermatheca bilobed, copulatory duct long divisible into 2 parts.

Type species: *Indosmodicinus bengalensis* sp. nov.

Etymology: The generic name is derived from the name of the country.
Remark: The new genus belongs to the tribe Smodicinini of the subfamily Thomisinae. The present genus *Indosmodicinus* appears close to *Smodicinus* Simon than to *Smodicinodes* Ono in the shape of prosomal crest. Differential diagnosis of the mentioned genera are presented in table 1.

Indosmodicinus bengalensis sp. nov.

Description: Female (Holotype):
Total length- 3.48, carapace length-1.24, carapace width-1.18, abdominal length-2.21, abdominal width-1.66. Prosoma (fig.1) whitish grey, globose, with a yellowish grey crest extending all through posteriorly, further extended over the abdomen, broad anteriorly and narrow posteriorly, warty, raised near the ocular area, depressed behind, further raised at the posterior 1/3, with a midlongitudinal yellowish white band extending from base to apex; with 6 broad tubercular projections on the edge, each projection long, pointed, extending much beyond prosoma. Of these anterior pair finger like, broad at base, median pair outwardly and downwardly curved, distinct neck region between median and posterior pair, posterior pair long, broad, extending up to basal 1/3 of opisthosoma, bifurcate apically, inner one further bifid, tip of each projections with a short, dagger shaped seta. Eyes 8, on the crest, black, lateral eyes large, sub equal, median eyes small, sub equal, posterior row much wider than the anterior, anterolaterals on a tubercular base, situated at outer basal angle of the anterior pair of projection, posterolaterals situated at the inner basal half of the same projection, posteromedians with a black patch around, further angularly with 2 yellow broad patch approaching the median band, laterally and downwardly with 2 yellow, long, rather narrow band marking the base of median pair of projection, ocular quad trapezoid. Clypeus yellowish grey, broad, anterolateral angles with 2 long, strong, claw like tubercular projections, margin with 6 long setae. Inter ocular distance: AME–AME=0.27, ALE–AME=0.21, ALE–ALE=0.86, PME–PME=0.54, PLE–PME=0.37, PLE–PLE=1.51, ALE–PLE=0.45, AME–PME=0.29. Chelicerae (fig.2) yellowish black, broad, only promargin with a tooth, anteriorly scopulate, fangs yellow, curved. Maxillae (fig.3) grey, margins pale, longer than broad, basally truncate, broad posteriorly, outer margin incurved, clothed with few brown hairs; labium grey, apical margin pale and convex, with few hairs, longer than broad, with a 'U' shaped brown patch; sternum (fig.4) brown, except anterior margin, top like, longer than broad, clothed with brown hairs.

Legs long, yellowish white, with a black band on apices of femora, greater part of tibia I and II, base of metatarsi I and II, this in III and IV paler, each femora with a small dorsal spine, tarsal claw 2. Leg formula 2143.

Opisthosoma (fig.1) grey, pentagonal, with a caudal hump, dorsum variably decorated with black, with few scattered small brown spots, of these posteromedians largest (muscular apodemes), encircled by yellow circular band, each band with a oblique white band running outwardly, 2 pairs of small black patch just behind it; venter greyish white, with broad, transverse, brown band, just below the epigastric furrow, posterior half with 2 oblique brown bands uniting at base of spinnerets, in between these 2 bands a broad median longitudinal yellow band, its lateral margins with 9 pairs of brown spots arranged in longitudinal series, spinnerets grey black.

Epigynum-Internal genitalia (figs. 5 & 6): atrium longer than broad, 2 lip like fertilization duct, opening visible bilaterally; spermatheca broad, bilobed, copulatory duct long, divisible into 2 parts, apically narrow, convoluted, basally sac like, copulatory openings oblique.

Material Examined: Holotype: Female, Sissamara, Jaldapara Wildlife Sanctuary, Jalpaiguri, West Bengal, India, Coll. D. C. Dhali, 12.iv.2009. Paratypes: 1 Female, Mairadanga, Jaldapara Wildlife Sanctuary, Jalpaiguri, West Bengal, India, Coll. S. Sen, 14.iv.2009; 1 Female, Sevok, Mahananda Wildlife Sanctuary, Darjeeling, West Bengal, India, Coll. S. Sen, 18.v.2009.
Type Deposition: Entomology Laboratory, Department of Zoology, University of Calcutta, Regn. No. EZC 0020-09.
Distribution: India: West Bengal.
Etymology: The specific epithet is derived from the name of the State.

ACKNOWLEDGEMENTS

We are grateful to Dr. Tang Guo for his valuable advice and literature support during this study. We thank DBT, Govt. of India (BT/PR6391/NDB/51/078/2005 dt. 20.11.2006) for sponsoring the project and Department of Forest, Govt. of West Bengal and the Head, Department of Zoology, University of Calcutta for necessary support.

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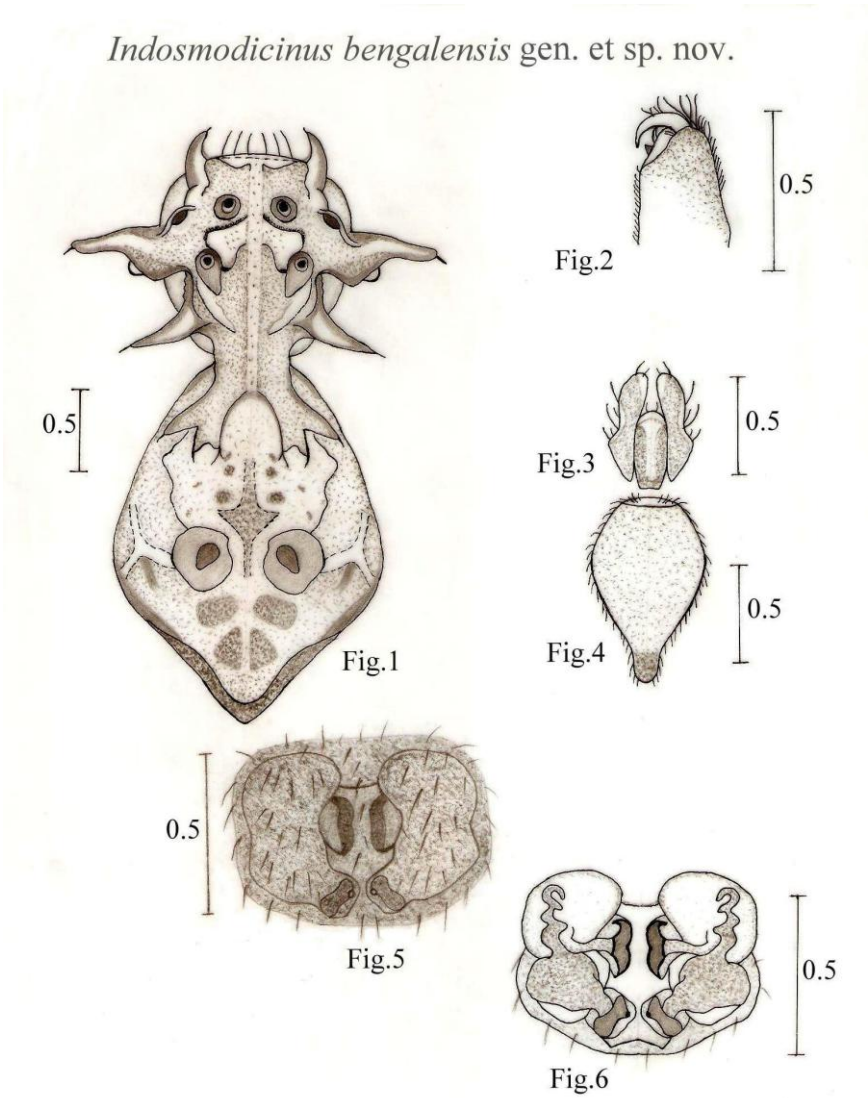

Figures 1-6. *Indosmodicinus bengalensis* gen. et sp. nov.: Female: 1. Whole body, 2. Chelicerae, 3. Maxillae and labium, 4. Sternum, 5. Epigynum, 6. Internal genitalia.

Figure 7. *Indosmodicinus bengalensis* gen. et sp. nov. (female): Photograph

Table 2. Length of legs of female holotype of *Indosmodicinus bengalensis* gen et sp. nov. (in mm).

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	1.65	0.60	1.04	0.86	0.69	4.84
II	1.65	0.65	1.21	1.17	0.39	5.07
III	1.21	0.30	0.95	0.52	0.30	3.28
IV	1.34	0.34	1.0	0.65	0.43	3.74

Table 1. Showing the differences between *Indosmodicinus* gen. nov., *Smodicinus* Simon and *Smodicinodes* Ono.

Characters	***Indosmodicinus* gen. nov.**	***Smodicinus* Simon**	***Smodicinodes* Ono**
A. Prosomal crest	All 3 pairs of tubercular projections long, pointed, extending much beyond prosoma.	Tubercular projections long, pointed, except anterior pair extending up to the margin of prosoma.	Tubercular projections small, blunt, except anterior pair never reaching the prosomal margin.
	Median pair extending outwardly and downwardly.	Median pair extending downwardly.	Median pair too small, directed upwardly.
	Presence of long neck region between median and posterior pair.	Such neck region absent.	Such neck region absent.
	Posterior pair extended upto basal 1/3 of opisthosoma, bifurcate, inner one further bifid.	Posterior pair not extending beyond the prosoma, bifurcate but inner one not bifid.	Posterior pair neither extending upto prosomal margin nor bifurcate.
B. Clypeus	Anterolateral tubercular projections long, strong, claw like.	Anterolateral tubercular projections absent.	Anterolateral tubercular projections very small.
	Median tubercle absent.	Median tubercle absent.	Median tubercle present.
	Setae 3 pairs, similar.	Setae 2 pairs.	Setae 3, middle one longest.
C. Cheliceral margin	Promargin with a small tooth.	Each margin with a setae.	Promargin with 2 small teeth (*S. kovaci* Ono) or with 5 beard shaped long hairs (*S. hupingensis* Tang et al.).
D. Opisthosoma	Long, pentagonal.	Small, oval.	Elongate oval (*S. kovaci* Ono) or pear shaped (*S. hupingensis* Tang et al.).
	Caudal hump present.	Caudal hump absent.	Caudal hump absent.
E. Epigynum-Internal genitalia	Epigynum without guide pocket; spermatheca bilobed, copulatory duct long, divisible into 2 parts, apically narrow and convoluted and basally sac like.	Epigynum without guide pocket, with a median depression; spermatheca and copulatory duct small.	Epigynum with a guide pocket in the anterior part; spermatheca divided into 2 parts, tubular part with a reniform gland, the closed part oval (*S. kovaci* Ono) or spermatheca long, stick shaped, each with 'U' shaped copulatory duct, copulatory opening small (*S. hupingensis* Tang et al).

A NEW SUBSPECIES OF *CARABUS (HOMOEOCARABUS) MAEANDER* FISCHER VON WALDHEIM, 1822 (COLEOPTERA, CARABIDAE) FROM NORTH TUNGUSKA RIVER VALLEY (NORTH SIBERIA)

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[Obydov, D. 2010. A new subspecies of *Carabus (Homoeocarabus) maeander* Fischer von Waldheim, 1822 (Coleoptera: Carabidae) from North Tunguska River valley (North Siberia). Munis Entomology & Zoology, 5 (2): 350-353**]**

ABSTRACT: A new subspecies of *Carabus (Homoeocarabus) maeander*: *Carabus (Homoeocarabus) maeander evenkiensis* ssp. n. is described from North Tunguska River valley in Evenk Autonomous Region (North Siberia). Diagnostic data are given.

KEY WORDS: Coleoptera, Carabidae, *Carabus (Homoeocarabus) maeander,* new subspecies, North Siberia, Evenk Autonomous Region, North Tunguska River.

Carabus (Homoeocarabus) maeander Fischer von Waldheim, 1822 has been described from Nerchinsk (southern Transbaikalie). This species is found in the following countries: South Korea, Russia, Japan, Canada and America. In America this species is found in north-central to north-eastern United States and ranges across most of Canada. In Japan *Carabus maeander* occurs on Hokkaido Island. In Russia the species is distributed in East Siberia from Irkutsk Region to Kamtchatka, southern Russian Far East, Sakhalin, southern Kuriles (Kunashir Island). Hokkaido and Kunashir Islands inhabits subspecies *Carabus (Homoeocarabus) maeander paludis* Géhin, 1885.

The wide area of *Carabus maeander* is inhabited by many unequally differing populations. Some of the groups of populations, undoubtedly, must be considered as subspecies. At the same time, the majority of populations constitute a continuous sequence of forms slightly different in size, coloration and proportions, but it is hardly possible to consider these forms as subspecies.

Recently I have received two specimens (male and female) of *Carabus maeander* collected in the North Tunguska River valley in Evenk Autonomous Region (North Siberia). The specimens are rather peculiar morphologically and distributed on periphery of a specific area of *Carabus maeander* and in my opinion are represented by separate subspecies.

The descriptions of *Carabus maeander evenkiensis* ssp. n. is given below.

DESCRIPTION

Carabus (Homoeocarabus) maeander evenkiensis ssp. n.

(Figs 1, 2).

Holotype: male with label: "North Siberia, Evenk Autonomous Region, N Tunguska River, 60 km up to Tura Village, Tabachnyi Stream, 19.VI.1972" (the collector is not known).

Papatype: female, same locality, 15.VI.1972.

The holotype is preserved in the collection of the State Museum of Biology (Moscow, Russia). The paratype is preserved in the collection of the State Museum of Biology (Moscow, Russia).

Body length in male is 15.4 mm (including mandibles), width 6.3 mm; body length in female is 18.5 mm, width 7.6 mm.

Head (Fig. 4) not thickened, ratio width of pronotum/width of head 2.25; eyes big, strongly convex; mandibles relatively long, narrow, slightly incurved; terebral tooth of the right and left mandibles bi-dentate, strongly prominent; retinaculum of the left mandible smaller, retinaculum of the right mandible bigger, strongly prominent; surface of mandibles smooth. Frontal furrows shallow, inside coarsely-wrinkled with coarse punctures. Frons, vertex and neck coarsely-wrinkled with dense coarse punctures. Labrum wider than clypeus, moderately notched, with two lateral setae. Antenna protruding beyond the base of pronotum by three apical segments; palpi slightly dilated; penultimate segment of the maxillary palpi equal to the last segment; penultimate segment of the labial palpi with two setae. Mentum tooth triangular, shorter than lateral lobes; submentum with two setiferous pores.

Prothorax (Fig. 4) transverse, convex, broadest at about middle; ratio width/length 1.50. Pronotum with dense coarse wrinkles and punctures; pronotal sculpture more rough laterally. Median longitudinal line distinct; basal foveae deep, inside coarsely-wrinkled. Sides of pronotum narrowly margined; lobes of hind angles broad, evenly rounded, slightly bent downwards; anterior pronotal angles prominent. Lateral margin with two setiferous pores: one pore at about middle and one pore near hind angle.

Elytrae short-oval, convex, widest behind middle; shoulders prominent; sides of elytrae narrowly margined. Ratio length/width 1.48; ratio width of elytrae/width of pronotum 1.37. Elytral sculpture: elytral interspaces strongly convex, primary elytral interspaces interrupted into relatively short links; secondary elytral interspaces integral, tertiaries reduced. Primary foveoles indistinct; striae coarsely punctured.

Metepisternum coarsely-punctured, not longer than its width. Abdominal sternites smooth; sternal sulci not deep.

Legs of normal length; fore male tarsi with four dilated segments bearing hairy pads.

Aedeagus (Fig. 6) evenly curved apical lamella relatively short, slightly dilated; endophallic structure (Fig. 8) in general is characteristic for the species.

Head and prothorax (Fig. 4) reddish-bronze; elytrae (Figs 1, 2) greenish-bronze, elytral interspaces black; mandibles, palpi, antennae, legs, claws and ventral body surface black.

Differential diagnosis. The new subspecies differs from *Carabus (Homoeocarabus) maeander maeander* Fischer von Waldheim, 1822 (Fig. 3) by following features: frons, vertex and neck completely coarsely-wrinkled with dense coarse punctures (Fig. 4) (in nominotypical subspecies frons nearly smooth, vertex and neck with sparse coarse punctures, Fig. 5); pronotum completely with dense coarse wrinkles and punctures, anterior angles of pronotum prominent (Fig. 4) (while in *Carabus maeander maeander* pronotum on disk with sparse coarse punctures and wrinkles, laterally with more rough sculpture, anterior pronotal angles evenly rounded, Fig. 5); elytrae broader and shorter, ratio length/width 1.48 (while in nominotypical subspecies this coefficient is 1.60); apical lamella of aedeagus (Fig. 6) shorter than in

nominotypical subspecies (Fig. 7); coloration of prothorax and elytrae brighter (Figs 1, 2, 3).

Distribution. Russia, North Siberia, Evenk Autonomous Region, North Tunguska River valley. Up to now only one population is known.

Habitat. Probably the beetles were collected in the forested area.

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Figs 1-3. *Carabus*, general view:

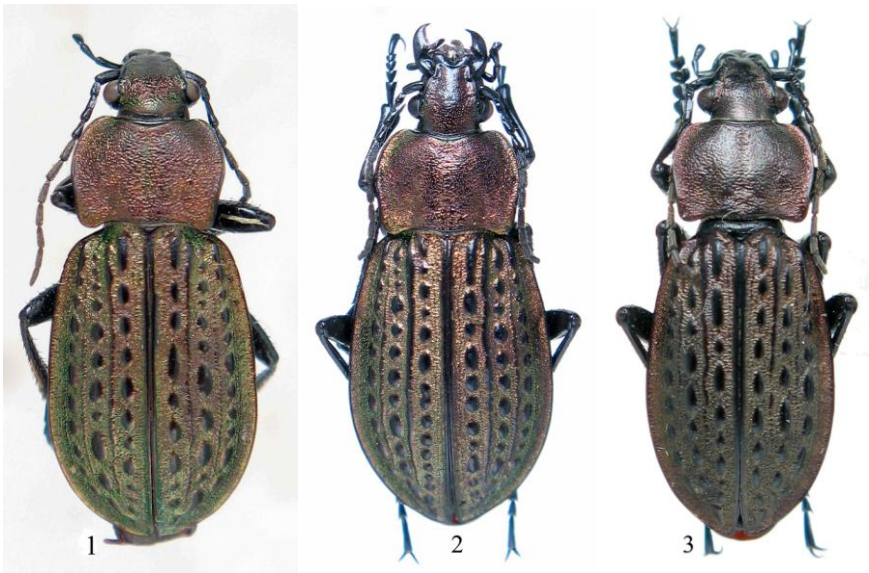

Fig.1. *Carabus maeander evenkiensis* ssp. n., male (holotype).
Fig.2. *Carabus maeander evenkiensis* ssp. n., female (paratype).
Fig.3. *Carabus maeander maeander*, male (from southern Transbaikalie, Chita env.).

Figs 4-5. Head and prothorax:

Fig.4. *Carabus maeander evenkiensis* ssp. n., male (holotype).
Fig.5. *Carabus maeander maeander*, male (from Chita env.).

Figs 6-8. Male genital structure:

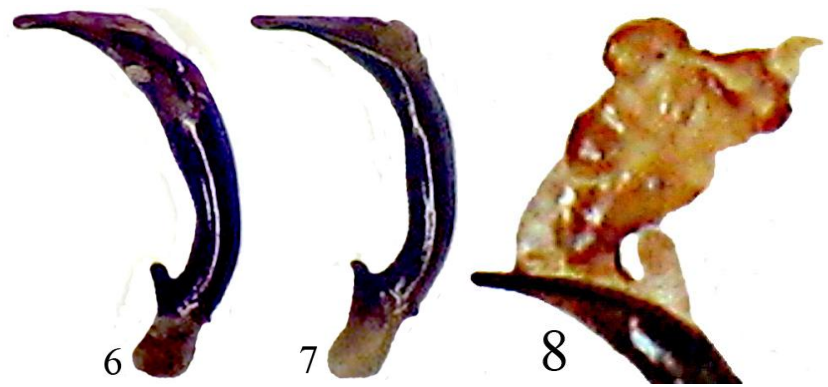

Fig.6. Aedeagus of *Carabus maeander evenkiensis* ssp. n. (holotype).
Fig.7. Aedeagus of *Carabus maeander maeander* (from Chita env.).
Fig.8. Endophallus of *Carabus maeander evenkiensis* ssp. n. (holotype).

AN INTRODUCTION TO TRUE BUGS FAUNA OF GUNBER VALLEY WITH TWO NEW RECORDS FOR IRANIAN FAUNA (HEMIPTERA: HETEROPTERA)

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[Khaghaninia, S., Pour Abad, R. F., Askari, O. & Fent, M. 2010. An introduction to true bugs fauna of Gunber valley including two new records for Iranian fauna (Hemiptera: Heteroptera). Munis Entomology & Zoology, 5 (2): 354-360**]**

ABSTRACT: Gunber region, in East Azarbayjan province was surveyed for aquatic and terrestrial Heteroptera between May 2008 and September 2009. Forty two species belonging to 33 genera and 14 families were collected. Among these species *Anthocoris nemorum* (Linnaeus, 1761), *Nabis pseudoferus pseudoferus* Romane, 1949, *Orius niger* (Wolff, 1811), *Orius horvathi* (Reuter, 1884), *Geocoris arenarius* (Jakovlev, 1867), *Geocoris megacephalus* (Rossi, 1790), *Velia affinis* Kolenati, 1857, *Gerris maculatus* Tamanini, 1946, *Gerris lateralis* Schummel, 1832 are predators. The Species belonging to Miridae were the most conspicuous and reversely the members of Stenocephalidae had the minimum frequency. All of the species are new for the Gunber region, *Stenodema calcarata* (Fallén, 1807) and *Globiceps flavomaculatus* (Fabricius, 1794) belonging to family Miridae are new records to the Iran Heteroptera fauna.

KEY WORDS: Fauna, Gunber valley, New records, Heteroptera.

Gunber valley, in north western of Sahand mountain; East Azerbayjan province, is located in UTM (Universal transfer Mercator) coordinate system, X from 594563 to 611450 E; Y from 4174485 to 4179862 N, with varying latitude from 2188 m to 2276 m. This mountainous area is one of the famous localities in Iran in view point of Damascus rose producing.

Heteroptera, true bugs, are generally regarded as a suborder of the Hemiptera (Triplehorn & Johnson, 2005). They can often be identified by the structure of the forewing or hemelytron which consisting of a hardened or thickened basal portion and a membranous apical portion (Kelton, 1980). There may be around 37000 described species worldwide, and possibly another 25000 species remaining to be described. The world fauna is divided into roughly 75 families. The number of species of better known continental faunas such as North America, Europe and Australia may be around 2000 to 5000 species (Chaplin, 2009).

Heteroptera have sucking mouthparts encased in a labium or rostrum that is used to guide the mouthparts to the food source or prey (Lodos & Önder, 1986). Most of the Heteroptera feed on plants or plant material such as seeds, fruits or pollen which some of them known as serious plant pests (Dolling, 1991). On the other hand, predacious bugs, catch other insects and Acarina, reduce the number of agricultural pests and may be used in biological control (Schuh, 1995; Meyer, 2005). So far the fauna of this group of insects has been studied in limited areas of Iran by related specialists (Safavi, 1973; Modarres Awal, 1993; Linnavuori & Modarres Awal, 1998; Linnavuori & Hosseini, 2000; Linnavuori, 2008). Considering the importance of Heteroptera in view point of agriculture, their identification seems valuable in unstudied regions of the country.

MATERIAL AND METHODS

This study was conducted during 2008 - 2009. Samples collected from 15 localities through Gunber valley (Fig. 1). Sampling was performed using various methods such as sweep net, malaise trap and long handled sieve. The collected specimens were placed in ordinary paper envelopes after killing them in cyanid bottle in order to bring them in laboratory. The most important part of the body which used for identification is the male genital organ which has sclerotic structure. Methods of Kelton (1980) with some modifications were used for extraction of the organ. Then genital organs of male (pygophore and parameres) and female (spermtheca and genital plates) were sand out and supplied constant preparation. In order to specimen identification, various valid identification keys particularly for Palearctic region (Stichel, 1960; Kerzhner & Yachevski, 1964; Wagner, 1970, 1971, 1973) were used. Finally characteristic parts of specimens were drawn for identification.

The distributional information for the new records is listed under three subheadings: Europe (EU), North Africa (NA), Asia (AS).

RESULTS

In this study 42 species belonging to 14 families were collected and identified. All of them are as new records for the region and two species marked by an asterisk are newly reported to Iran insect fauna which listed as follows:

Family Gerridae Leach, 1815

***Gerris maculatus* Tamanini, 1946**

Material examined: 24 specimens (12♂, 12♀), May 2009, on flora and lake surface.

Family Notonectidae Latreille, 1802

***Notonecta viridis* Delcourt, 1909**

Material examined: 8 specimens (5♂, 3♀), May 2009, on fluor and lake surface.

Family Veliidae Brullé, 1836

***Velia affinis* Kolenati, 1857**

Material examined: 65 specimens (33♂, 32♀), May 2009, on flora and lake surface.

Family Anthocoridae Fieber, 1836

***Anthocoris nemorum* (Linnaeus, 1761)**

Material examined: 24 specimens (12♂, 12♀), May 2009, on sunflowers.

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

***Orius niger* (Wolff, 1811)**

Material examined: 18 specimens (12♂, 6♀), May 2009, on sunflowers.

Distribution in Iran: Fars, Kerman and Khorasan (Modarres Awal, 2002).

***Orius horvathi* (Reuter, 1884)**

Material examined: 21 specimens (13♂, 8♀), May 2009, from alfalfa fields.

Family Lygaeidae Schilling, 1829

***Aphanus rolandri* (Linnaeus, 1758)**

Material examined: 25 specimens (15♂, 10♀), may 2009, on debris.

***Geocoris arenarius* (Jakovlev, 1867)**

Material examined: 34 specimens (12♂, 22♀), may 2009, on debris.

***Geocoris megacephalus* (Rossi, 1790)**
Material examined: 8 specimens (3♂, 5♀), may 2009, on debris.
***Lygaeus equestris* (Linnaeus, 1758)**
Material examined: 13 specimens (9♂, 4♀), May 2009, on weeds.
***Nysius senecionis* (Shilling, 1829)**
Material examined: 18 specimens (9♂, 9♀), May 2009, on weeds.

Family Miridae Hahn, 1833

***Adelphocoris lineolatus* (Geoze, 1778)**
Material examined: 22 specimens (18♂, 4♀), April 2009, on grasses.
Note: The species is commonly distributed in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal, 2002).
***Campylomma diversicorne* Reuter, 1878**
Material examined: 17 specimens (12♂, 5♀), may 2009, on grasses.
***Deraeocoris pallens* (Reuter, 1904)**
Material examined: 23 specimens (13♀, 10♂), May 2009, on alfalfa.
****Globiceps flavomaculatus* (Fabricius, 1794)**
Material examined: 5 specimens (4♂, 1♀), June 2009, on alfalfa.
Description: Length 5- 5.5 mm, black and pale yellow mirids, Arolia converging apically (Fig. 2,a). Distance from eye to apex of clypeus equal to diameter of an eye (Fig. 2,b). proboscis usually reaching beyond middle coxae and gradually tapering apically, 3ed and 4th segments of proboscis together much shorter than 2nd segment, not thickend their articulations. Raised areas of pronotum not conical but more or less flat at least base of corium and cuneus (except its apex) white. Dorsum of body (especially pronotum and base of hemelytra) with silvery scales which easily fall off (Fig. 2,c). male paramers as shown in Fig. 2,d (Carvalho, 1960).
Distribution: **EU:** Austria, Belgium, Bosnia Hercigovina, Byelorussia, Bularia, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Greece, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Moldovia, The Netherlands, Norway, Poland, Portugal, Romania, Russia (North, Central and South European Territories), Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, Yugoslavia (Serbia, Montenegro). AS: Azerbaijan, China (Northeastern, Northern and Northwestern Territories), Kazakhistan (Asian part), Korea (North and South), Russia (East Siberia, Far East, West Siberia), Turkey (Asian part), (Kerzhner & Josifov, 1999; Chaplin, 2009).
***Lygus pratensis* (Linnaeus, 1758)**
Material examined: 55 specimens (39♂, 16♀), June 2009, on alfalfa.
***Lygus rugulipennis* Poppius, 1911**
Material examined: 46 specimens (26♂, 20♀), April 2009, on alfalfa.
****Stenodema* calcarata (Fallén, 1807)**
Material examined: 52 specimens (24♂, 28♀), May 2009, on grasses.
Description: Length 7-8 mm, membrane with 2 cells, or hemelytra shortened without membrane. If hemelytra shortened, they usually cover not less than 1/2-1/3 of the abdomen, if hemelytra normal, cuneus separated by a distinct suture and membrane with 2 cells (Fig. 3,a) Claws with more or less widened and flattened, laminate or scalelike arolia (Fig. 3,b). Pronotum without cervical ring sides, pronotum not broadly laminate, scutellum and posterior part of pronotum distinctly punctuate, vertex with longitudinal groove (Fig. 3,c). First segment of hind tarsi twice as long as second segment of hind tarsi (Fig. 2,d). Second antennal segment not clavate (Fig. 3,e). Hind femora with 2 denticles close together (Fig. 3,f) (Kerzhner & Yachevski, 1964).
Distribution: **EU:** Albania, Andorra, Austria, Belgium, Byelorussia, Bosnia Hercigovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Germany, Hungary, Ireland, Italy, Kazakhistan (European part), Latvia, Liechtenstein, Lithonia, Luxembourg, Macedonia, Moldovia, The Netherlands, Norway, Poland, Portugal, Romania, Russia (North, Central and South European Territories), Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, Yugoslavie (Serbia, Montenegro), Turkey (European part). **NA:** Algeria, Morocco, Tunisia. **AS:** Azerbaijan, Armenia, China (Northeastern, Northern and Northwestern Territories), Georgia, Iraq, Israel, Japan, Kazakhistan (Asian

part), Kirgizia, Korea (North and South), Lebanon, Russia (East Siberia, Far East, West Siberia), Syria, Tadzhikistan, Turkey (Asian part), Uzbekistan (Kerzhner & Josifov, 1999; Chaplin, 2009).

***Stenodema turanica* Reuter, 1904**

Material examined: 12 specimens (7♂, 5♀), May 2009, on peppermint and alfalfa.

Family Nabidae A. Costa, 1853

***Nabis pseudoferrus pseudoferus* Remane, 1949**

Material examined: 55 specimens (35♂, 20♀), April 2009, on borage, alfalfa and licorice.
Note: The species is predator and collected on sainfoin and Lucerne (Modarres Awal, 2002).

Family Pyrrhocoridae Amyot & Serville, 1843

***Pyrrhocoris apterus* (Linnaeus, 1758)**

Material examined: 88 specimens (41♂, 47♀), April 2009, on debris.
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 & Serville, 1843

***Corizus hyoscyami* (Linnaeus, 1758)**

Material examined: 42 specimens (18♂, 24♀), May 2009; 12 specimens, June 2009, on weeds.

***Rhopalus parumpunctatus* Schilling, 1829**

Material examined: 15 specimens (9♂, 6♀), May 2009; 12 specimens, June 2009, on weeds.

Family Stenocephalidae Dallas, 1852

***Dicranocephalus agilis* (Scopoli, 1763)**

Material examined 4 specimen, (2♂, 2♀), April 2009, on weeds.

Family Coreidae Leach, 1815

***Ceraleptus gracilicornis* (Herrich-Schaeffer, 1835)**

Material examined: 21 specimens (12♂, 9♀), May 2009, 29 specimens, June 2010, on *Cirsium*.

***Coreus marginatus* (Linnaeus, 1758)**

Material examined: 44 specimens (16♂, 28♀), June 2009, 20 specimens, May 2010, on *Cirsium* and poison hemlock.

Family Alydidae Amyot & Serville, 1843

***Camptopus lateralis* (Germar, 1817)**

Material examined: 3 specimens (2♂, 1♀), May 2009, on weeds.

Family Scutelleridae Leach, 1815

***Eurygaster integriceps* Puton, 1888**

Material examined: 78 specimens (42♂, 36♀), May 2009, on wheat.
Note: This species has generally distribution in Iran (Modarres Awal, 2002).

***Eurygaster maura* (Linnaeus, 1758)**

Material examined: 16 specimens (5♂, 11♀), May 2009, on wheat.

***Odontotarsus robustus* Jakovlev, 1883**

Material examined: 16 specimens (7♂, 9♀), June 2009, on weeds.

Family Pentatomidae Leach, 1815

***Aelia rostrata* Boheman, 1852**

Material examined: 23 specimens (13♂, 10♀), May 2009, on wild graminae.

***Aelia virgata* (Herrich-Schaeffer, 1841)**

Material examined: 34 specimens (16♂, 18♀), october 2009, under *astragalus* sp.

***Ancyrosoma leucogrammes* (Gmelin, 1789)**
Material examined: 13 specimens (6♂, 7♀), May 2009, on weeds.
***Carpocoris lunulatus* (Goeze, 1778)**
Material examined: 31 specimens (16♂, 15♀), May 2009, on cereals.
***Apodiphus amygdali* (Germar, 1817)**
Material examined: 29 specimens (18♂, 11♀), May 2009, 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 fuscispinus* (Boheman, 1849)**
Material examined: 18 specimens (8♂, 10♀), May 2009, on weeds.
***Carpocoris purpureipennis* (De Geer, 1761)**
Material examined: 22 specimens (14♂, 8♀), May 2009, on weeds.
***Dolycoris baccarum* (Linnaeus, 1758)**
Material examined: 25 specimens (18♂, 7♀), May 2009, on Lucerne.
***Dolycoris penicillatus* Horváth, 1904**
Material examined: 12 specimens (4♂, 8♀), June 2009, on weeds.
***Eurydema ventralis* Kolenati, 1846**
Material examined: 32 specimens (15♂, 17♀), May 2009, on rape.
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* (Linnaeus, 1758)**
Material examined: 44 specimens (23♂, 11♀), June 2009, on wild crucifereae.
***Ventocoris fischeri* (Herich-Schaeffer, 1851)**
Material examined: 38 specimens (18♂, 20♀), May 2009, on weeds; October 2009, under *Astragalus* sp.

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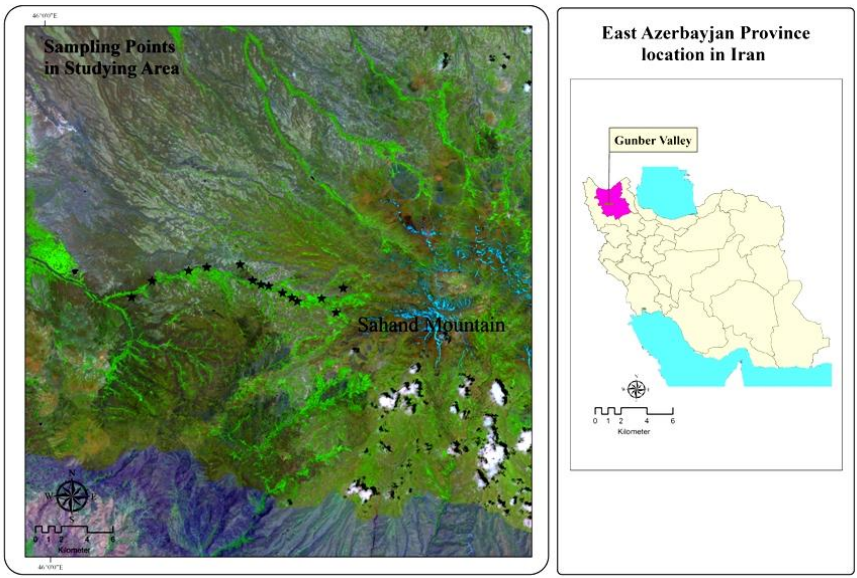

Figure 1. Location of sampling points on satellite image (SPOT) of Gunber valley.

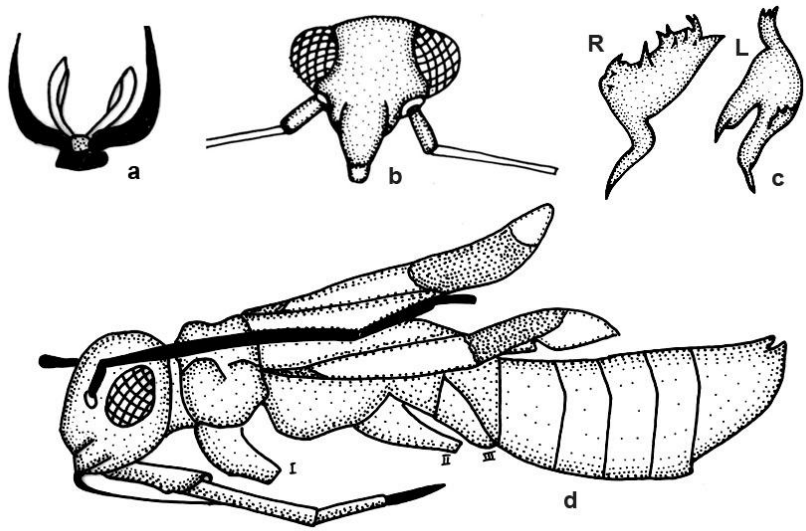

Figure 2. Globiceps *flavomaculatus* (Fabricius, 1794), a: Apex of tarci; b: Head; c: Paramers (Right and Left); d: Head, pronotum, proboscis and hemelytra.

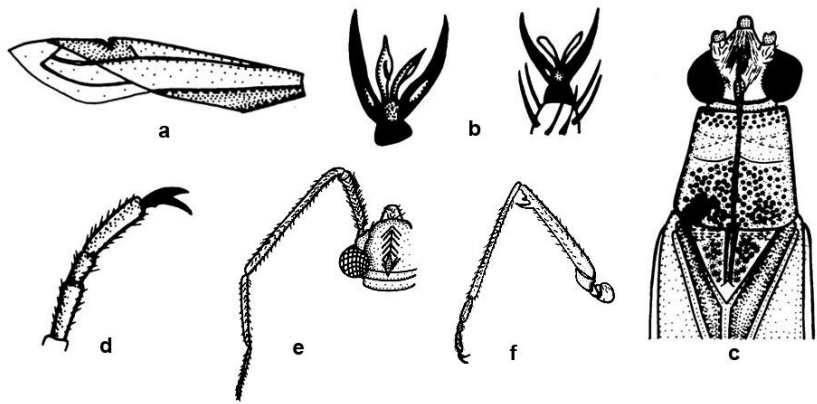

Figure 3. *Stenodema calcarata* (Fallén, 1807), a: Hemelytra; b: Claw; c: Vertex, pronotum and scutellum; d: Tarsus; e: Head and antenna; f: Hind femur.

CARABUS (*ARCHAEOCARABUS*) SEMENOV, 1898 VS. *ARCHAEOCARABUS* M'COY, 1849: THE NEED FOR A SUBSTITUTE NAME (COLEOPTERA: CARABIDAE)

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ABSTRACT. According to the International Code of Zoological Nomenclature (ICZN, 1999), *Carabus* (*Archaeocarabus*) Semenov, 1898 is not correct. Because the subgeneric epithet is illegitimate as being a junior homonym of *Archaeocarabus* M'Coy, 1849. Therefore, the author propose a substitute name for *Carabus* (*Archaeocarabus*) Semenov, 1898 as *Carabus* (*Acoptopterus*) Lapouge, 1927. A list is given for all taxa of this subgenus in the present text. Accordingly, new combinations are herein proposed for the taxa currently included in this subgenus. Known distributions of all taxa are also presented hereby with a checklist of known taxa in this subgenus.

KEY WORDS. Nomenclatural changes, homonymy, replacement name, Coleoptera, Carabidae, *Carabus, Archaeocarabus, Acoptopterus*.

In an effort to reduce the number of homonyms in Carabidae, I found one subgenus name whose had been previously published for other taxon, making it junior homonym. In accordance with the International Code of Zoological Nomenclature, I propose a substitute name for this subgenus.

Family CARABIDAE
Genus *CARRABUS* Linnaeus, 1758
Subgenus *ACOPTOPTERUS* Lapouge, 1927 (substitute name)

Archaeocarabus Semenov, 1898. Horae Soc. ent. Ross., 31, 338. (Coleoptera: Adephaga: Caraboidea: Carabidae: Carabinae: Carabini: *Carabus*). Preoccupied by *Archaeocarabus* M'Coy, 1849. Ann. Mag. nat. Hist., (2) 4, 173. (Crustacea: Decapoda: Achelata: Palinuroidea: Palinuridae).

Remarks on nomenclatural changes: The genus name *Archaeocarabus* was initially introduced by M'Coy (1849) for a fossil decapod genus (with the type species *Archaeocarabus bowerbanki* M'Coy, 1849. It is still used as a valid genus name. It has four taxa now according to De Grave et al (2009).

Subsequently, Semenov (1898) described a new subgenus of the genus *Carabus* Linnaeus, 1758 (with the type species *Carabus relictus* Semenov, 1898 from Sichuan, China) under the same generic name in the family Carabidae. *Carabus* Linnaeus, 1758 has 117 subgenera now. It is also still used as a valid genus group name. It has a generic synonym as *Acoptopterus* Lapouge, 1927 of which type species is *Carabus vigilax* Bates, 1890. It has 37 species (including the type species) now. All species are from China. So this subgenus is endemic to China.

Thus, the genus group name *Archaeocarabus* Semenov, 1898 is a junior homonym of the genus *Archaeocarabus* M'Coy, 1849. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus group

name *Archaeocarabus* Semenov, 1898 the replacement name *Acoptopterus* Lapouge, 1927.

Summary of nomenclatural changes:

Genus *Carabus* Linnaeus, 1758

Subgenus *Acoptopterus* Lapouge, 1927 **substitute name**
[type sp. *Carabus vigilax* Bates, 1890]
pro *Archaeocarabus* Semenov, 1898 (nec M'Coy, 1849)
[type sp. *Carabus relictus* Semenov, 1898]

Species *Carabus* (*Acoptopterus*) *agamemnon* Breuning, 1943 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *agamemnon* Breuning, 1943
Distribution: China: Sichuan, Emei Shan.
Species *Carabus* (*Acoptopterus*) *andreiianus* Deuve, 2007 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *andreiianus* Deuve, 2007
Distribution: China: N-Sichuan, Pingwu Xian, Baima env.
Species *Carabus* (*Acoptopterus*) *anhuinus* Imura, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *anhuinus* Imura, 1996
Distribution: China: SW-Anhui, Dabie Shan, Qianshan Xian (Tianzhu Mts.), Yuexi Xian.
Species *Carabus* (*Acoptopterus*) *baimanorum* Deuve, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *baimanorum* Deuve, 1999
Distribution: China: N-Sichuan, Pingwu Xian, Wanbacui.
Species *Carabus* (*Acoptopterus*) *battoniensis* Deuve, 1991 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *battoniensis* Deuve, 1991
Distribution: China: S-Gansu, Minchow (=Min Xian).
Species *Carabus* (*Acoptopterus*) *bornianus* Hauser, 1922 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *bornianus* Hauser, 1922
Synonym: *Carabus albrechti* Maindron, 1906 (non Morawitz, 1862)
Distribution: China: Yunnan, Tali-sen-fu (= Dali), Kuh-tsin-fu, Kouang-hsien, Pe-yen-tsin, Yunnan-fu.
Subspecies *Carabus* (*Acoptopterus*) *bornianus bornianus* Hauser, 1922 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *bornianus bornianus* Hauser, 1922
Distribution: China: Yunnan, Tali-sen-fu (= Dali), Kuh-tsin-fu, Kouang-hsien, Pe-yen-tsin, Yunnan-fu.
Subspecies *Carabus* (*Acoptopterus*) *bornianus drumonti* Deuve, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *bornianus drumonti* Deuve, 2005
Distribution: China: C-Yunnan, Kunming env..
Subspecies *Carabus* (*Acoptopterus*) *bornianus luxiensis* Deuve, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *bornianus luxiensis* Deuve, 2005
Distribution: China: C-Yunnan, Luxi env..
Species *Carabus* (*Acoptopterus*) *camilloi* Cavazzuti & Ratti, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *camilloi* Cavazzuti & Ratti, 1998
Distribution: China: NE-Sichuan, Ping ba Zhen, Taiping (= Wanyuan).
Species *Carabus* (*Acoptopterus*) *dongchuanicus* Deuve, 1994 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus* Deuve, 1994
Distribution: China: N-Yunnan, Dongchuan and S-Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *dongchuanicus dongchuanicus* Deuve, 1994 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus dongchuanicus* Deuve, 1994
Distribution: China: N-Yunnan, Dongchuan.
Subspecies *Carabus* (*Acoptopterus*) *dongchuanicus jiucaipingensis* Deuve, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus jiucaipingensis* Deuve, 2005
Distribution: China: NW-Guizhou, Liupanshui, Dawan, Jiucaiping Shan Mt..
Subspecies *Carabus* (*Acoptopterus*) *dongchuanicus luojicus* Cavazzuti, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus luojicus* Cavazzuti, 1998
Distribution: China: S-Sichuan, Lunan Shan, Xichang, Luoji.
Subspecies *Carabus* (*Acoptopterus*) *dongchuanicus meiguensis* Imura, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus meiguensis* Imura, 1998
Distribution: China: S-Sichuan, Daliang Shan, Meigu Xian, Dafengding Mt., Meigu env..

Subspecies *Carabus* (*Acoptopterus*) *dongchuanicus mianshanicus* Cavazzuti, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dongchuanicus mianshanicus* Cavazzuti, 1997
Distribution: China: S-Sichuan, Mianshan.

Species *Carabus* (*Acoptopterus*) *dreuxioides* Deuve, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dreuxioides* Deuve, 1998
Distribution: China: NW-Hunan and CW-Hubei.

Subspecies *Carabus* (*Acoptopterus*) *dreuxioides dreuxioides* Deuve, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dreuxioides dreuxioides* Deuve, 1998
Distribution: China: NW-Hunan, Sangzhi.

Subspecies *Carabus* (*Acoptopterus*) *dreuxioides wushanling* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *dreuxioides wushanling* Kleinfeld, 1998
Distribution: China: CW-Hubei, Changyang, Wushanling.

Species *Carabus* (*Acoptopterus*) *emanuelei* Imura, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *emanuelei* Imura, 1997
Distribution: China: SW-Hunan, S of Suining, Huangshan.

Subspecies *Carabus* (*Acoptopterus*) *emanuelei emanuelei* Imura, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *emanuelei emanuelei* Imura, 1997
Distribution: China: SW-Hunan, S of Suining, Huangshan.

Subspecies *Carabus* (*Acoptopterus*) *emanuelei grabneri* Kleinfeld, 2003 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *emanuelei grabneri* Kleinfeld, 2003
Distribution: China: C-Hunan, Lengshuijang, Boyuetong.

Species *Carabus* (*Acoptopterus*) *fontellus* Deuve, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *fontellus* Deuve, 1997
Distribution: China: Guizhou and Hunan.

Subspecies *Carabus* (*Acoptopterus*) *fontellus attrepidans* Deuve, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *fontellus attrepidans* Deuve, 2000
Distribution: China: ?NW-Hunan, Dayong env..

Subspecies *Carabus* (*Acoptopterus*) *fontellus fontellus* Deuve, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *fontellus fontellus* Deuve, 1997
Distribution: China: Guizhou.

Subspecies *Carabus* (*Acoptopterus*) *fontellus pseudoemeicola* Deuve, 2001 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *fontellus pseudoemeicola* Deuve, 2001
Distribution: China: Hunan, Zhangjiajie.

Subspecies *Carabus* (*Acoptopterus*) *fontellus semifuscus* Cavazzuti & Ratti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *fontellus semifuscus* Cavazzuti & Ratti, 1999
Distribution: China: NE-Guizhou, between Wanshan and Tongren, Chadian.

Species *Carabus* (*Acoptopterus*) *gressittianus* Mandl, 1975 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus* Mandl, 1975
Distribution: China: Fujian, Guandong, Hunan and Jiangxi.

Subspecies *Carabus* (*Acoptopterus*) *gressittianus bambousicola* Deuve & Tian, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus bambousicola* Deuve & Tian, 1999
Distribution: China: NC-Guandong, Ruyuan Xian, Nanling reserve, Shikengkong Mt..

Subspecies *Carabus* (*Acoptopterus*) *gressittianus caementibos* Imura, 2009 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus caementibos* Imura, 2009
Distribution: China: Fujian, Dehua Xian.

Subspecies *Carabus* (*Acoptopterus*) *gressittianus daanensis* Deuve, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus daanensis* Deuve, 1999
Distribution: China: NW-Fujian, Wuyi Shan.

Subspecies *Carabus* (*Acoptopterus*) *gressittianus daiyunshan* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus daiyunshan* Kleinfeld, 1998
Distribution: China: Fujian, Daiyun Shan, Dehua.

Subspecies *Carabus* (*Acoptopterus*) *gressittianus fuscomarginatus* Kleinfeld, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus fuscomarginatus* Kleinfeld, 1997
Distribution: China: C-Fujian, SE of Yongan, Tianbaoyan Mt..

Subspecies *Carabus* (*Acoptopterus*) *gressittianus gressittianus* Mandl, 1975 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus gressittianus* Mandl, 1975
Distribution: China: Jiangxi, Guandong and Fujian: Hong San Se (= Hong Shan) and Yongding.

Subspecies *Carabus* (*Acoptopterus*) *gressittianus shanminicus* Deuve, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *gressittianus shanminicus* Deuve, 1999
Distribution: China: Fujian, Shanmin.

Species *Carabus* (*Acoptopterus*) *jinnanicus* Deuve & Tian, 2006 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *jinnanicus* Deuve & Tian, 2006
Distribution: China: S-Shangxi, between Jiang Xian and Yangcheng, Lishan Mts., Shunawangping.

Species *Carabus* (*Acoptopterus*) *koidei* Imura, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *koidei* Imura, 1996
Distribution: China: SW-Sichuan, Muli.
Species *Carabus* (*Acoptopterus*) *kucerai* Deuve, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *kucerai* Deuve, 1997
Distribution: China: S-Shaanxi and E-Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *kucerai kucerai* Deuve, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *kucerai kucerai* Deuve, 1997
Distribution: China: S-Shaanxi, Lüeyang.
Subspecies *Carabus* (*Acoptopterus*) *kucerai puchneri* Kleinfeld, 2007 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *kucerai puchneri* Kleinfeld, 2007
Distribution: China: E-Sichuan, road between Pingwu and Nanping, Mupi village env..
Subspecies *Carabus* (*Acoptopterus*) *kucerai wuangxianus* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *kucerai wuangxianus* Kleinfeld, 1998
Distribution: China: E-Sichuan, W-Wuangxian, Zhuitoushi Mt..
Species *Carabus* (*Acoptopterus*) *kweitshauensis* Mandl, 1975 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *kweitshauensis* Mandl, 1975
Distribution: China: Guizhou, Shih-men-kan (= Heituhe).
Species *Carabus* (*Acoptopterus*) *latipennis* Breuning, 1932 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *latipennis* Breuning, 1932
Distribution: China: N-Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *latipennis latipennis* Breuning, 1932 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *latipennis latipennis* Breuning, 1932
Distribution: China: Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *latipennis shansutiaensis* Lassalle & Remond, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *latipennis shansutiaensis* Lassalle & Remond, 1998
Distribution: China: N-Sichuan, Shansutia.
Species *Carabus* (*Acoptopterus*) *ludingensis* Deuve & Taglianti, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *ludingensis* Deuve & Taglianti, 1992
Distribution: China: W-Sichuan, Luding env..
Subspecies *Carabus* (*Acoptopterus*) *ludingensis gonggaiensis* Deuve, 2002 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *ludingensis gonggaiensis* Deuve, 2002
Distribution: China: Sichuan, Gongga Shan.
Subspecies *Carabus* (*Acoptopterus*) *ludingensis ludingensis* Deuve & Taglianti, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *ludingensis ludingensis* Deuve & Taglianti, 1992
Distribution: China: W-Sichuan, Luding Xian, Xin Shin, Siao Lou.
Species *Carabus* (*Acoptopterus*) *maowenensis* Deuve, 2001 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *maowenensis* Deuve, 2001
Distribution: China: C-Sichuan, Maoxian (= Maowen).
Species *Carabus* (*Acoptopterus*) *mianningensis* Kleinfeld, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *mianningensis* Kleinfeld, 2000
Distribution: China: S-Sichuan, Mianning.
Species *Carabus* (*Acoptopterus*) *mirandus* Cavazzuti & Rapuzzi, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *mirandus* Cavazzuti & Rapuzzi, 2005
Distribution: China: S-Sichuan, Jinyang.
Species *Carabus* (*Acoptopterus*) *morphocaraboides* Deuve, 1989 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides* Deuve, 1989
Distribution: China: N-Yunnan and S-Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides altiguizhouicus* Deuve & Li, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides altiguizhouicus* Deuve & Li, 2005
Distribution: China: NW-Guizhou, Liupanshui, Dawan, Jiucaiping Shan Mt..
Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides dongchuan* Cavazzuti, 2001 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides dongchuan* Cavazzuti, 2001
Distribution: China: NE-Yunnan, Dongchuan, Ta Hai Zhi Shan.
Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides morphocaraboides* Deuve, 1989 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides morphocaraboides* Deuve, 1989
Distribution: China: NE-Yunnan, Dongchuan env..

Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides pani* Deuve & Tian, 2001 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides pani* Deuve & Tian, 2001
Distribution: China: N-Yunnan, Luqian Xian, Jiaozhi Shan.

Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides pigmentatus* Cavazzuti, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides pigmentatus* Cavazzuti, 1998
Distribution: China: N-Yunnan, Mts. between Dayao and Yangpengzi.

Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides yao* Imura, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides yao* Imura, 1999
Distribution: China: NE-Yunnan, Qiaojia Xian, Yao Shan.

Subspecies *Carabus* (*Acoptopterus*) *morphocaraboides zhaojueanus* Imura, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *morphocaraboides zhaojueanus* Imura, 1999
Distribution: China: S-Sichuan, Zhaojue Xian, between Xichang and Meigu.

Species *Carabus* (*Acoptopterus*) *nanosomus* Hauser, 1931 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nanosomus* Hauser, 1931
Distribution: China: Guangxi, Guizhou, Hubei and Sichuan.

Subspecies *Carabus* (*Acoptopterus*) *nanosomus cordithoracicus* Deuve, 1989 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nanosomus cordithoracicus* Deuve, 1989
Distribution: China: NE-Guangxi, N of Guilin, Longsheng Xian, Huaping, Qianjiadong.

Subspecies *Carabus* (*Acoptopterus*) *nanosomus maotaiophilus* Deuve, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nanosomus maotaiophilus* Deuve, 1996
Distribution: China: SE-Guizhou, Leigong Shan near Kaili.

Subspecies *Carabus* (*Acoptopterus*) *nanosomus nanosomus* Hauser, 1931 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nanosomus nanosomus* Hauser, 1931
Distribution: China: SE-Sichuan, Jinfo Shan massif (Kinfu Shan, Sung-Kanho river).

Subspecies *Carabus* (*Acoptopterus*) *nanosomus wufengensis* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nanosomus wufengensis* Kleinfeld, 1998
Distribution: China: SW-Hubei, Yizhuxiang, Wufeng.

Species *Carabus* (*Acoptopterus*) *nestor* Breuning, 1934 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor* Breuning, 1934
Distribution: China: Guizhou, Hubei and Sichuan.

Subspecies *Carabus* (*Acoptopterus*) *nestor barbulatus* Cavazzuti & Ratti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor barbulatus* Cavazzuti & Ratti, 1999
Distribution: China: S-Guizhou, Yunwu Mt..

Subspecies *Carabus* (*Acoptopterus*) *nestor emeicola* Deuve & Imura, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor emeicola* Deuve & Imura, 1992
Distribution: China: C-Sichuan, Emei Shan.

Subspecies *Carabus* (*Acoptopterus*) *nestor gongtong* (Imura, 2004) **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor gongtong* (Imura, 2004)
Distribution: China: SC-Sichuan, Wawu Shan, between Gufopeng and Jonhuqiao.

Subspecies *Carabus* (*Acoptopterus*) *nestor loui* Deuve & Mourzine, 2004 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor loui* Deuve & Mourzine, 2004
Distribution: China: C-Sichuan, NW of Chengdu, SW of Guankou, Qingcheng Houshan.

Subspecies *Carabus* (*Acoptopterus*) *nestor nestor* Breuning, 1934 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor nestor* Breuning, 1934
Distribution: China: SE-Sichuan, Jinfo Shan.

Subspecies *Carabus* (*Acoptopterus*) *nestor xianfengicus* Deuve & Li, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *nestor xianfengicus* Deuve & Li, 2000
Distribution: China: SW-Hubei, Xianfeng Xian, Laoyan, Hefeng Xian.

Species *Carabus* (*Acoptopterus*) *oblongior* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *oblongior* Deuve, 1992
Distribution: China: N-Yunnan.

Subspecies *Carabus* (*Acoptopterus*) *oblongior hei* Cavazzuti, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *oblongior hei* Cavazzuti, 1996
Distribution: China: SW-Sichuan annd NW-Yunnan, Yongning env., W bank of Lugu lake.

Subspecies *Carabus* (*Acoptopterus*) *oblongior oblongior* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *oblongior oblongior* Deuve, 1992
Distribution: China: N-Yunnan, Lijiang, Ganhaizi pass.

Subspecies *Carabus* (*Acoptopterus*) *oblongior yunlingicus* Deuve, 1994 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *oblongior yunlingicus* Deuve, 1994
Distribution: China: NW-Yunnan, between Zhongdian and Weixi, Yunling Shan Mt..

Species *Carabus* (*Acoptopterus*) *ohomopteroides* Deuve & Tian, 2004 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *ohomopteroides* Deuve & Tian, 2004
Distribution: China: W-Yunnan, Weixi Xian, Samage.

Species *Carabus* (*Acoptopterus*) *paris* Breuning, 1932 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *paris* Breuning, 1932
Synonym: *Carabus modestus* Oberthür, 1884 (non Fabricius, 1801)
Distribution: China: N-Sichuan, Mts. NW of Ya'an, Wolong env., W of Chengdu, Xiling Shan.

Species *Carabus* (*Acoptopterus*) *pseudolatipennis* Deuve, 1991 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis* Deuve, 1991
Distribution: China: Gansu, Hubei, Shaanxi and Sichuan.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis bashanensis* Imura, 1995 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis bashanensis* Imura, 1995
Distribution: China: NE-Sichuan, Dabashan Mts., Chengkou Xian, Bashan env..

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis gracilescens* Deuve, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis gracilescens* Deuve, 1999
Distribution: China: N-Sichuan, Pingwu Xian.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis huayangzhen* Cavazzuti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis huayangzhen* Cavazzuti, 1999
Distribution: China: S-Shaanxi, 80 km N of Yang Xian, Huayang Zhen.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis lantianensis* Cavazzuti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis lantianensis* Cavazzuti, 1999
Distribution: China: SE-Shaanxi, pass between Lantian and Shang Xian.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis nagahatai* Imura & Okomoto, 2003 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis nagahatai* Imura & Okomoto, 2003
Distribution: China: E-Sichuan, Micangshan Mts., Nanjiang Xian.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis nanpingensis* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis nanpingensis* Deuve, 1992
Distribution: N-Sichuan, Nanping Xian.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis pseudolatipennis* Deuve, 1991 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis pseudolatipennis* Deuve, 1991
Distribution: China: S-Shaanxi, Long Xian and S-Gansu.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis qinlingicus* Deuve, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis qinlingicus* Deuve, 1998
Distribution: China: S-Shaanxi, Qinling Shan Mts., 15 km N of Xunyuangba.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis shennongjianus* Imura, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis shennongjianus* Imura, 1996
Distribution: China: W-Hubei, Shennongjia env. (Yanzi pass).

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis wenxianensis* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis wenxianensis* Deuve, 1992
Distribution: China: S-Gansu, Wenxian env..

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis yangxianensis* Deuve, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis yangxianensis* Deuve, 1999
Distribution: China: S-Shaanxi, Yang Xian.

Subspecies *Carabus* (*Acoptopterus*) *pseudolatipennis yingpanjienus* Cavazzuti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *pseudolatipennis yingpanjienus* Cavazzuti, 1999
Distribution: China: S-Shaanxi, between Shagoujie and Yingpanjie.

Species *Carabus* (*Acoptopterus*) *relictus* Semenov, 1898 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *relictus* Semenov, 1898
Distribution: China: C-Sichuan, between Sing-pu-guan and Tan-chua (= Tonghua) and Wenchuan.

Species *Carabus* (*Acoptopterus*) *shamaevi* Imura, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *shamaevi* Imura, 1996
Distribution: China: C-Sichuan, near Wolong and W of Chengdu, Xiling Shan.

Species *Carabus* (*Acoptopterus*) *tianbaoshan* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *tianbaoshan* Kleinfeld, 1998
Distribution: China: C-Fujian, SE of Yongan, Tianbaoyan Mt..

Species *Carabus* (*Acoptopterus*) *tieguanzi* Imura, 1990 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *tieguanzi* Imura, 1990
Distribution: China: C-Sichuan, Emei Shan.

Species *Carabus* (*Acoptopterus*) *vigil* Semenov, 1898 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil* Semenov, 1898
Synonym: *Carabus striatus* Semenov, 1887 (non DeGeer, 1781; Chaudoir, 1869; Baillon, 1878; Kraatz, 1879)
Distribution: China: Gansu, Hubei, Shaanxi, Sichuan.

Subspecies *Carabus* (*Acoptopterus*) *vigil claricollis* Cavazzuti & Ratti, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil claricollis* Cavazzuti & Ratti, 1998
Distribution: China: N-Jiangxi, Lu Shan.
Subspecies *Carabus* (*Acoptopterus*) *vigil cordulatus* Cavazzuti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil cordulatus* Cavazzuti, 1999
Distribution: China: S-Shaanxi, 80 km N of Yang Xian, Huayang Zhen.
Subspecies *Carabus* (*Acoptopterus*) *vigil dabashanus* Imura, 1995 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil dabashanus* Imura, 1995
Distribution: China: NE-Sichuan, Dabashan Mts., Chengkou Xian, Bashan env..
Subspecies *Carabus* (*Acoptopterus*) *vigil funiuensis* (Imura, 2005) **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil funiuensis* (Imura, 2005)
Distribution: China: W-Henan, Neixiang Xian, Funiu Shan, Baotianman.
Subspecies *Carabus* (*Acoptopterus*) *vigil giacomazzoi* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil giacomazzoi* Deuve, 1992
Distribution: China: W-Sichuan, 180 km SW of Chengdu, Xin Gou.
Subspecies *Carabus* (*Acoptopterus*) *vigil guangwushanus* Imura & Su, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil guangwushanus* Imura & Su, 2000
Distribution: China: NE-Sichuan, Micang Shan, Nanjiang, pass between Shanliangqu and Taoyuan, Guangwu Shan Mt..
Subspecies *Carabus* (*Acoptopterus*) *vigil kangensis* Deuve & Li, 2003 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil kangensis* Deuve & Li, 2003
Distribution: China: SE-Gansu, Kang Xian (= Cheng Xian), Yangtian, Wucheng-xi.
Subspecies *Carabus* (*Acoptopterus*) *vigil nigrominimus* Deuve & Mourzine, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil nigrominimus* Deuve & Mourzine, 1997
Distribution: China: S-Gansu, between Wenxian and Wudu, Toqizi.
Subspecies *Carabus* (*Acoptopterus*) *vigil ohshimaorum* Deuve, 1991 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil ohshimaorum* Deuve, 1991
Distribution: China: W-Hubei, Shennongjia.
Subspecies *Carabus* (*Acoptopterus*) *vigil pseudoparis* Deuve, 1992 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil pseudoparis* Deuve, 1992
Distribution: China: S-Shaanxi, Long Xian, Taibai Shan Massif.
Subspecies *Carabus* (*Acoptopterus*) *vigil pseudotosanus* Deuve & Mourzine, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil pseudotosanus* Deuve & Mourzine, 1997
Distribution: China: S-Gansu, E of Wudu, Wangziguan.
Subspecies *Carabus* (*Acoptopterus*) *vigil pyrochromus* Deuve, 1997 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil pyrochromus* Deuve, 1997
Distribution: China: S-Gansu, Tianshui env..
Subspecies *Carabus* (*Acoptopterus*) *vigil quercinus* Cavazzuti, 1999 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil quercinus* Cavazzuti, 1999
Distribution: China: C-Shaanxi, Tongchuan, Shimen Shan, S-slope.
Subspecies *Carabus* (*Acoptopterus*) *vigil vigil* Semenov, 1898 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil vigil* Semenov, 1898
Distribution: China: S-Gansu, Minchow (= Min Xian).
Subspecies *Carabus* (*Acoptopterus*) *vigil xingshanensis* Imura, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil xingshanensis* Imura, 1996
Distribution: China: CW-Hubei, W of Xingshan, ?W-Henan, Lushi env..
Subspecies *Carabus* (*Acoptopterus*) *vigil xunyangbaensis* Deuve, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil xunyangbaensis* Deuve, 2000
Distribution: China: S-Shaanxi, Qinling Shan, 6 km E of Xunyangba.
Subspecies *Carabus* (*Acoptopterus*) *vigil zaohongipennis* Imura & Okomoto, 2003 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil zaohongipennis* Imura & Okomoto, 2003
Distribution: China: E-Sichuan, Micangshan Mts., Nanjiang Xian, above Yingshuiba.
Subspecies *Carabus* (*Acoptopterus*) *vigil zhugguicus* Deuve & Kabak, 2008 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigil zhugguicus* Deuve & Kabak, 2008
Distribution: China: Gansu, Zhudqu.

Species *Carabus* (*Acoptopterus*) *vigilax* Bates, 1890
from *Carabus* (*Archaeocarabus*) *vigilax* Bates, 1890
Distribution: China: C-Sichuan.
Subspecies *Carabus* (*Acoptopterus*) *vigilax vigilax* Bates, 1890
from *Carabus* (*Archaeocarabus*) *vigilax vigilax* Bates, 1890
Distribution: China: C-Sichuan, Chia-ting-fu (= Leshan) and Wa-shan (= Mts. between Fulin and Ya'an), Emei Shan.
Subspecies *Carabus* (*Acoptopterus*) *vigilax wassulandensis* Deuve, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *vigilax wassulandensis* Deuve, 2000
Distribution: China: C-Sichuan, Sanjiangkou, Sanjiang, Wassuland (= Yingxiuwan).

Species *Carabus* (*Acoptopterus*) *wutaishanicus* Muller, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *wutaishanicus* Muller, 2000
Distribution: China: NE-Shangxi, Wutai Shan.

Species *Carabus* (*Acoptopterus*) *xupuensis* Kleinfeld, 1998 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *xupuensis* Kleinfeld, 1998
Distribution: China: W-Hunan, S of Xupu, Liangfengjie.

Species *Carabus* (*Acoptopterus*) *yunnanus* Fairmaire, 1886 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus* Fairmaire, 1886
Synonym: *Carabus cecileae* Beheim & Breuning, 1943 [China: Yunnan, Pe-yen-tsin (Yanfeng near Dayao, between Dali and Kunming)]
Distribution: China: Sichuan and Yunnan.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus enneadraconis* (Imura, Zhou & Su, 2004) **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus enneadraconis* (Imura, Zhou & Su, 2004)
Distribution: China: SW-Sichuan, Jiulong Xian, S-part.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus guerryanus* Breuning, 1961 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus guerryanus* Breuning, 1961
Distribution: China: Yunnan, Hang-kkia-pin (= between Dali and Lijiang, N of Jizu Shan).

Subspecies *Carabus* (*Acoptopterus*) *yunnanus moffanggouensis* Deuve, 2006 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus moffanggouensis* Deuve, 2006
Distribution: China: Sichuan, Jinping Shan.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus niobe* Kleinfeld, 2000 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus niobe* Kleinfeld, 2000
Distribution: China: W-Yunnan, Xuebang Shan, Lujing river, Lanping.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus pseudoyunnanus* Deuve, 1994 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus pseudoyunnanus* Deuve, 1994
Distribution: China: Yunnan, Ta-pin-tze (= between Dali and Lijiang, N of Jizu Shan), Lijiang env..

Subspecies *Carabus* (*Acoptopterus*) *yunnanus yanmenicus* Deuve, 2005 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus yanmenicus* Deuve, 2005
Distribution: China: NW-Yunnan, Yanmen.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus yanyuanicus* Cavazzuti, 1996 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus yanyuanicus* Cavazzuti, 1996
Distribution: China: SW-Sichuan, Yanyuan.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus yunnanus* Fairmaire, 1886 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus yunnanus* Fairmaire, 1886
Distribution: China: Yunnan, Dali env. and Lijiang env., Ganhaizi pass, Yulongxue Shan, Xuebang Shan.

Subspecies *Carabus* (*Acoptopterus*) *yunnanus zhiericus* Deuve, 2006 **comb. nov.**
from *Carabus* (*Archaeocarabus*) *yunnanus zhiericus* Deuve, 2006
Distribution: China: Sichuan, Zhi'er.

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A NEW SPECIES OF STIGMAEID MITES FROM EAST AZARBAIJAN, IRAN (ACARI: PROSTIGMATA: STIGMAEIDAE)

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ABSTRACT: A new species, *Stigmaeus shabestariensis* n. sp., is described and illustrated from specimens collected from soil of an apple orchard at Shabestar (Shendabad), East Azarbaijan, Iran. This species is distinct from similar species of *Stigmaeus* in having two extra isolated shields.

KEY WORDS: Acari, East Azarbaijan, new species, Stigmaeidae, *Stigmaeus*, Iran.

Stigmaeidae is the second most frequent and abundant group of predatory mites on plant leaves, after Phytoseiidae which feed on a variety of arthropods. These mites are generally orange, yellowish, greenish or reddish forming an important component of the Acari fauna of soil, litter, vegetation and even occur on sandflies. This family consists of at least 29 genera distinguished by the following combination of characters: dorsal shields absence or dorsum completely covered by 2-4 shields or partly covered by 3 or more shields ; having the so called "thumb-claw" process and terminal eupathidium on palptarsus; chelicerae free or partially fused and shape of empodia of leg tarsi; coxae I and II distinctly separated from coxae III and IV, and genital and anal openings contiguous (Flechtmann, 1975; Krantz, 1978; Martinez-Ortega et al., 1983; Fan & Zhang, 2005). To date one new species of the genus *Stigmaeus*, *Stigmaeus malekii* Haddad et al., 2006, has been reported from East Azarbaijan and in this paper the second new species is described and figured. The terminology and abbreviations follow Kethley (1990). All measurements are given in micrometres (μm).

Stigmaeidae Oudemans, 1931
Type genus: *Stigmaeus* Koch, 1836

***Stigmaeus* Koch, 1836**
Type species: *Stigmaeus cruentus* Koch, 1836

***Diagnosis*.** Idiosoma narrowly to broadly oval in dorsoventral view dimpled or reticulated in most species. Chelicerae incompletely retractile, right and left members indipendent. Palptibial claw subequal to or slightly shorter than palptarsus; accessory claw seta-like or spinelike; terminal eupathidia on

palptarsus basally fused and split into 3 long prongs; subcapitulum with 2 pairs of subcapitular setae, *m* anterolaterad of pharynx. Prodorsum typically with a large shield, bearing 3 pairs of setae (*vi*, *ve* and *sci*) and a pair of platelets bearing setae *sce*; at least one pair of eyes evident in some species, tough not in others, pob present or absent. Dorsal hysterosomal area C–F typically with 1– 2 shields surrounded by 3–5 pairs of platelets, shield with 2–3 pairs of setae; setae d_1 and d_2 never on the same shield; humeral shields large or small, dorso- or ventrolateral, with setae c_2; intercalary shields (F) obvious, entire or divided along midline, with a pair of setae (f_1). Suranal shield (H) entire or divided, with 2–3 pairs of setae (h_3 absent or present). Endopodal shields I–II and III–IV present, divided along midline. Numbers of setae on leg segments variable amoung species, except tibiae uniformly 7-6-6-6. Leg tarsal claws robust; empodial shafts branching into tenent hairs before extending beyond tips of claws, with 3 pairs of tenent hairs(Fan & Zhang, 2005; Summers, 1962).

Stigmaeus shabestariensis **Haddad, Lotfollahi & Akbari n. sp.**
(Figs. 1–7)

FEMALE (n=5)**:** Idiosoma fusiform and elongate. Dorsal and ventral shields except the extra lateral shield on prodorsum are completely with a reticular design. Measurements of holotype (variations in measurements of paratypes in parentheses): Length of body (including gnathosoma) 424 (419–440), (excluding gnathosoma) 361 (354– 373), width 165 (165–185) (Fig. 1).

Gnathosoma**:** Subcapitulum faintly punctate, with 2 pairs of subcapitular (*m*, *n*) and 2 pairs of adoral setae (or_1, or_2) (Fig. 2). Palpal chaetotoxy: tarsus with 1 terminal tridentate eupathidium + 1 solenidion + 5 tactile setae; tibia with 1 well-developed claw + 1 spine-like accessory claw + 2 tactile setae; genua with 1 tactile setae; femur with 3 serrate setae (Fig. 3). Subcapitular setae *n* longer than *m*, *m* = 25, *n* = 38(38–41); *m*–*m* = 32 (28–32), *n*–*n* = 32 (32–33), *m*–*n* = 11 (11–12).

Dorsum(Fig. 1)**:** Prodorsum almost entirely striated, except for the reticulated propodosomal plate with setae *vi*, *ve* and *sci* and a pair of auxillary shields with setae *sce* , no eyes and pobs evident on propodosomal shield; ratios: *vi*: *vi*– *vi* = 0.5 (0.4–0.5), *ve*: *sci* = 1.2 (1.1–1.2), *sce*: *sci* = 1.1 (1.1–1.2); setae *vi* 17(17–19), *ve* 20, *sci* 17 (17–19), *sce* 19 (19–22); distances: *vi*–*vi* 32 (32–39), *vi*–*ve* 23 (23–25), *ve*-*ve* 48 (47–52), *ve*–*sci* 43 (39–43), *sci*-*sci* 79 (79–82),*sci*–*sce* 25 (22–25). Opisthosoma with an elongate central shield containing setae c_1 and c_2, a pair of elongate-oval lateral shield containing setae d_2 , 3 pairs of small platelets with setae e_1, e_2 and f_1 and a pair of no-setae bearing small platelets ; 14 pairs of dorsal setae (including c_2); setal lengths: c_1 15 (10–15), c_2 16 (16–21), d_1 13 (12–14), d_2 14 (13–15), e_1 15 (14–16), e_2 10 (10–14), f_1 17 (16–19); ratios c_1: c_1–c_1 = 0.4 (0.2–0.4), e_1: e_1–e_1 = 0.3, c_1–c_1: d_1–d_1: e_1–e_1: f_1–f_1 = 0.9–1: 1–1.1: 1–1.2: 1.4–1.6; distances: c_1–c_1 41 (38–41), c_1–d_1 67 (63–67), d_1–d_1 44 (40–44), d_1– d_2 48 (47–52), d_2-d_2 114 (113–136), d_1–e_1 57 (57–63), e_1–e_1 44 (41–48), e_1–e_2 35 (35–40), e_2-e_2 99 (99–118), e_1–f_1 29 (29– 32), f_1–f_1 62 (57–66); Suranal shield reticulated and complete, bearing 3 pairs of setae, h_1 22 (19–23), h_2 29 (28–31), h_3 19 (18–21).

Venter (Fig. 2)**:** Covered with striae except for coxal and anogenital area; Ventral setae *1a*, *3a* and *4a* equal in length, ratio *1a*: *3a*: *4a* = 1.2–1.3: 1.3–1.6: 1.2–1.9; lengths: *1a* 27 (24–27), *3a* 27 (27–32) and *4a* 25 (24– 29). Aggenital area with 4 pairs of setae, ag_1 and ag_2 on same platelet and ag_3 and ag_4 on same platelet, ag_1

18 (15–24), ag_2 18 (17–21), ag_3 21, ag_4 18 (17–21); anogenital valves with 2 pairs of genital setae and 3 pairs of pseudanal setae, lengths: g_1 23 (19–23), g_2 25 (20–25), ps_1 19 (19–23), ps_2 25 (25–27), ps_3 22 (22– 24).

Legs (Figs. 4–7)**:** Length: leg I 181 (175–181), leg II 140 (136–140), leg III 140 (133–140), leg IV 163 (158–163). Counts of setae (solenidia and setae κ not included) on legs I–IV: coxae 2, 2, 2, 2; trochanters 1, 1, 2, 1; femora 4, 4, 3, 2; genua 5 + 1κ, 5, 2, 2; tibiae 5 +1φ+1φp, 5 + 1φp, 5 + 1φp, 5 + 1φp; tarsi 13 + 1ω, 9 + 1ω, 7 + 1ω, 7 + 1ω. Lengths of solenidia: *I*ω 17 (15–17), *II*ω 14 (13–14), *III*ω 7, *IV*ω 7.

Male: Unknown.

Type materials**:** Holotype female and four paratype females of *S. shabestariensis* n. sp. collected from the soil of an apple orchard at Shabestar (Shendabad), East Azarbaijan, Iran on 15 August 2009, A.Akbari. The type materials are preserved as slide mounted specimens. The holotype and two paratypes are deposited in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran. Two other paratype females will be deposited in the Arachnida Collection of Plant Protection Research Institute, Pretoria, South Africa.

Remarks**:** This species closely resembles *Stigmaeus pulchellus* Kuznetsov, 1978 and *Stigmaeus purpurascens* Summers, 1962 in the body shape and arrangement of shields, however it differs from these species in that dorsal setae are much shorter, propodosomal shield has an extra isolated shield laterally, an extra no-setae-bearing shield lateral to intercalary shields and 2 pairs of aggenital shilds.

Etymology**:** This species is named after the region where it was collected.

ACKNOWLEDGMENTS

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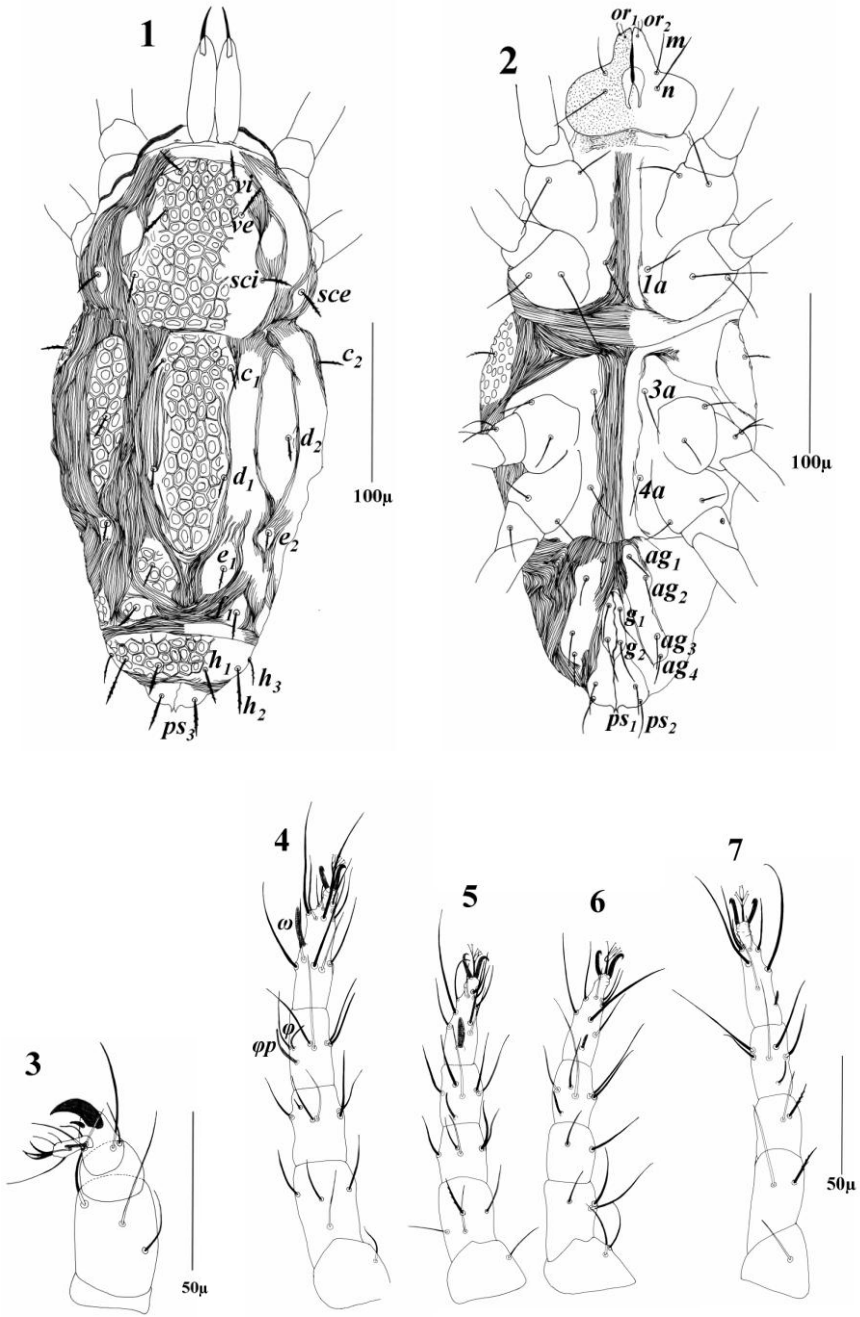

Figures 1–7. *Stigmaeus shabestariensis* Haddad, Lotfollahi & Akbari n. sp. (female): **1.** dorsal view, **2.** ventral view, **3.** Palp, **4.** leg I, **5.** leg II, **6.** leg III, **7.** leg IV.

NEW SPECIES OF *UNICORN* PLATNICK & BRESCOVIT (ARANEAE, OONOPIDAE) FROM NORTH-WEST ARGENTINA

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[González Reyes, A. X., Corronca, J. A. & Cava, M. B. 2010. New species of *Unicorn* Platnick & Brescovit (Araneae: Oonopidae) from North-West Argentina. Munis Entomology & Zoology, 5 (2): 374-379]

ABSTRACT: A new species of *Unicorn* genus, *Unicorn sikus* sp. nov. (from male and female) is diagnosed, described and illustrated. This new species was collected between 2200-4000m.a.s.l. in different semi-arid sites of Puna and Monte de Sierras y Bolsones eco-regions of the North-West of Salta Province, Argentina.

KEY WORDS: Goblin Spider, taxonomy, semi-arid areas, *Unicorn*, new species.

Oonopidae or goblin spiders are a worldwide family of minute, haplogyne spiders that are particularly dominant in leaf litter and humus, especially in the tropics (Tong & Li, 2009). This family is represented by 74 genera and 543 known species all over the World (Platnick, 2010). The *Unicorn* genus, consisting of six known species, was described by Platnick & Brescovit (1995), and has a distribution on Bolivia, Chile and Argentina. This genus seems closest to the monotypic oonopid genus *Xiombarg* (Brignolli, 1979) with actual distribution on the South-East of Brazil and North-East of Argentina (Misiones Province) (Platnick & Brescovit, 1995). Both genera present a cheliceral lamina, terminating in a strong, tooth-shaped process situated opposite the tip of the cheliceral fang; the capsulate tarsal organ; and the uniseriate tarsal claw dentition (Platnick & Brescovit, 1995).

In Argentina, *Unicorn* is represented by only one known species (*U. argentina* (Mello-Leitão, 1940) inhabits in semi-desert sites of the Quebrada del Toro (Mendoza Province-2570m.a.s.l.), and Valle Fértil Department (San Juan Province-1300m.a.s.l.). The lowest altitude where one species of this genus was collected corresponding to the North of Santiago-Chile (1100m.a.s.l.). Other *Unicorn* species were recorded on semi-deserts areas of the North of Chile and Aroma (Bolivia), where the species were collected between 2000-4000m.a.s.l. The new Argentinean species, here described, where collected in different sites of the Puna eco-region (2200-4000m.a.s.l.), from Ingeniero Maury to Muñano, and Monte de Sierras y Bolsones eco-region of the Parque Nacional Los Cardones (2250m.a.s.l.) (Salta Province). The spiders were collected using pit-fall trapping during different ecological studies (2005-2007) carried out by the IEBI´s arthropods group in Salta Province, Argentina.

MATERIAL AND METHODS

The studied material is deposited in the Museo de Ciencias Naturales (Colección IEBI-FCN) of the Universidad Nacional de Salta (Argentina) (MCN-U.N.Sa). General morphological characters were examined and measured under

an Olympus SZ4540 stereomicroscope. One female specimen was completely cleared with lactic acid 90% in a double boiler during 15 minutes and then observed under a Primo Star Karl Zeiss Microscope. Photographs were taken with a Canon G10 digital camera fixed to the microscopes and transferred to Adobe Photoshop CS2 for adjustment. One male and female were used to take photographs under the Scanning Electron Microscopy (SEM) at the LASEM (Laboratorio de Microscopía Electrónica de Barrido, ANPCyT/UNSa/CONICET, Salta, Argentina). Measurements of leg articles were taken from the dorsal side. All measurement results are given in millimeter.

Family OONOPIDAE Simon, 1890

Genus *Unicorn* Platnick & Brescovit, 1995
Type sp.: *Unicorn catleyi* Platnick & Brescovit, 1995

***Unicorn sikus* sp. nov.**
(Figs. 1-5)

Types. Female holotype from Cajoncillos (25º14´S 65º56´W), 3085mts, Parque Nacional Los Cardones-Salta (Argentina), Site 6- pitfall-trap, 7/V/2007; Cava, M.B. Col; male and female paratypes from Las Cuevas (24º22´S 66º05´W), 3705mts, Ruta 51, Salta (Argentina), Site 13-pitfall-trap, 19/VIII/2006, González Reyes A.X & J.A. Corronca Cols., deposited in MCN-U.N.Sa (IEBI´s Collection).

Etymology. The specific name is a noun in apposition taken from the traditional Andean panpipe (sikus) that remember, in part, the anterior clypeal male´s projection of this spider genus.

Diagnosis. The males of *U. sikus* sp. nov. seem closest to *U. huanaco* (Platnick & Brescovit, 1995) by the general shape of the male embolus, but differ by: the more spherical and larger basal portion of the bulb; the middle portion longer and wider raising near the centre of the bulb (Figs. 4e-4g); and by the bulb finishing in a double twisted embolus tip (Figs. 4d-e), but with the distal end of the embolus shorter and wider than in *U. huanaco* (Fig. 4h). The females of *U. sikus* sp. nov. share with *U. catleyi* (Platnick & Brescovit, 1995) the shape of the distal portion of the single anterior receptaculum with lateral projections, but the end on the new species is wider (Figs. 4b-c). The females are distinguished from others of this genus by: the Y-shaped single anterior receptaculum with two pairs of lateral projections on the distal portion (Fig. 4c); the length of the anterior receptaculum stretching out from the sub-circular sclerotized median plate (Fig. 4b) and by the sub-pentagonal membranous median receptaculum (Fig. 4c).

Female holotype. Total length 2.95. Carapace 1.10 long, 0.95 wide. Opisthosoma 1.85 long, 1.45 wide. Chelicerae 0.55 long. Eye measurements: ALE: 0.09, PME: 0.10; PLE: 0.10. PME separated by the half of its diameter from the ALE; PLE separated by one diameter from the PME. Leg lengths: I- femora 1.20, patella+tibia 1.30, metatarsi 1.08, tarsi 0.45, total 4.03; II- 1.30, 1.38, 1.10, 0.43, 4.21; III- 1.23, 1.18, 1.03, 0.38, 3.82; IV- 1.38, 1.20, 1.28, 0.40, 4.26. Leg formula: 4213. Leg spination: Tib. I-III- p0.1.1, r0.1.1, v1.1.2, IV- p1.1.0, r0.1.2, v1.1.2; Mt I- p1.1.0, r1.1.0, v1.2.2, II- p1.1.0, r1.1.0, v1.2.0, III- p1.1.0, r1.1.0, v2.2.1, IV- p1.1.0, r1.1.1, v1.1.2. Carapace pale yellow with four grey lines radiating forward the ocular area finishing on a median-posterior sub-pentagonal grey spot (Figs. 3a-

3d). Chelicerae pale yellow-brown with a median lamina terminating in single, large, tooth-shaped process situated opposite fang tip (Figs. 2a-3e). Long endites with a short serrula composed by a single row of teeth (Fig. 2b). Legs pale yellow clothed with long light grey setae. Tarsi with two claws, with only one single row of long teeth (Figs. 1a-b) and three spatulate setae under them (Fig. 1d). Tarsal organ capsulated with a single slit sensitive organ on all tarsi (Fig. 1c). Pedipalp of the female without a terminal claw (Fig. 2b-c). Opisthosoma whitish with a dark cardiac mark and posterior chevrons as in Figs. 3b-3d; venter pale without markings. Female genitalia as in Figs. 4a-c.

Male paratype. Total length 2.45, without clypeal horn. Carapace 1.00 long, 1.00 wide. Opisthosoma 1.45 long, 1.00 wide. Chelicerae 0.57 long. Eye measurements: ALE: 0.09, PME: 0.10; PLE: 0.10. PME separated by little more than a half of its diameter from the ALE; PLE separated by less than one diameter from the PME. Leg lengths: I- femora 1.30, patella+tibia 1.40, metatarsi 1.10, tarsi 0.50, total 4.20; II- 1.45, 1.53, 1.23, 0.53, 4.74; III- 1.33, 1.05, 1.08, 0.45, 3.91; IV- 1.60, other segments missing. Leg formula: 4213?. Leg spination: Tib. I-II- p0.1.1, r0.1.1, v0.0.2, III- p1.1.0, r2.1.0, v0.0.2; Mt I- p1.1.0, r1.1.0, v0.2.2, II- p1.1.0, r0.1.0, v2.2.0, III- p0.0.1, r1.1.0, v2.2.1. Male with a characteristic and large clypeal horn (Fig. 3c) and with an elongated chelicerae (Fig. 3f). Coloration and other somatic characters as in female. Palp of the male as in Figs. 4d-h.

Other material examined: ARGENTINA: Salta Province: near Gobernador Manuel Solá (24°35´S 65°50´W), 2554mts, two females, 15/V/2006, González Reyes, A. X. & J.A. Corronca Cols., (MCN-U.N.Sa); climbing the Abra Blanca (24°19´S 66°06´W), 3861mts, one immature, 19/VIII/2006, González Reyes, A. X. & J.A. Corronca Cols., (MCN-U.N.Sa); 12km W. of Santa Rosa de Tastil (24°22´S 66°01´W), 3227mts, one female, 24/II/2006, González Reyes, A. X. & J.A. Corronca Cols., (MCN-U.N.Sa); 14km W. of Ingeniero Maury (24°36´S 65°51´W), 2554mts, one female, 24/II/2006, González Reyes, A. X. & J.A. Corronca Cols., (MCN-U.N.Sa).

Distribution. Argentina: Salta Province.

Remarks: All the specimens were collected on Monte de Sierras and Bolsones and Puna eco-regions of the North-West of Salta Province, using a pit-fall trapping during the summer, autumn and winter season (Figs. 5a-b). The spiders were collected on semi-arid areas with poor litter coverage, but with a great amount of rocks of different sizes over a sandy soil. The poor vegetation stratum on those eco-regions is low and xeric.

Note. The SEM photographs of the spinnerets showing the six spinnerets with spigots and the setose and narrow colulus (Figs. 2d-e). These are the first pictures of the spinnerets obtained to this genus. The anterior spinnerets have three segments, and the posterior ones only two. The anterior spinnerets show spigots of the ampullate glands (Fig. 2d), meanwhile the median and the posterior ones have only spigots of pyriform glands (Fig. 2e). The poor number of available specimens was a limit to taken others pictures where those characters will be showing with better details.

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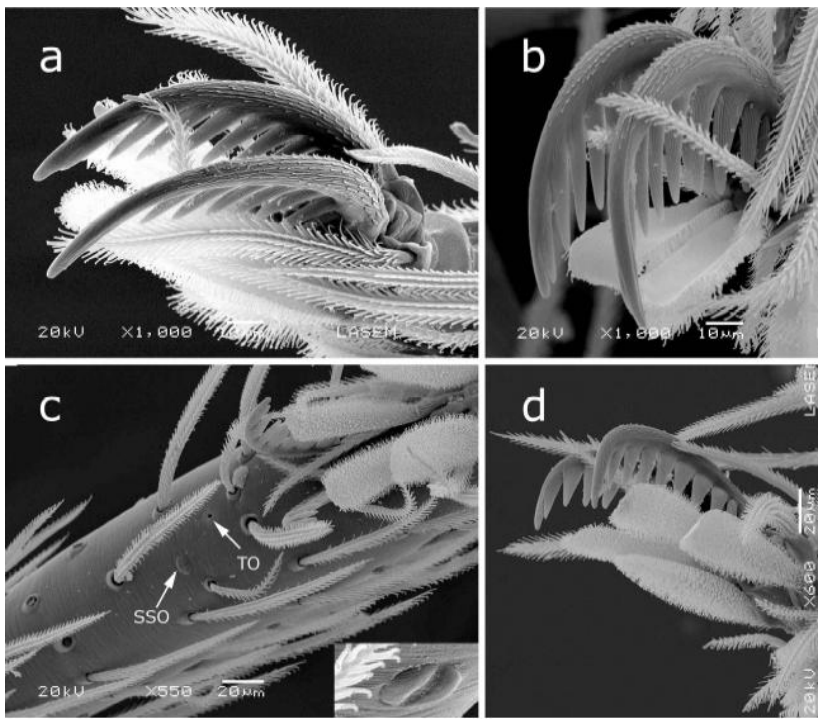
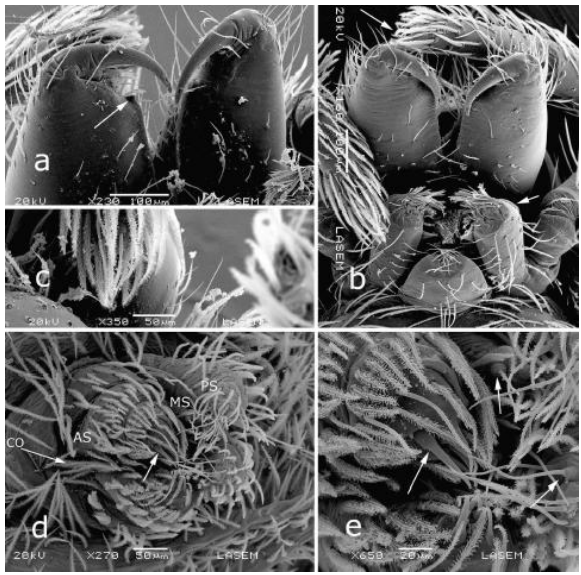
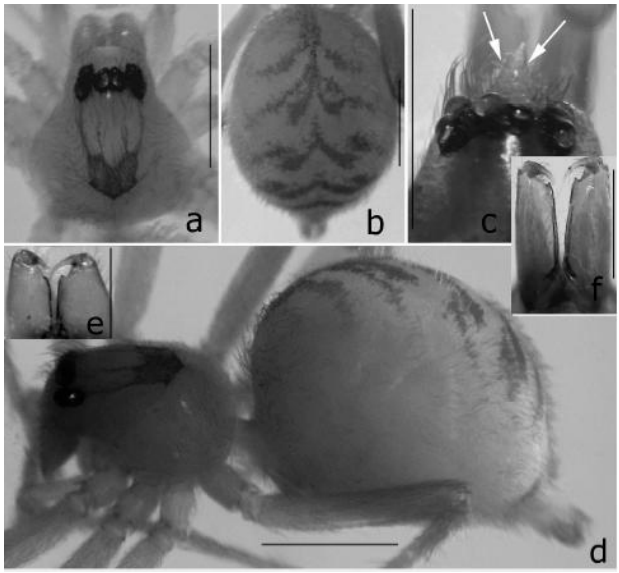


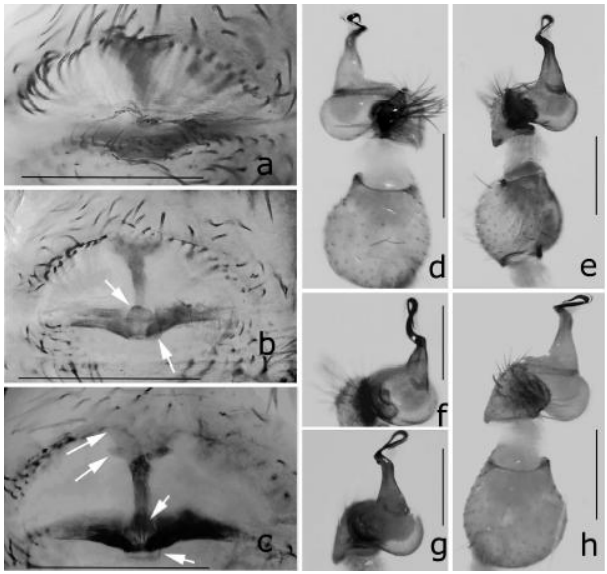
Figures 1 a-d. Female of *Unicorn sikus* sp. nov.: a. Claws of leg I, oblique dorsal view; b. Claws of leg IV, distal view showing a single row of long teeth and spatulate setae; c. Tarsi IV, dorsal view showing the capsulated tarsal organ and the single slit sensitive organ; d. Claws of leg IV ventral oblique view showing spatulate setae and lateral setae. The magnification is on the pictures.



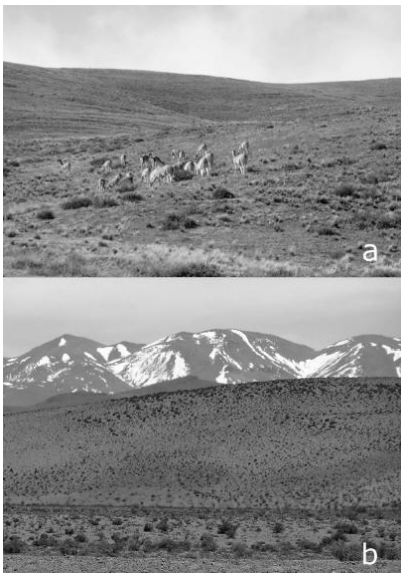
Figures 2 a-e. Female of *Unicorn sikus* sp. nov.: a. Chelicerae, ventral view showing the large tooth-shaped process; b. Ventral view of the carapace showing the serrula, labium, chelicerae and female pedipalp; c. Detail of the female pedipalp without claw; d. Spinnerets, ventral view, showing the setose colulus in anterior position; e. Spinnerets, details of the spigots. The magnification is on the pictures.



Figures 3 a-f. *Unicorn sikus* sp. nov. a. Female carapace showing dorsal view; b. Opisthosoma, female, dorsal view; c. Carapace of the males, dorsal view, showing the clypeal horn; d. Female, carapace and opisthosoma, lateral view; e. Female chelicerae, ventral view; f. Male chelicerae, ventral view. Scale=0,50mm.



Figures 4 a-h. *Unicorn sikus* sp. nov. a-c: Female; d-h: Male. a. Female genitalia, ventral view; b. Internal female genitalia, cleared, showing sub-circular sclerotized median plate; c. Internal females genitalia, cleared, showing anterior receptaculum with lateral projections and sub-pentagonal membranous median receptaculum; d. Left male palp, prolateral view; e. Left male palp, retrolateral view; f. Left male palp, detail of embolus, prolateral view; g. Left male palp, ventral view; h. Left male palp, another ventral view. Scale=0.20mm.



Figures 5 a-b. Areas where the *U. sikus* sp. nov. was collected. a. Cajoncillos (3085m.a.s.l.) (Monte de Sierras y Bolsones eco-region), Parque Nacional Los Cardones; b. Near Muñano (3989 m.a.s.l.) (Puna eco-region).

THE TURKISH DORCADIINI WITH ZOOGEOGRAPHICAL REMARKS (COLEOPTERA: CERAMBYCIDAE: LAMIINAE)

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[Özdikmen, H. 2010. The Turkish Dorcadiini with zoogeographical remarks (Coleoptera: Cerambycidae: Lamiinae). Munis Entomology & Zoology, 5 (2): 380-498**]**

ABSTRACT: All taxa of the tribe Dorcadiini Latreille, 1825 in Turkey are evaluated and summarized with zoogeographical remarks. Also *Dorcadion praetermissum mikhaili* ssp. n. is described in the text.

KEY WORDS: *Dorcadion, Neodorcadion,* Dorcadiini, Lamiinae, Cerambycidae, Coleoptera, Turkey.

The main aim of this work is to clarify current status of the tribe Dorcadiini in Turkey.

The work on Turkish Dorcadiini means to realize a study on about one third or one fourth of Turkish Cerambycidae fauna. As the same way, Turkish Dorcadiini is almost one second or one third of Dorcadiini in the whole world fauna. Turkish Dorcadiini is a very important group. This importance originated from their high endemism rate, and also their number of species. However, the information on all Turkish Dorcadiini is not enough.

The first large work on Dorcadiini species was carried out by Ganglbauer (1884). He evaluated a total of 152 species of the genus *Dorcadion* and 13 species of the genus *Neodorcadion*. He gave 30 *Dorcadion* species and 4 *Neodorcadion* species for Turkey. Then, the number of Turkish *Dorcadion* species raised to 53 with 23 described species by Heyden (1894), Ganglbauer (1897), Jakovlev (1899), Daniel (1900, 1901), Pic (1895, 1900, 1901, 1902, 1905, 1931), Suvorov (1915), Plavilstshikov (1958). In 1962, the largest work on Dorcadiini was realized by Breuning. He gave 353 *Dorcadion* species of in his work and mentined from a total of 92 species for Turkey. He also gave 9 *Neodorcadion* species of in his work and mentined from a total of 5 species for Turkey. Then many new *Dorcadion* species had been described by various authors from Turkey as 19 species by Breuning, 5 species by Holzschuh, 4 species by Braun, 3 species by Bernhauer, 3 species by Breuning & Ruspoli, 1 species by Breuning & Villiers, 1 species by Adlbauer, 1 species by Kraetschmer and 1 species by Önalp) until 1990.

In 1990 and 1991, a study on all Turkish *Dorcadion* fauna was carried out by Önalp. She stated a total of 52 species for Turkey. She also mentioned that 11 species among them are the first record of Turkey, 23 species are endemic to Turkey and 18 species are none endemic species in her work. Consequently, her work was far from determining the real

status of Turkish Dorcadiini. Since, this work includes many lacking information for Turkey.

After Önalp's work, a total of 13 new *Dorcadion* species was described by Holzschuh (1991, 1995, 2007) [3 species], Peks (1992, 1993) [3 species], Sabbadini & Pesarini (1992) [1 species], Pesarini & Sabbadini (1998, 2007) [5 species], Kadlec (2006) [1 species] related to Turkey. Among them, only *Dorcadion johannisfranci* Pesarini & Sabbadini, 2007 is none endemic taxon for Turkey. The remaining 10 species are endemic taxa to Turkey.

Recently, Danilevsky in Löbl & Smetana (2010) gave a total of 155 species for Turkey. 150 of them belong to the genus *Dorcadion* (1 species for *Carinatodorcadion*, 140 species for Cribridorcadion, 4 species for *Maculatodorcadion* and 5 species for *Megalodorcadion*) and 5 of them belong to the genus *Neodorcadion*.

For this reason, the present work is realized by aiming to determine all Turkish Dorcadiini fauna entirely and detailed.

Tribe DORCADIINI Latreille, 1825

= Dorcadionini Swainson & Shuckard, 1840 (incorrect original stem)
= Dorcadodiidae Gistel, 1856
= Dorcadionitae Thomson, 1860
= Dorcadionites Fairmaire, 1864
= Dorcadionides Lacordaire, 1869
= Dorcadiini LeConte, 1873
= Dorcadionini Breuning, 1948, 1958, 1962

Type genus: *Dorcadion* Dalman, 1817

Body large, oval and convex. Head voluminous and inclined, with wide membrane between clypeus and labrum (typical for *Eodorcadion*). Antennae short and thick, not ciliate undersides. The first antennal segment without or at most with an open scar, longer than third to at most a little shorter than the third. Eyes small, narrow, emarginate, finely faceted, their lower lobes transverse or oblique. Pronotum in general is quadrangular or lightly more breadth and with strong lateral conic tubercles. Prosternal process arched and unarmed. Metasternum very much short. The mesothoracic coxal cavities opened. Elytra strongly fused, imbricated, never dehiscent, oval, with or without distinct humeral carina. Elytra more or less tapering toward apex and toward base. Developed membranous hind wings absence. Wing almost completely reduced. They limited to a small scale. Elytra covered with recumbent pubescence and numerous stout erect setae. Legs short and thick; front femora proturuding outside; middle tibiae with a external groove or sinus (Breuning, 1962; Villiers, 1978; Cherepanov, 1990; Vives, 2000; Danilevsky & Kasatkin, 2006).

These characters always are enough to separate of this tribe distinctly from all other tribes of the subfamily Lamiinae. However, the tribe is

close to Lamiini Latreille, 1825, Monochamini Gistel, 1856 and Parmenini Mulsant, 1839.

It differs from Lamiini Latreille, 1825 and Monochamini Gistel, 1856 as follows:

In Dorcadiini, the base of elytra never covers the base of pronotum and usually only slightly is wider than it. In Lamiini and Monochamini, the base of elytra more or less covers the base of pronotum and is always much wider than it. Also, in Dorcadiini, 1st antennal segment without transverse costa or flattening (only in some species of *Eodorcadion* with a cross-section ridge at the top, but it is not a costa. In Lamiini and Monochamini, 1st antennal segment with a transverse costa before apex adjoining a flattened area at apex. Moreover, in Dorcadiini, hind wings underdeveloped, in form of small scales. In Lamiini and Monochamini, hind wings well developed, folded under elytra.

It also differs from Parmenini Mulsant, 1839 as follows:

In Parmenini, femora more or less swollen; antennae with long and erect hairs; elytra without sharply humeral edge. In Dorcadiini, femora not swollen; antennae without long hairs (with only short hairs); in most cases, elytra with noticeably ridge and with sharply humeral edge; pronotum prominent and sharp lateral spines.

Also according to Vives (2000), in Dorcadiini and Parmenini, hind membranous wings absent or very limited, generally not functional. Elytra strongly imbricated. In Lamiini and Monochamini, hind membranous wings present, developed and functional. Elytra dehiscent. Also in Dorcadiini, antennae short and thick, without ciliae in the internal and low part; middle tibiae with a strong medium rut that marks a dentiform node; eyes strongly faceted. In Parmenini, antennae very short and thin, with ciliae in the low part; middle tibiae without a projecting node; eyes finely faceted.

According to Vives & Zarazaga (in Vives, 2000) stated that "*the family level name Dorcadodiidae Gistel, 1856 has priority on at present used of Dorcadionini Thomson, 1860. A change of name would not useful by no means the nomenclatural stability in a complex group such as this one. We emphasize that the correct name of this tribe must be Dorcadiini, since the root of the genus Dorcadion (meaning in English small roebuck from the Greek word) is dorcadi - and not dorcadion-. Not having been corrected in advance, we prefer supporting the common usage*". So Vives (2000) used the name Dorcadionini as the tribal name.

Sama (2002) stated that the correct name of the tribe is Dorcadiini (Pessarini & Sabbadini, 1994) and not Dorcadionini as previously used.

However, the name Dorcadionini was accepted and used by many authors (e.g. Aurivillius, 1921; Breuning, 1948, 1962, 1966; Villiers, 1978; Bense, 1995; Althoff & Danilevsky, 1997; Vives, 2000; Danilevsky et al., 2004; Danilevsky & Kasatkin, 2006 etc.).

Bousquet et al. (2009) used the name Dorcadionini Swainson & Shuckard, 1840 for the tribe. They stated "*Dorcadioninae Swainson and Shuckard, 1840: 290, 291 (incorrect original stem). Type genus: Dorcadion Dalman, 1817 [stem = Dorcadi- (see Vives and Alonso-Zarazaga 2000: 659)]. Type species: Cerambyx glycyrrhizae Pallas, 1773 designated by Thomson (1864: 43). Comment. 1) The first valid type species designation for Dorcadion is that of Blanchard (1841: pl. 68) who designated Cerambyx fuliginator Linnaeus, 1758. However, acceptance of this species as type species will imply nomenclatural changes and not promote stability. The case should be referred to the Commission for a ruling (see Bousquet 2008: 619). 2) This family-group name is not properly formed from the stem of the type genus. However, the spelling is in prevailing usage and so is to be maintained (Article 29.5). 3) This family-group name has been placed in synonymy with the tribe Lamiini by Sama (2008: 233). Dorcadodiidae Gistel, 1856: 376. Type genus: Dorcadodium Gistel, 1856 [stem = Dorcadodi-]. Type species: Lamia morio Fabricius, 1787 designated by Vives and Alonso Zarazaga (2000: 659)*".

Recently, Danilevsky in Löbl & Smetana (2010) used Dorcadionini Swainson & Shuckard, 1840 as the tribe name.

Finally, we used the name Dorcadiini in the present text.

Aurivillius (1921) gave 61 genera in the tribe Dorcadionini. Breuning (1962) mentioned that some new genera had been described since Aurivillius (1921). However, he placed 71 genera among them in the different tribes as Parmenini (29 genera), Morimopsini (21 genera), Phantasini (2 genera), Phrissomini (1 genus), Crossotini (1 genus), Pteroliini (1 genus), Apomecynini (11 genera), Acanthocinini (5 genera). So according to Breuning (1962), the tribe Dorcadionini was included only the genera *Dorcadion* Dalman, 1817; *Neodorcadion* Ganglbauer, 1884 and *Eodorcadion* Breuning, 1947.

Iberodorcadion was described by Breuning (1943) as a subgenus of the genus *Dorcadion*. Breuning (1943) divided the genus *Dorcadion* in six subgenera: *Iberodorcadion*, *Carinatodorcadion*, *Maculatodorcadion*, *Cribridorcadion*, *Dorcadion* s.str. and *Pedestredorcadion* on the base of male genitalia. Vives (1976) the subgenus *Iberodorcadion* Breuning, 1943 was raised to the genus level, without contributing any reason for this change of taxonomical status and he proposed the subgenera *Iberodorcadion* s.str. (type sp.: *Cerambyx fuliginator* Linnaeus, 1758),

Hispanodorcadion (type sp.: *Dorcadion hispanicum* Mulsant, 1851) and *Baeticodorcadion* (type sp.: *Dorcadion mus* Rosenhauer, 1856) on the base of the external morphology (shape of the pronotum and elytral design) as well as indicating biological and geographical aspects. However, Villiers (1978) treated *Iberodorcadion* (= *Baeticodorcadion* = *Hispanodorcadion*) as a subgenus of *Dorcadion*. Subsequently, several authors have indicated the extreme filogenetic proximity between the subgenera proposed by Vives (1976). Hernández & Ortuño (1992) studied the female genitaliae of 18 species of *Iberodorcadion*. They do not find significant differences that comfirm the existence of the mentioned subgenera. So the approach of Villiers (1978) was recently supported by Tomé (2002). On the other hand, Danilevsky et al. (2004) accepted *Iberodorcadion* as a separate genus on the base of endophallic characters. Recently, Danilevsky in Löbl & Smetana (2010) gave *Iberodorcadion* Breuning, 1943 as a separate genus.

Politodorcadion (type sp.: *Dorcadion politum* Dalman, 1823) was described by Danilevsky (1996) as a subgenus of *Dorcadion*. Danilevsky et al. (2004) stated that "the unique taxonomical position of *Dorcadion* (*Politodorcadion*) is demonstrated; possible generic level of the taxon is supposed". The relations between *Politodorcadion* and *Eodorcadion* were shown by Danilevsky et al. (2004). So Danilevsky (2010b) regarded it as a separate genus. Recently, Danilevsky in Löbl & Smetana (2010) also gave *Politodorcadion* Danilevsky, 1996 as a separate genus.

The genus *Trichodorcadion* Breuning, 1942 from India and Nepal was transfered in Dorcadionini by Danilevsky & Kasatkin (2006) on the base of endophallic characters.

Consequently, now we accept that the name of the tribe is Dorcadiini. This tribe includes 6 genera as *Dorcadion* Dalman, 1817; *Neodorcadion* Ganglbauer, 1884; *Trichodorcadion* Breuning, 1942; *Iberodorcadion* Breuning, 1943; *Eodorcadion* Breuning, 1947 and *Politodorcadion* Danilevsky (1996) now.

The tribe Dorcadiini has Palaearctic (N Africa to China) and Oriental (India to Nepal) chorotypes. *Trichodorcadion* Breuning, 1942 has Oriental chorotype (India, Nepal). *Iberodorcadion* Breuning, 1943 has European (chiefly Iberian) chorotype (Spain to Poland). *Eodorcadion* Breuning, 1947 has E-Palaearctic chorotype (Russia, Siberia, Mongolia, China); *Politodorcadion* Danilevsky (1996) has Asian chorotype (Kazakhstan, W Siberia, China). These genera are not represented in Turkey.

Dorcadiini is represented with 2 genera as *Dorcadion* Dalman, 1817 and *Neodorcadion* Ganglbauer, 1884 in Turkey.

1. The sclerite between clypeus and labrum is not present.....***Docadion***
-. The sclerite between clypeus and labrum is present.....***Neodorcadion***

Consequently, Turkish Dorcadiini includes 218 species of 2 genera. 26 species (20 species of *Dorcadion* Dalman, 1817 + 2 species of *Neodorcadion* Ganglbauer, 1884 + 4 species *Iberodorcadion* Breuning, 1943) are very doubtful or impossible for Turkey. Since, the most of these species have been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. So these species are not confirmed for Turkey now. In fact that Turkish Dorcadiini comprise of 192 species of 2 genera. 134 species among them are endemic taxa to Turkey. 58 species are none endemic taxa for Turkey. Moreover, some species have subspecies. So these are represented by subspecies in Turkey. So the number of taxa of Turkish Dorcadiini is 235 (192 species + 43 subspecies) in real.

The following list includes the Turkish Dorcadiini species. In the list, endemic taxa and unconfirmed or impossible taxa for Turkey signed the marks (*) and (!) respectively.

Genus *DORCADION* Dalman, 1817

Subgenus *CARINATODORCADION* Breuning, 1943
***Dorcadion aethiops* (Scopoli, 1763)**
***Dorcadion carinatum* (Pallas, 1771)**
***Dorcadion fulvum* (Scopoli, 1763)**
***Dorcadion hybridum* Ganglbauer, 1884**
***Dorcadion ingeae* Peks, 1993**

Subgenus *CRIBRIDORCADION* Pic, 1903
***Dorcadion abstersum* Holzschuh, 1982**
***Dorcadion accola* Heyden, 1894**
***Dorcadion afflictum* Pesarini & Sabbadini, 1998**
***Dorcadion albicolle* Breuning, 1943**
***Dorcadion albolineatum* Küster, 1847**
***Dorcadion albonotatum* Pic, 1895**
***Dorcadion amanense* Breuning, 1943**
***Dorcadion anatolicum* Pic, 1900**
***Dorcadion angorense* Ganglbauer, 1897**
***Dorcadion apicerufum* Breuning, 1943**
***Dorcadion arcivagum* Thomson, 1867**
***Dorcadion ardahense* Breuning, 1975**
***Dorcadion arenarium* (Scopoli, 1763)**
***Dorcadion atritarse* Pic, 1931**
***!Dorcadion atticum* Kraatz, 1873**
***Dorcadion auratum* Tournier, 1872**
***Dorcadion bangi* Heyden, 1894**
***Dorcadion banjkovskyi* Plavilstshikov, 1958**
***Dorcadion beckeri* Kraatz, 1873**
***Dorcadion bisignatum* Jakovlev, 1899**

***Dorcadion bistriatum* Pic, 1898**
******Dorcadion bithyniense* Chevrolat, 1856**
***Dorcadion blanchardi* Mulsant & Rey, 1863**
******Dorcadion blandulus* Holzschuh, 1977**
******Dorcadion bodemeyeri* Daniel, 1900**
******Dorcadion boluense* Breuning, 1962**
******Dorcadion boszdaghense* Fairmaire, 1866**
******Dorcadion bouilloni* Breuning & Ruspoli, 1975**
******Dorcadion brauni* Breuning, 1979**
******Dorcadion bremeri* Breuning, 1981**
***Dorcadion breuningi* Heyrovsky, 1943**
******Dorcadion bulgharmaadense* Breuning, 1946**
******Dorcadion cachinno* Thomson, 1868**
******Dorcadion carinipenne* Pic, 1900**
******Dorcadion carolisturanii* Breuning & Ruspoli, 1971**
******Dorcadion cinctellum* Fairmaire, 1866**
***Dorcadion cinerarium* (Fabricius, 1787)**
***Dorcadion cingulatum* Ganglbauer, 1884**
******Dorcadion coiffaiti* Breuning, 1962**
***Dorcadion complanatum* Ganglbauer, 1884**
***Dorcadion condensatum* Küster, 1852**
******Dorcadion confluens* Fairmaire, 1866**
******Dorcadion culminicola* Thomson, 1868**
***Dorcadion decipiens* (Germar, 1824)**
******Dorcadion delagrangei* Pic, 1894**
******Dorcadion deyrollei* Ganglbauer, 1884**
***Dorcadion dimidiatum* Motschulsky, 1838**
***Dorcadion divisum* Germar, 1839**
******Dorcadion dobrovljanskii* Suvorov, 1915**
******Dorcadion drusoides* Breuning, 1962**
******Dorcadion elazigi* Breuning, 1971**
!*Dorcadion elegans* Kraatz, 1873**
******Dorcadion enricisturanii* Breuning & Ruspoli, 1971**
***Dorcadion equestre* (Laxmann, 1770)**
******Dorcadion escherichi* Ganglbauer, 1897**
!*Dorcadion etruscum* (Rossi, 1790)**
***Dorcadion ferruginipes* Ménétriés, 1836**
***Dorcadion formosum* Kraatz, 1870**
***Dorcadion gallipolitanum* Thomson, 1867**
******Dorcadion gebzeense* Breuning, 1974**
******Dorcadion glabricolle* Breuning, 1943**
******Dorcadion glabrofasciatum* Daniel, 1901**
!*Dorcadion glaucum* Faldermann, 1837**
***Dorcadion haemorrhoidale* Hampe, 1852**
***Dorcadion halepense* (Kraatz, 1873)**
******Dorcadion hampii* Mulsant & Rey, 1863**
******Dorcadion heinzi* (Breuning, 1964)**
***Dorcadion hellmanni* Ganglbauer, 1884**
!*Dorcadion holosericeum* Krynicki, 1832**
******Dorcadion holtzi* (Pic, 1905)**
******Dorcadion holzschuhi* Breuning, 1974**
******Dorcadion iconiense* Daniel, 1901**

***!Dorcadion impressicolle* Kraatz, 1873**
***!Dorcadion indutum* Faldermann, 1837**
****Dorcadion infernale* Mulsant & Rey, 1863**
****Dorcadion inspersum* Holzschuh, 1982**
****Dorcadion investitum* Breuning, 1970**
****Dorcadion ispartense* Breuning, 1962**
****Dorcadion jakovleviellum* Plavilstshikov, 1951**
****Dorcadion janatai* Kadlec, 2006**
***Dorcadion johannisfranci* Pesarini & Sabbadini, 2007**
****Dorcadion kagyzmanicum* Suvorov, 1915**
****Dorcadion karsense* Suvorov, 1915**
***Dorcadion kasikoporanum* Pic, 1902**
****Dorcadion kindermanni* Waltl, 1838**
****Dorcadion kraetschmeri* Bernhauer, 1988**
****Dorcadion kurdistanum* Breuning, 1944**
****Dorcadion kurucanum* Holzschuh, 2007**
****Dorcadion ladikanum* Braun, 1976**
***Dorcadion laeve* Faldermann, 1837**
****Dorcadion lameeri* Théry, 1896**
****Dorcadion ledereri* Thomson, 1865**
****Dorcadion ledouxi* Breuning, 1974**
****Dorcadion linderi* Tournier, 1872**
***Dorcadion lineatocolle* Kraatz, 1873**
***!Dorcadion litigiosum* Ganglbauer, 1884**
****Dorcadion lodosi* Sabbadini & Pesarini, 1992**
****Dorcadion lohsei* Braun, 1976**
****Dorcadion longulum* Breuning, 1943**
***Dorcadion lugubre* Kraatz, 1873**
****Dorcadion maceki* Holzschuh, 1995**
***Dorcadion margheritae* Breuning, 1964**
****Dorcadion martini* Bernhauer, 1988**
***!Dorcadion mediterraneum* Breuning, 1942**
****Dorcadion menradi* Holzschuh, 1989**
****Dorcadion merkli* Ganglbauer, 1884**
****Dorcadion mesopotamicum* Breuning, 1944**
****Dorcadion micans* Thomson, 1867**
****Dorcadion miminfernale* Breuning, 1970**
***!Dorcadion minutum* Kraatz, 1873**
***Dorcadion mniszechi* Kraatz, 1873**
****Dorcadion muchei* Breuning, 1962**
****Dorcadion multimaculatum* Pic, 1932**
***!Dorcadion murrayi* Küster, 1847**
****Dorcadion nigrostriatum* Adlbauer, 1982**
***Dorcadion nitidum* Motschulsky, 1838**
***Dorcadion niveisparsum* Thomson, 1865**
***Dorcadion nobile* Hampe, 1852**
***Dorcadion obsoletum* Kraatz, 1873**
****Dorcadion obtusum* Breuning, 1944**
****Dorcadion oezdurali* Önalp, 1988**
***Dorcadion olympicum* Ganglbauer, 1882**
****Dorcadion ortrudae* Braun, 1980**
****Dorcadion paracinerarium* Breuning, 1974**

***Dorcadion parallelum* Küster, 1847**
******Dorcadion pararufipenne* Braun, 1976**
******Dorcadion parescherichi* Breuning, 1966**
******Dorcadion pavesii* Pesarini & Sabbadini, 1998**
***Dorcadion pedestre* (Poda, 1761)**
******Dorcadion petrovitzi* Heyrovsky, 1964**
******Dorcadion piochardi* Kraatz, 1873**
******Dorcadion pittinorum* Pesarini & Sabbadini, 1998**
******Dorcadion pluto* Thomson, 1867**
******Dorcadion poleti* Breuning, 1948**
******Dorcadion praetermissum* Pesarini & Sabbadini, 1998**
******Dorcadion preissi* Heyden, 1894**
******Dorcadion pseudarcivagum* Breuning, 1943**
******Dorcadion pseudobithyniense* Breuning, 1962**
******Dorcadion pseudinfernale* Breuning, 1943**
******Dorcadion pseudocinctellum* Breuning, 1943**
******Dorcadion pseudoholosericeum* Breuning, 1962**
******Dorcadion pseudopreissi* Breuning, 1962**
******Dorcadion punctipenne* Küster, 1852**
******Dorcadion punctulicolle* Breuning, 1944**
!*Dorcadion pusillum* Küster, 1847**
!*Dorcadion pygmaeum* Breuning, 1947**
******Dorcadion quadripustulatum* Kraatz, 1873**
***Dorcadion regulare* Pic, 1931**
!*Dorcadion reitteri* Ganglbauer, 1884**
******Dorcadion rigattii* Breuning, 1966**
******Dorcadion rizeanum* (Breuning & Villiers, 1967)**
******Dorcadion robustum* Ganglbauer, 1884**
******Dorcadion rolandmenradi* Peks, 1992**
******Dorcadion rosinae* Daniel, 1900**
***Dorcadion rosti* Pic, 1900**
******Dorcadion rufipenne* Breuning, 1946**
******Dorcadion rufoapicale* Breuning, 1943**
!*Dorcadion sareptanum* Kraatz, 1873**
******Dorcadion saulcyi* Thomson, 1865**
***Dorcadion scabricolle* Dalman, 1817**
******Dorcadion schultzei* Heyden, 1894**
!*Dorcadion scopolii* (Herbst, 1784)**
******Dorcadion scrobicolle* Kraatz, 1873**
******Dorcadion semibrunneum* Pic, 1903**
******Dorcadion semilineatum* Fairmaire, 1866**
!*Dorcadion semilucens* Kraatz, 1873**
***Dorcadion seminudum* Kraatz, 1873**
******Dorcadion semivelutinum* Kraatz, 1873**
***Dorcadion septemlineatum* Waltl, 1838**
!!*Dorcadion sericatum* Sahlberg, 1823**
******Dorcadion sinopense* Breuning, 1962**
******Dorcadion sinuatevittatum* Pic, 1937**
******Dorcadion smyrnense* (Linnaeus, 1757)**
******Dorcadion sodale* Hampe, 1852**
******Dorcadion sonjae* Peks, 1993**
******Dorcadion steineri* Holzschuh, 1977**

***Dorcadion striolatum* Kraatz, 1873**
***Dorcadion sturmi* Frivaldsky, 1837**
****Dorcadion subatritarse* Breuning, 1966**
****Dorcadion subcinctellum* Breuning, 1962**
****Dorcadion subinterruptum* Pic, 1900**
****Dorcadion subsericatum* Pic, 1901**
****Dorcadion subvestitum* Daniel, 1900**
***Dorcadion sulcipenne* Küster, 1847**
****Dorcadion syriense* Breuning, 1943**
***Dorcadion tauricum* Waltl, 1838**
****Dorcadion theophilei* Pic, 1898**
***?Dorcadion tuerki* Ganglbauer, 1884**
****Dorcadion turcicum* Breuning, 1963**
****Dorcadion ullrichi* Bernhauer, 1988**
***Dorcadion urmianum* Plavilstshikov, 1937**
***Dorcadion variegatum* Ganglbauer, 1884**
***Dorcadion wagneri* Küster, 1846**
****Dorcadion walteri* Holzschuh, 1991**
****Dorcadion weyersi* Fairmaire, 1866**

Subgenus *MACULATODORCADION* Breuning, 1942
****Dorcadion janssensi* Breuning, 1966**
***Dorcadion quadrimaculatum* Küster, 1848**
****Dorcadion triste* Frivaldsky, 1845**
****Dorcadion wolfi* Kraetschmer, 1985**

Subgenus *DORCADION* Dalman, 1817
***!Dorcadion gebleri* Kraatz, 1873**
***!Dorcadion glicyrrhizae* (Pallas, 1773)**

Genus *NEODORCADION* Ganglbauer, 1884
***Neodorcadion bilineatum* (Germar, 1824)**
****Neodorcadion exornatoides* Breuning, 1962**
***Neodorcadion exornatum* (Frivaldsky, 1835)**
***!Neodorcadion fallax* (Kraatz, 1873)**
***Neodorcadion laqueatum* (Waltl, 1838)**
****Neodorcadion orientale* Ganglbauer, 1884**
***Neodorcadion pelleti* (Mulsant & Rey, 1863)**
***!Neodorcadion virleti* (Brullé, 1832)**

Genus *IBERODORCADION* Breuning, 1943

Subgenus *IBERODORCADION* Breuning, 1943
***!Iberodorcadion fuliginator* (Linnaeus, 1758)**

Subgenus *BAETICODORCADION* Vives, 1976
***!Iberodorcadion mucidum* (Dalman, 1817)**

Subgenus *HISPANODORCADION* Vives, 1976
***!Iberodorcadion heydeni* (Kraatz, 1870)**
***!Iberodorcadion molitor* (Fabricius, 1775)**

The following list includes the subspecies of Turkish *Dorcadion* species. The list comprises of 80 subspecies which are represented into 37 species in Turkey.

Genus *DORCADION* Dalman, 1817

Subgenus *CARINATODORCADION* Breuning, 1943
***D. aethiops aethiops* (Scopoli, 1763)**
***D. carinatum carinatum* (Pallas, 1771)**
***D. fulvum fulvum* (Scopoli, 1763)**
***D. hybridum hybridum* Ganglbauer, 1884**

Subgenus *CRIBRIDORCADION* Pic, 1903
***D. anatolicum anatolicum* Pic, 1900**
***D. anatolicum seydisehirense* Breuning (in Sama, 1982)**
***D. anatolicum brignolii* Breuning (in Sama, 1982)**
***D. arenarium arenarium* (Scopoli, 1763)**
***D. bangi bangi* Heyden, 1894**
***D. bangi heinzorum* Braun, 1975**
***D. bangi roridum* Pesarini & Sabbadini, 1998**
***D. beckeri beckeri* Kraatz, 1873**
***D. boluense boluense* Breuning, 1962**
***D. boluense imitator* Pesarini & Sabbadini, 1998**
***D. boluense corallinum* Pesarini & Sabbadini, 1998**
***D. dimidiatum dimidiatum* Motschulsky, 1838**
***D. dimidiatum kelkiticum* Özdikmen & Hasbenli, 2004**
***D. dimidiatum korgei* Breuning, 1970**
***D. divisum divisum* Germar, 1839**
***D. divisum mytilinense* Kraatz, 1873**
***D. divisum subdivisum* Breuning, 1955**
***D. divisum parteinterruptum* Breuning, 1962**
***D. enricisturanii enricisturanii* Breuning & Ruspoli, 1971**
***D. enricisturanii densepunctatum* Braun, 1978**
***D. equestre nogelli* Fairmaire, 1866**
***D. equestre reclinatum* Kraatz, 1892**
***D. formosum formosum* Kraatz, 1870**
***D. formosum ponticum* Breuning, 1970**
***D. gallipolitanum gallipolitanum* Thomson, 1867**
***D. gallipolitanum gandolphei* Tournier, 1872**
***D. hampii hampii* Mulsant & Rey, 1863**
***D. hampii aureovittatum* Kraatz, 1873**
***D. infernale infernale* Mulsant & Rey, 1863**
***D. infernale asperatum* Breuning, 1947**
***D. infernale edremitense* Breuning, 1966**
***D. laeve micula* Plavilstshikov, 1937**
***D. lugubre lugubre* Kraatz, 1873**
***D. micans micans* Thomson, 1867**
***D. micans susheriense* Breuning, 1970**
***D. obtusum obtusum* Breuning, 1944**
***D. obtusum marashense* Breuning, 1948**
***D. olympicum olympicum* Kraatz, 1873**
***D. olympicum convexum* Breuning, 1943**

***D. olympicum flavosuturale* Krätschmer, 1987**
***D. pararufipenne pararufipenne* Braun, 1976**
***D. pararufipenne rassei* Braun, 1976**
***D. pedestre pedestre* (Poda, 1761)**
***D. piochardi piochardi* Kraatz, 1873**
***D. praetermissum praetermissum* Pesarini & Sabbadini, 1998**
***D. praetermissum mikhaili* ssp. n.**
***D. piochardi ladikense* Breuning & Villiers, 1967**
***D. rufipenne rufipenne* Breuning, 1946**
***D. rufipenne major* Breuning, 1962**
***D. saulcyi saulcyi* Thomson, 1865**
***D. saulcyi javeti* Kraatz, 1873**
***D. scabricolle scabricolle* Dalman, 1817**
***D. scabricolle caramanicum* Daniel, 1903**
***D. scabricolle paphlagonicum* Breuning, 1962**
***D. scabricolle balikesirense* Breuning, 1962**
***D. scabricolle uludaghicum* Breuning, 1970**
***D. scrobicolle scrobicolle* Kraatz, 1873**
***D. scrobicolle morulum* Holzschuh, 1995**
***D. semibrunneum semibrunneum* Pic, 1903**
***D. semibrunneum anamasum* Pic, 1934**
***D. septemlineatum septemlineatum* Waltl, 1838**
***D. septemlineatum novemlineatum* Kraatz, 1873**
***D. septemlineatum octolineatum* Kraatz, 1873**
***D. septemlineatum demirciense* Breuning, 1966**
***D. septemlineatum abanti* Braun, 1976**
***D. sodale sodale* Hampe, 1852**
***D. sodale trapesunticum* Breuning, 1946**
***D. sodale blumenthali* Breuning, 1966**
***D. subsericatum subsericatum* Pic, 1901**
***D. subsericatum vulneratum* Pesarini & Sabbadini, 1998**
***D. sulcipenne caucasicum* Küster, 1847**
***D. sulcipenne argonauta* Suvorov, 1913**

Subgenus *MACULATODORCADION* Breuning, 1942
***D. quadrimaculatum quadrimaculatum* Küster, 1848**
***D. quadrimaculatum nodicorne* Tournier, 1872**
***D. triste triste* Frivaldsky, 1845**
***D. triste phrygicum* Peks, 1993**

Zoogeographical Analysis

Breuning (1962) stated 18 faunal areas for the whole world Dorcadiini. 7 of them were related to Turkish fauna as Thraco-bithynian faunal area (including Thrace and NW Anatolia, namely Bithynia), NW Anatolian faunal area (including NW Anatolia, namely Mysidia), CW Anatolian faunal area (including W and CW Anatolia, namely Lydian and Phrygian elements), Atticio-cilician faunal area (including Greece to SCW Anatolian elements, namely Greeco-cilician elements), Paphlagonian faunal area (including NCW Anatolian, namely Paphlagonian elements), Cappadocian faunal area (including C Anatolian elements [to Tokat and

Ankara prov. in N, to Konya prov. in W and to N Syria in S]), Circum-Aegean faunal area (including W Anatolian elements, elements of Aegean Islands and Greek elements [Attician and E Morean]). The remaining 11 faunal areas were related to European fauna only. Therefore, especially NE, E and SE Anatolian elements have not been used to determine any faunal area until now.

Turkish Dorcadiini includes 192 species. 134 species, namely about 70 % of the species have "Anatolian" chorotype. 28 species, namely about 15 % of the species have "SW-Asiatic" chorotype. 23 species, namely about 12 % of the species have "Turano-Mediterranean" chorotype. 4 species, namely abut 2 % of the species have "Turano-European" chorotype. Each of the remaining species has a different chorotype. One species, namely about 0.6 % of the species has "E-European" chorotype. One species, namely about 0.6 % of the species has E-Mediterranean chorotype. And one species, namely about 0.6 % of the species have "Turanian" chorotype (Fig. 1). So the most number of Turkish Dorcadiini species belongs to endemic species ("Anatolian" chorotype) for Turkey (70 %). 27 % of the species which have "SW-Asiatic" and "Turano-Mediterranean" chorotypes, follows this.

The present zoogeographical characterization is based on the chorotype classification of Anatolian fauna, recently proposed by Taglianti et al. (1999). As far as possible as one chorotype description can be determined for each taxon in the text.

For zoogeographical evaluation, the all known species of Turkish Dorcadiini are presented in the following text.

134 species have "Anatolian" chorotype, namely they are endemic to Turkey. These taxa are *D. abstersum* Holzschuh, 1982; *D. accola* Heyden, 1894; *D. afflictum* Pesarini & Sabbadini, 1998; *D. albicolle* Breuning, 1943; *D. albolineatum* Küster, 1847; *D. albonotatum* Pic, 1895; *D. amanense* Breuning, 1943; *D. anatolicum* Pic, 1900; *D. angorense* Ganglbauer, 1897; *D. arcivagum* Thomson, 1867; *D. ardahense* Breuning, 1975; *D. bangi* Heyden, 1894; *D. banjkovskyi* Plavilstshikov, 1958; *D. bisignatum* Jakovlev, 1899; *D. bithyniense* Chevrolat, 1856; *D. blandulus* Holzschuh, 1977; *D. bodemeyeri* Daniel, 1900; *D. boluense* Breuning, 1962; *D. boszdaghense* Fairmaire, 1866; *D. bouilloni* Breuning & Ruspoli, 1975; *D. brauni* Breuning, 1979; *D. bremeri* Breuning, 1981; *D. bulgharmaadense* Breuning, 1946; *D. cachinno* Thomson, 1868; *D. carinipenne* Pic, 1900; *D. carolisturanii* Breuning & Ruspoli, 1971; *D. cinctellum* Fairmaire, 1866; *D. coiffaiti* Breuning, 1962; *D. confluens* Fairmaire, 1866; *D. culminicola* Thomson, 1868; *D. delagrangei* Pic, 1894; *D. deyrollei* Ganglbauer, 1884; *D. dobrovljanskii* Suvorov, 1915; *D. drusoides* Breuning, 1962; *D. elazigi* Breuning, 1971; *D. enricisturanii* Breuning & Ruspoli, 1971; *D. escherichi* Ganglbauer, 1897; *D. gebzeense* Breuning, 1974; *D. glabricolle* Breuning, 1943; *D. glabrofasciatum* Daniel, 1901; *D. hampii* Mulsant & Rey, 1863; *D. heinzi* (Breuning, 1964); *D. holtzi* (Pic, 1905); *D. holzschuhi* Breuning, 1974; *D. iconiense* Daniel, 1901; *D. infernale* Mulsant & Rey, 1863; *D. ingeae* Peks, 1993; *D.*

inspersum Holzschuh, 1982; *D. investitum* Breuning, 1970; *D. ispartense* Breuning, 1962; *D. jakovleviellum* Plavilstshikov, 1951; *D. janatai* Kadlec, 2006; *D. janssensi* Breuning, 1966; *D. kagyzmanicum* Suvorov, 1915; *D. karsense* Suvorov, 1915; *D. kindermanni* Waltl, 1838; *D. kraetschmeri* Bernhauer, 1988; *D. kurdistanum* Breuning, 1944; *D. kurucanum* Holzschuh, 2007; *D. ladikanum* Braun, 1976; *D. lameeri* Théry, 1896; *D. ledereri* Thomson, 1865; *D. ledouxi* Breuning, 1974; *D. linderi* Tournier, 1872; *D. lodosi* Sabbadini & Pesarini, 1992; *D. lohsei* Braun, 1976; *D. longulum* Breuning, 1943; *D. maceki* Holzschuh, 1995; *D. martini* Bernhauer, 1988; *D. menradi* Holzschuh, 1989; *D. merkli* Ganglbauer, 1884; *D. mesopotamicum* Breuning, 1944; *D. micans* Thomson, 1867; *D. miminfernale* Breuning, 1970; *D. muchei* Breuning, 1962; *D. multimaculatum* Pic, 1932; *D. nigrostriatum* Adlbauer, 1982; *D. obtusum* Breuning, 1944; *D. oezdurali* Önalp, 1988; *D. ortrudae* Braun, 1980; *D. paracinerarium* Breuning, 1974; *D. pararufipenne* Braun, 1976; *D. parescherichi* Breuning, 1966; *D. pavesii* Pesarini & Sabbadini, 1998; *D. petrovitzi* Heyrovsky, 1964; *D. piochardi* Kraatz, 1873; *D. pittinorum* Pesarini & Sabbadini, 1998; *D. pluto* Thomson, 1867; *D. poleti* Breuning, 1948; *D. praetermissum* Pesarini & Sabbadini, 1998; *D. preissi* Heyden, 1894; *D. pseudarcivagum* Breuning, 1943; *D. pseudinfernale* Breuning, 1943; *D. pseudobithyniense* Breuning, 1962; *D. pseudocinctellum* Breuning, 1943; *D. pseudoholosericeum* Breuning, 1962; *D. pseudopreissi* Breuning, 1962; *D. punctipenne* Küster, 1852; *D. punctulicolle* Breuning, 1944; *D. quadripustulatum* Kraatz, 1873; *D. rigattii* Breuning, 1966; *D. rizeanum* (Breuning & Villiers, 1967); *D. robustum* Ganglbauer, 1884; *D. rolandmenradi* Peks, 1992; *D. rosinae* Daniel, 1900; *D. rufipenne* Breuning, 1946; *D. rufoapicale* Breuning, 1943; *D. saulcyi* Thomson, 1865; *D. schultzei* Heyden, 1894; *D. scrobicolle* Kraatz, 1873; *D. semilineatum* Fairmaire, 1866; *D. semivelutinum* Kraatz, 1873; *D. semibrunneum* Pic, 1903; *D. sinopense* Breuning, 1962; *D. sinuatevittatum* Pic, 1937; *D. smyrnense* (Linnaeus, 1757); *D. sodale* Hampe, 1852; *D. sonjae* Peks, 1993; *D. steineri* Holzschuh, 1977; *D. subatritarse* Breuning, 1966; *D. subcinctellum* Breuning, 1962; *D. subinterruptum* Pic, 1900; *D. subsericatum* Pic, 1901; *D. subvestitum* Daniel, 1900; *D. syriense* Breuning, 1943; *D. theophilei* Pic, 1898; *D. triste* Frivaldsky, 1845; *D. turcicum* Breuning, 1963; *D. ullrichi* Bernhauer, 1988; *D. walteri* Holzschuh, 1991; *D. weyersi* Fairmaire, 1866; *D. wolfi* Kraetschmer, 1985; *N. exornatoides* Breuning, 1962 and *N. orientale* Ganglbauer, 1884.

A total of 28 species have "SW-Asiatic" chorotype [Namely, 8 species have "SW-Asiatic (Anatolo-Caucasian)" chorotype. These taxa are *D. auratum* Tournier, 1872; *D. beckeri* Kraatz, 1873; *D. bistriatum* Pic, 1898; *D. nitidum* Motschulsky, 1838; *D. niveisparsum* Thomson, 1865; *D. rosti* Pic, 1900 and *D. sulcipenne* Küster, 1847. 12 species have "SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian)" chorotype. These taxa are *D. apicerufum* Breuning, 1943; *D. dimidiatum* Motschulsky, 1838; *D. haemorrhoidale* Hampe, 1852; *D. hellmanni*

Ganglbauer, 1884; *D. kasikoporanum* Pic, 1902; *D. laeve* Faldermann, 1837; *D. mniszechi* Kraatz, 1873; *D. nobile* Hampe, 1852; *D. scabricolle* Dalman, 1817; *D. seminudum* Kraatz, 1873; *D. striolatum* Kraatz, 1873 and *D. wagneri* Küster, 1846. 5 species have "SW-Asiatic (Irano-Anatolian)" chorotype. These taxa are *D. blanchardi* Mulsant & Rey, 1863; *D. cingulatum* Ganglbauer, 1884; *D. complanatum* Ganglbauer, 1884; *D. tuerki* Ganglbauer, 1884 and *D. urmianum* Plavilstshikov, 1937. 4 species have "SW-Asiatic (Syro-Anatolian)" chorotype. These taxa are *D. formosum* Kraatz, 1870; *D. halepense* (Kraatz, 1873); *D. parallelum* Küster, 1847 and *D. variegatum* Ganglbauer, 1884].

A total of 23 species have "Turano-Mediterranean" chorotype [Namely, 19 species have "Turano-Mediterranean (Balkano-Anatolian)" chorotype. These taxa are *D. atritarse* Pic, 1931; *D. breuningi* Heyrovsky, 1943; *D. condensatum* Küster, 1852; *D. decipiens* (Germar, 1824); *D. divisum* Germar, 1839; *D. ferruginipes* Ménétriés, 1836; *D. gallipolitanum* Thomson, 1867; *D. hybridum* Ganglbauer, 1884; *D. lugubre* Kraatz, 1873; *D. margheritae* Breuning, 1964; *D. olympicum* Ganglbauer, 1882; *D. quadrimaculatum* Küster, 1848; *D. septemlineatum* Waltl, 1838; *D. sturmi* Frivaldsky, 1837; *D. tauricum* Waltl, 1838; *N. bilineatum* (Germar, 1824); *N. exornatum* (Frivaldsky, 1835); *N. laqueatum* (Waltl, 1838) and *N. pelleti* (Mulsant & Rey, 1863). 3 species have "Turano-Mediterranean (Balkano-Anatolian) or Thracian" chorotype. These taxa are *D. johannisfranci* Pesarini & Sabbadini, 2007; *D. obsoletum* Kraatz, 1873 and *D. regulare* Pic, 1931. One species as *D. lineatocolle* Kraatz, 1873 has "Turano-Mediterranean (Balkano-Anatolian) or Balkanian" chorotype].

A total of 4 species have "Turano-European" chorotype [Namely, 3 species have "Turano-European (Ponto-Pannonian)" chorotype. These taxa are *D. aethiops* (Scopoli, 1763); *D. arenarium* (Scopoli, 1763) and *D. fulvum* (Scopoli, 1763). One species as *D. pedestre* (Poda, 1761) has "Turano-European (Turano-Sarmato-Pannonian)" chorotype].

One species as *D. equestre* (Laxmann, 1770) has "E-European" chorotype.

One species as *D. cinerarium* (Fabricius, 1787) has "E-Mediterranean (NE-Mediterranean)" chorotype.

One species as *D. carinatum* (Pallas, 1771) has "Turanian (Ponto-Caspian)" chorotype.

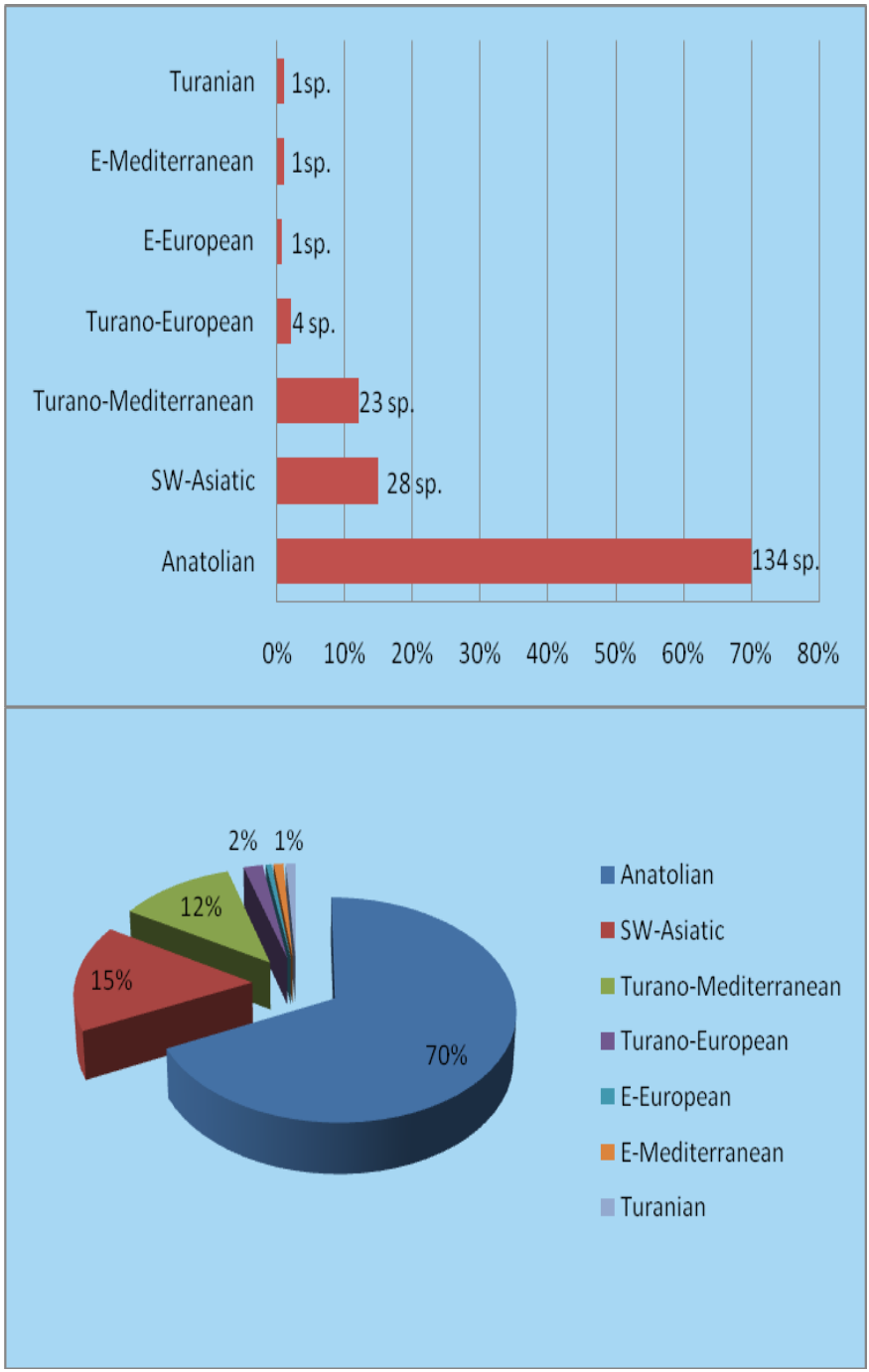

Figure 1. Zoogeographical composition of Turkish Dorcadiini.

Determined faunal areas in Turkey according to zoogeographical composition of the endemic species of Turkish Dorcadiini

For Turkish endemic taxa (134 species), 5 main faunal areas can be determined as N-Anatolian, E-Anatolian, S-Anatolian, C-Anatolian and W-Anatolian faunal areas. In this part, various abbreviations are used for the distribution patterns of the Turkish endemic species (see the end of this part for abbreviations).

N-ANATOLIAN FAUNAL AREA

This area includes whole territory of N Turkey as European Turkey (Thrace) and N-Anatolia. It can be divided into 5 faunal subareas as Thracian (European Turkey), NW-Anatolian (Bithynio-Mysidian), NCW-Anatolian (Paphlagonian), NC-Anatolian (Pontic) and NE-Anatolian (Armenian). This area is characterized by 58 species.

Thracian (European Turkey) faunal subarea:
This area is characterized only by 1 species in real as *Dorcadion ingeae* Peks, 1993. However, 3 species can also be evaluated like belong to this subarea as *Dorcadion albolineatum* Küster, 1847 [Thracian, to SE Anatolian (Mesopotamian)], *Dorcadion quadripustulatum* Kraatz, 1873 [Thracian to NW Anatolian (Mysidian)] and *Neodorcadion orientale* Ganglbauer, 1884 [Thracian to NW and W Anatolian (Mysidian and Lydian)].

NW-Anatolian (Bithynio-Mysidian) faunal subarea:
This area is characterized by 10 species as *Dorcadion coiffaiti* Breuning, 1962 (MAR: SMP), *Dorcadion gebzeense* Breuning, 1974 (MAR: KP to BSR: WBSR), *Dorcadion pluto* Thomson, 1867 (MAR: KP to EAR: EKP), *Dorcadion praetermissum* Pesarini & Sabbadini, 1998 (MAR: C of SMP), *Dorcadion pseudobithyniense* Breuning, 1962 (MAR: W of SMP), *Dorcadion punctipenne* Küster, 1852 (MAR), *Dorcadion rolandmenradi* Peks, 1992 (MAR: C of SMP to AER: N of CWAP), *Dorcadion turcicum* Breuning, 1963 (MAR: CW of SMP), *Dorcadion wolfi* Kraetschmer, 1985 (MAR: W of SMP) and *Neodorcadion exornatoides* Breuning, 1962 (MAR: CW of SMP).

NCW-Anatolian (Paphlagonian) faunal subarea:
This area is characterized by 8 species as *Dorcadion boluense* Breuning, 1962 (BSR: W of WBSR), *Dorcadion lameeri* Théry, 1896 (BSR: CN of WBSR), *Dorcadion maceki* Holzschuh, 1995 (BSR: W of WBSR), *Dorcadion pararufipenne* Braun, 1976 (BSR: W of WBSR, CAR: USP), *Dorcadion preissi* Heyden, 1894 (BSR: CN of WBSR), *Dorcadion rufipenne* Breuning, 1946 (BSR: WBSR, CAR: USP and NW of CKP), *Dorcadion subsericatum* Pic, 1901 (BSR: WBSR, CAR: USP and NW of CKP, and KP), *Dorcadion walteri* Holzschuh, 1991 (BSR: W of WBSR).

NC-Anatolian (Pontic) faunal subarea:
This area is characterized by 18 species as *Dorcadion afflictum* Pesarini & Sabbadini, 1998 (BSR: W of CBSR), *Dorcadion bouilloni* Breuning & Ruspoli, 1975 (BSR: E of CBSR), *Dorcadion enricisturanii* Breuning & Ruspoli, 1971 (BSR: WBSR to W and NW of CBSR), *Dorcadion ladikanum* Braun, 1976 (BSR: N of CBSR), *Dorcadion ledereri* Thomson, 1865 (BSR: C and N of CBSR), *Dorcadion*

linderi Tournier, 1872 (BSR: CBSR), *Dorcadion parescherichi* Breuning, 1966 (BSR: W of CBSR), *Dorcadion piochardi* Kraatz, 1873 (BSR: NE of WBSR and CBSR, CAR: N of CKP), *Dorcadion pittinorum* Pesarini & Sabbadini, 1998 (BSR: W of CBSR), *Dorcadion pseudarcivagum* Breuning, 1943 (BSR: C of CBSR), *Dorcadion pseudoholosericeum* Breuning, 1962 (BSR: NE of WBSR), *Dorcadion pseudopreissi* Breuning, 1962 (BSR: NE of WBSR to C of CBSR), *Dorcadion rigattii* Breuning, 1966 (BSR: S of CBSR and CAR: NE of CKP), *Dorcadion robustum* Ganglbauer, 1884 (BSR: C of CBSR), *Dorcadion scrobicolle* Kraatz, 1873 (CAR: CN of CKP to BSR: C and CSE of CBSR), *Dorcadion semivelutinum* Kraatz, 1873 (CAR: NE of CKP), *Dorcadion sinopense* Breuning, 1962 (BSR: NE of WBSR) and *Dorcadion subatritarse* Breuning, 1966 (BSR: W of CBSR).

NE-Anatolian (Armenian) faunal subarea:
This area is characterized by 18 species as *Dorcadion ardahense* Breuning, 1975 (NE of EAR: EKP), *Dorcadion banjkovskyi* Plavilstshikov, 1958 (NE of EAR: EKP), *Dorcadion bisignatum* Jakovlev, 1899 (NE of EBSR), *Dorcadion carolisturanii* Breuning & Ruspoli, 1971 (BSR: E of CBSR, W of EBSR), *Dorcadion dobrovljanskii* Suvorov, 1915 (BSR: EBSR or EAR: EKP), *Dorcadion hampii* Mulsant & Rey, 1863 (CAR: NE of CKP and BSR: CBSR to EAR: EKP), *Dorcadion heinzi* (Breuning, 1964) (BSR: W of EBSR), *Dorcadion investitum* Breuning, 1970 (EAR: W of EKP), *Dorcadion jakovleviellum* Plavilstshikov, 1951 (EAR: EKP), *Dorcadion janssensi* Breuning, 1966 (BSR: EBSR), *Dorcadion kagyzmanicum* Suvorov, 1915 (EAR: E of EKP), *Dorcadion karsense* Suvorov, 1915 (EAR: E of EKP), *Dorcadion ledouxi* Breuning, 1974 (EAR: E of EKP), *Dorcadion rizeanum* (Breuning & Villiers, 1967) (BSR: CE of EBSR), *Dorcadion rufoapicale* Breuning, 1943 (CAR: NE of CKP to BSR: EBSR), *Dorcadion sodale* Hampe, 1852 (BSR: C of EBSR and EAR: W of EKP), *Dorcadion steineri* Holzschuh, 1977 (BSR: CE of EBSR) and *Dorcadion theophilei* Pic, 1898 (BSR: CN of EBSR).

Consequently, the N-Anatolian Dorcadiini includes a total of 58 species. 18 species, namely about 31 % of the species have "Pontic" chorotype. 18 species, namely about 31 % of the species have "Armenian" chorotype. 10 species, namely about 17 % of the species have "Bithynio-Mysidian" chorotype. 8 species, namely abut 14 % of the species have "Paphlagonian" chorotype. 4 species, namely about 7 % of the species have "Thracian" chorotype (Fig. 2).

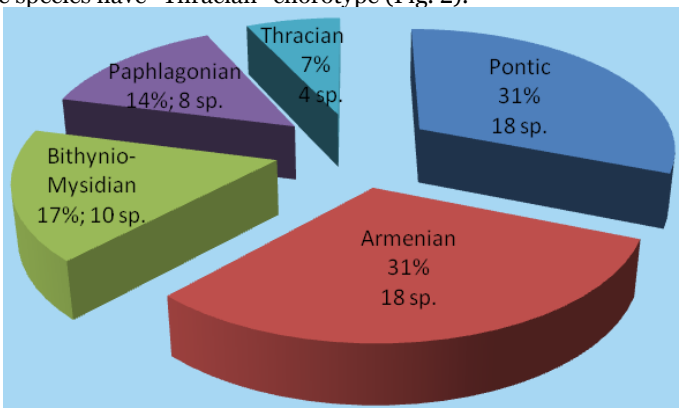

Figure 2. Zoogeographical composition of N-Anatolian faunal elements.

E-ANATOLIAN FAUNAL AREA

This is characterized by 11 species as *Dorcadion albonotatum* Pic, 1895 (EAR: E of UFP), *Dorcadion blandulus* Holzschuh, 1977 (EAR: C of UFP), *Dorcadion elazigi* Breuning, 1971 (EAR: C of UFP and W of UMVP), *Dorcadion glabricolle* Breuning, 1943 (EAR), *Dorcadion holzschuhi* Breuning, 1974 (EAR: W of UMVP), *Dorcadion inspersum* Holzschuh, 1982 (EAR: SE of UMVP), *Dorcadion janatai* Kadlec, 2006 (EAR: CW of UFP), *Dorcadion kurucanum* Holzschuh, 2007 (EAR: CW of UFP), *Dorcadion nigrostriatum* Adlbauer, 1982 (EAR: CW of UFP), *Dorcadion sonjae* Peks, 1993 (EAR: C of UFP) and *Dorcadion subcinctellum* Breuning, 1962 (EAR: W of UFP).

S-ANATOLIAN FAUNAL AREA

This area can be divided into 4 faunal subareas as SW-Anatolian (Carian), SCW-Anatolian (Cilician), SC-Anatolian (Amanusian) and SE-Anatolian (Mesopotamian). It is characterized by 27 species.

SW-Anatolian (Pamphylio-Carian) faunal subarea:
This area is characterized by 4 species as *Dorcadion brauni* Breuning, 1979 (AER: E of AP), *Dorcadion kraetschmeri* Bernhauer, 1988 (MER: E of ANP), *Dorcadion poleti* Breuning, 1948 (AER: E of AP) and *Dorcadion sinuatevittatum* Pic, 1937 (AER: E of AP to MER: NW of ANP and NE of AP).

SCW-Anatolian (Cilician) faunal subarea:
This area is characterized by 7 species as *Dorcadion arcivagum* Thomson, 1867 (MER: W of AP), *Dorcadion bulgharmaadense* Breuning, 1946 (CAR: S of CKP), *Dorcadion culminicola* Thomson, 1868 (MER: W of AP), *Dorcadion holtzi* (Pic, 1905) (MER: W of AP), *Dorcadion lohsei* Braun, 1976 (CAR: S of KP, MER: W of AP), *Dorcadion paracinerarium* Breuning, 1974 (CAR: S of KP, MER: W of AP) and *Dorcadion petrovitzi* Heyrovsky, 1964 (MER: W of AP).

SC-Anatolian (Amanusian) faunal subarea:
This area is characterized by 9 species as *Dorcadion accola* Heyden, 1894 (MER: AP to SEAR: DP), *Dorcadion amanense* Breuning, 1943 (E of MER: AP), *Dorcadion carinipenne* Pic, 1900 (E of MER: AP, SEAR: W of CFP), *Dorcadion delagrangei* Pic, 1894 (MER: AP and SEAR: W of CFP), *Dorcadion deyrollei* Ganglbauer, 1884 (MER: E of AP to EAR: E of UMVP), *Dorcadion drusoides* Breuning, 1962 (E of MER: AP), *Dorcadion pseudinfernale* Breuning, 1943 (E of MER: AP), *Dorcadion saulcyi* Thomson, 1865 (MER: AP, SEAR: W of CFP, EAR: W of UFP) and *Dorcadion syriense* Breuning, 1943 (E of MER: AP).

SE-Anatolian (Mesopotamian) faunal subarea:
This area is characterized by 7 species as *Dorcadion abstersum* Holzschuh, 1982 (EAR: HP), *Dorcadion kurdistanum* Breuning, 1944 (SEAR: W of DP, EAR: C of UFP), *Dorcadion mesopotamicum* Breuning, 1944 (SEAR: CFP to DP), *Dorcadion obtusum* Breuning, 1944 (SEAR to EAR: SE of UMVP and HP), *Dorcadion pavesii* Pesarini & Sabbadini, 1998 (EAR: HP), *Dorcadion punctulicolle* Breuning, 1944 (SEAR: W of DP) and *Dorcadion schultzei* Heyden, 1894 (SEAR: CS of DP).

Consequently, the S-Anatolian Dorcadiini includes a total of 27 species. 9 species, namely about 33 % of the species have "Amanusian" chorotype. 7 species, namely about 26 % of the species have "Cilician" chorotype. 7 species, namely about 26 % of the species have "Mesopotamian" chorotype. 4 species, namely about 15 % of the species have "Pamphylio-Carian" chorotype (Fig. 3).

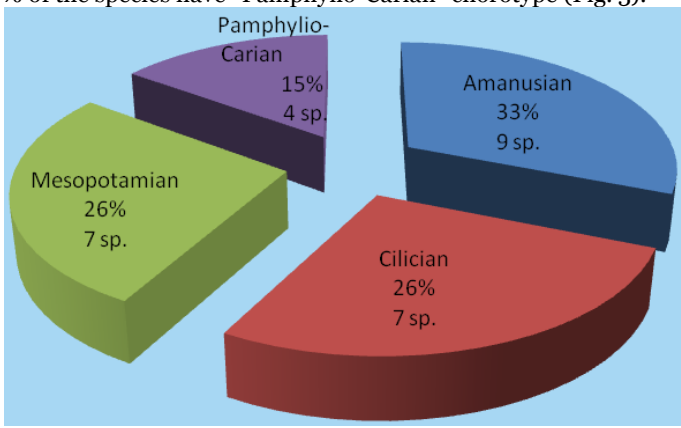

Figure 3. Zoogeographical composition of S-Anatolian faunal elements.

C-ANATOLIAN FAUNAL AREA

This area can be divided into 5 faunal subareas as CN and NCW-Anatolian (Galatio-Paphlagonian), CS-Anatolian (Lycaonian), CSW-Anatolian (Pisidian), CW-Anatolian (Phrygian) and CSE-Anatolian (Cappadocian). It is characterized by 19 species.

CN and NCW-Anatolian (Galatio-Paphlagonian) faunal subarea:
This area is characterized by 5 species as *Dorcadion angorense* Ganglbauer, 1897 (N of CAR: USP), *Dorcadion bangi* Heyden, 1894 (N of CAR: USP and BSR: W of WBSR to W of CBSR), *Dorcadion escherichi* Ganglbauer, 1897 (CAR to MAR: E of SMP, BSR: CBSR), *Dorcadion martini* Bernhauer, 1988 (N of CAR: USP), and *Dorcadion muchei* Breuning, 1962 (BSR: WBSR to CAR: N of CKP).

CS-Anatolian (Lycaonian) faunal subarea:
This area is characterized by 5 species as *Dorcadion albicolle* Breuning, 1943 (S of CAR: KP), *Dorcadion anatolicum* Pic, 1900 (S of CAR: KP and MER: NE of AP), *Dorcadion cachinno* Thomson, 1868 (CAR: S of KP, AER: W of CWAP), *Dorcadion iconiense* Daniel, 1901 (C of CAR) and *Dorcadion lodosi* Sabbadini & Pesarini, 1992 (CAR: S of KP).

CSW-Anatolian (Pisidian) faunal subarea:
This area is characterized only by 2 species as *Dorcadion ispartense* Breuning, 1962 (MER: NE of AP) and *Dorcadion rosinae* Daniel, 1900 (CAR: W of KP).

CW-Anatolian (Phrygian) faunal subarea:
This area is characterized only by 2 species as *Dorcadion bremeri* Breuning, 1981 (AER: E of CWAP) and *Dorcadion pseudocinctellum* Breuning, 1943 (CAR: W of KP to AER: W of CWAP).

CSE-Anatolian (Cappadocian) faunal subarea:
This area is characterized by 5 species as *Dorcadion menradi* Holzschuh, 1989 (MER: NE of AP to EAR: W of UFP), *Dorcadion miminfernale* Breuning, 1970 (MER: NE of AP to CAR: SE of CKP), *Dorcadion oezdurali* Önalp, 1988 (MER: NE of AP), *Dorcadion ortrudae* Braun, 1980 (MER: NE of AP) and *Dorcadion ullrichi* Bernhauer, 1988 (EAR: W of UFP).

Consequently, the N-Anatolian Dorcadiini includes a total of 19 species. 5 species, namely about 26 % of the species have "Galatio-Paphlagonian" chorotype. 5 species, namely about 26 % of the species have "Lycaonian" chorotype. 5 species, namely about 26 % of the species have "Cappadocian" chorotype. 2 species, namely abut 11 % of the species have "Pisidian" chorotype. 2 species, namely about 11 % of the species have "Phrygian" chorotype (Fig. 4).

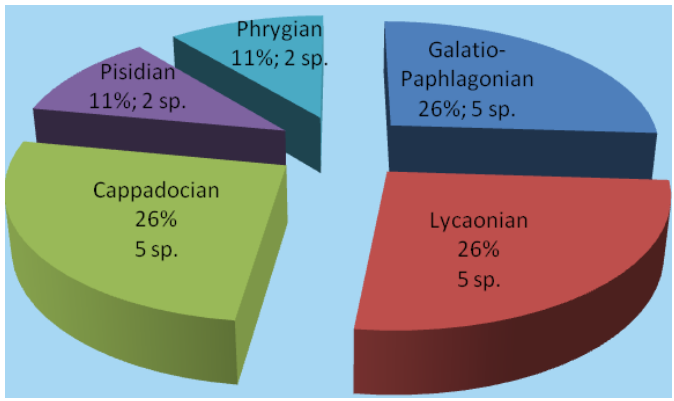

Figure 4. Zoogeographical composition of C-Anatolian faunal elements.

W-ANATOLIAN FAUNAL AREA

This area is characterized by 12 species as *Dorcadion boszdaghense* Fairmaire, 1866 (AER: W of AP), *Dorcadion cinctellum* Fairmaire, 1866 (AER: W of AP, CAR: W of KP), *Dorcadion confluens* Fairmaire, 1866 (AER: W of AP to SEAR: DP), *Dorcadion longulum* Breuning, 1943 (AER: W of AP), *Dorcadion merkli* Ganglbauer, 1884 (AER: W of AP), *Dorcadion multimaculatum* Pic, 1932 (AER: W of AP), *Dorcadion semibrunneum* Pic, 1903(AER: W of AP to MER: E of AP), *Dorcadion semilineatum* Fairmaire, 1866 (AER: W of AP to CAR: W of KP), *Dorcadion smyrnense* (Linnaeus, 1757) (MAR, AER, CAR: W of USP and KP, MER: AP), *Dorcadion subinterruptum* Pic, 1900 (AER: W of AP, CAR: W of USP and KP, MER: AP), *Dorcadion triste* Frivaldsky, 1845 (MAR: CW of SMP, AER: W of AP to MER: ANP) and *Dorcadion weyersi* Fairmaire, 1866 (AER: AP to MER: W of ANP).

Also 7 endemic species are distributed rather widely in Turkey (especially W half of Anatolia) as *Dorcadion bithyniense* Chevrolat, 1856 (BSR: WBSR, MAR: KP and SMP, AER: W of AP, CAR: KP), *Dorcadion bodemeyeri* Daniel, 1900 (AER: AP and CWAP, CAR: USP and KP, BSR: C of CBSR), *Dorcadion micans* Thomson, 1867 (CAR: USP to CKP and KP, MAR: SMP, AER: W of AP, MER: W of AP and SEAR: W of CFP), *Dorcadion glabrofasciatum* Daniel, 1901 (MAR: SMP, AER: W

of AP and CWAP, CAR: W of USP), *Dorcadion kindermanni* Waltl, 1838 (MAR, AER, CAR: USP), *Dorcadion infernale* Mulsant & Rey, 1863 (SE of MAR, AER, CAR, BSR: CBSR, MER and SEAR: DP) and *Dorcadion subvestitum* Daniel, 1900 (BSR: C of CBSR, CAR: USP, KP and SE of CKP, AER: W of AP, and EAR: W of UFP).

Consequently, the Turkish endemic Dorcadiini includes a total of 134 species. 58 species, namely about 43 % of the species have "N-Anatolian" chorotype. 27 species, namely about 20 % of the species have "S-Anatolian" chorotype. 19 species, namely about 14 % of the species have "C-Anatolian" chorotype. 12 species, namely abut 9 % of the species have "W-Anatolian" chorotype. 11 species, namely abut 8 % of the species have "E-Anatolian" chorotype. The remaining 7 species are distributed rather widely in Turkey (especially W half of Turkey) (Fig. 5).

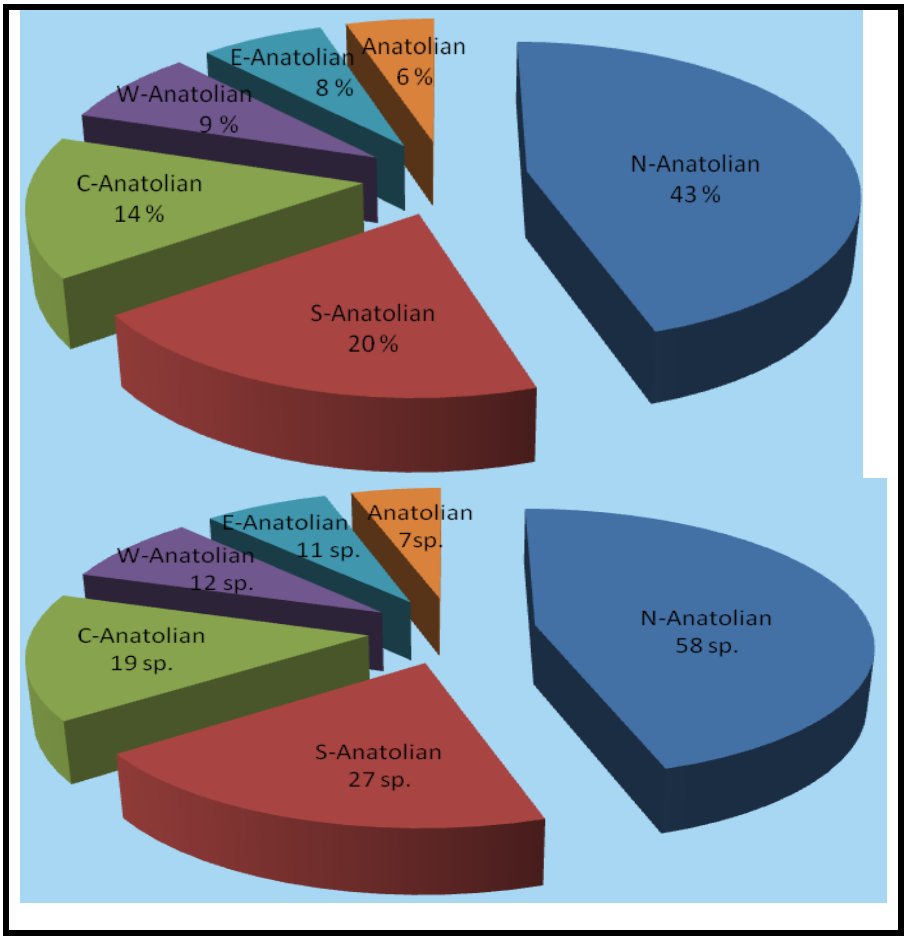

Figure 5. Zoogeographical composition of Turkish endemic Dorcadiini.

Turkey is divided into seven regional parts commonly. Each region includes some subdivisions. Their abbreviations are presented in the paranthesis as bold at the end of each division or subdivision. These are as follows:

Marmara Region (North-West Turkey) **(MAR)**
A. European Turkey (=Thracia)
1. Ergene Part (including Edirne and Tekirdağ provinces)
2. Istranca Part (including Kırklareli province)
3. Çatalca Part (including İstanbul province)
B. Asian Turkey (=North-West Anatolia)
1. Kocaeli Part (including Kocaeli and Sakarya provinces) **(KP)**
2. South Marmara Part (including Bilecik, Yalova, Bursa, Balıkesir and Çanakkale provinces) **(SMP)**

Aegean Region (West Turkey) **(AER)**
1. Aegean Part (including Manisa, İzmir, Aydın, Muğla and Denizli provinces) **(AP)**
2. Central-West Anatolia Part (including Kütahya, Uşak and Afyon provinces) **(CWAP)**

Mediterranean Region (South and Sout-West Anatolia) **(MER)**
1. Antalya Part [= Western Mediterranean] (including Burdur, Isparta and Antalya provinces) **(ANP)**
2. Adana Part [=Eastern Mediterranean] (including İçel, Adana, Osmaniye, Hatay, Kahramanmaraş and Kilis) **(AP)**

Central Anatolian Region (Central Anatolia) **(CAR)**
1. Upper Sakarya Part (including Eskişehir and Ankara provinces) **(USP)**
2. Konya Part (including Konya, Aksaray and Karaman provinces) **(KP)**
3. Central Kızılırmak Part (including Çankırı, Kırıkkale, Yozgat, Kırşehir, Nevşehir, Niğde, Kayseri and Sivas provinces) **(CKP)**

Black Sea Region (North Anatolia) **(BSR)**
1. Western Black Sea Part (including Düzce, Bolu, Karabük, Zonguldak, Bartın, Kastamonu and Sinop provinces) **(WBSR)**
2. Central Black Sea Part (including Samsun, Çorum, Amasya, Tokat and Ordu provinces) **(CBSR)**
3. Eastern Black Sea Part (including Giresun, Trabzon, Gümüşhane, Bayburt, Rize and Artvin provinces) **(EBSR)**

Eastern Anatolian Region (Eastern Anatolia) **(EAR)**
1. Erzurum-Kars Part (including Ardahan, Kars, Erzurum and Iğdır provinces) **(EKP)**
2. Upper Fırat Part (including Erzincan, Tunceli, Elazığ, Malatya, Bingöl and Bitlis provinces) **(UFP)**
3. Upper Murat-Van Part (including Ağrı, Muş and Van provinces) **(UMVP)**
4. Hakkari Part (including Şırnak and Hakkari provinces) **(HP)**

South-Eastern Anatolian Region (South-Eastern Anatolia) **(SEAR)**
1. Central Fırat Part (including Gaziantep, Adıyaman and Şanlıurfa provinces) **(CFP)**
2. Dicle Part (including Diyarbakır, Mardin, Batman and Siirt provinces) **(DP)**

ABREVIATIONS OF THE PROVINCES AND LANDS IN TURKEY

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

Genus *DORCADION* Dalman, 1817

Type sp.: *Cerambyx glycyrrhizae* Pallas, 1771

As general characters of the tribe. The genus can be characterized by longitudinal ridges and color bands on elytra and absence of sclerite between clypeus and labrum. Antennae shorter than body. Pronotum transverse, square or barely oblong, with lateral acute tubercles. Elytra oval, towards apex more tapering, apically rounded, with longitudinal ridges. Hind wings underdeveloped.

The genus has Palaearctic chorotype (N Africa to China). It includes 5 subgenera as *Dorcadion* s. str.; *Cribridorcadion* Pic, 1901; *Maculatodorcadion* Breuning, 1942; *Carinatodorcadion* Breuning, 1943; *Acutodorcadion* Danilevsky et al., 2004. Recently, Danilevsky in Löbl & Smetana (2010) also added *Megalodorcadion* Pesarini & Sabbadini, 1998 as 6th subgenus.

Almost all subgenera except the subgenus *Acutodorcadion* Danilevsky et al., 2004 are recorded from Turkey.

Subgenus *CARINATODORCADION* Breuning, 1943

Dorcadodium Gistel, 1856 (nomen oblitum)

Type sp.: *Cerambyx carinatus* Pallas, 1771 (nomen protectum)

In this subgenus, according to Breuning (1962), the first antennal segment pubescencent. 3rd antennal segment considerably shorter than the first. Penis wide, not narrowed or slightly narrowed apically, in apical very broadly rounded, besides, in the middle of the apical edge more or less deeply truncate, the lower lamella not projecting forwardly.

The subgenus was regarded by Sama (2002) as a separate genus on the base of endophallic structure. But Danilevsky et al. (2004) gave it as a subgenus of the genus *Dorcadion*.

According to Vives & Zarazaga (in Vives, 2000) stated that "the existence of a genus *Dorcadodium* Gistel, 1856 (Myst. Eur. Insectenw.: 63) has been ignored by the authors since its description. We designate as type species the originally included species: *Lamio morio* Fabricius, 1787. So *Dorcadodium* Gistel, 1856 is the most senior synonym of *Carinatodorcadion*". According to Sama (2002), *Dorcadodium* Gistel, 1856 is nomen oblitum.

This subgenus is represented by five species in Turkey. Only one species among them is endemic to Turkey. However, Danilevsky in Löbl & Smetana (2010) mentioned only 2 species for Turkey as *Dorcadion hybridum* Ganglbauer, 1884 and *Dorcadion ingeae* Peks, 1993.

Dorcadion aethiops (Scopoli, 1763)

Lamia morio Fabricius, 1787 (partim.)
Cerambyx scopolii Gmelin, 1790 nec Fuesslins, 1775 (partim.)
Dorcadion (Carinatodorcadion) aethiops m. *tomentosulum* Breuning, 1946
Dorcadion aethiops ab. *kudlai* Heyrovsky, 1951
Dorcadion (Carinatodorcadion) aethiops m. *lucidum* Tippmann, 1958
Dorcadion (Carinatodorcadion) aethiops ab. *brunneipenne* Tippmann, 1958
Dorcadion (Carinatodorcadion) aethiops ab. *rufoapicatum* Tippmann, 1958
Dorcadion (Carinatodorcadion) aethiops ab. *rufosuturatum* Tippmann, 1958
Dorcadion (Carinatodorcadion) aethiops ssp. *bergmanni* Tippmann, 1958
Dorcadion (Carinatodorcadion) propinquum Breuning, 1962

Original combination: *Cerambyx aethiops* Scopoli, 1763

Type loc.: Slovenia, Ljubliana, Circa Labacum

ssp.
***D. aethiops aethiops* (Scopoli, 1763)**
***D. aethiops majoripenne* Pic, 1926**

This species has 2 subspecies. *D. aethiops majoripenne* Pic, 1926 occurs only in Moldova and Greece. It is represented by the nominotypical subspecies in NW Turkey. According to Pesarini & Sabbadini (2007), *Dorcadion (C.) propinquum* Breuning, 1962 is a synonym and *D. aethiops* var. *majoripenne* Pic, 1926 is a subspecies of this species.

Records in Turkey: (ED-ES-TUR)
Edirne prov., Eskişehir prov. (Önalp, 1990); Turkey (Lodos, 1998).
Distribution: Europe (?Italy, Slovenia, Croatia and Bosnia-Herzegovina, Serbia, Macedonia, Albania, Greece, Bulgaria, Romania, Switzerland, Germany, Hungary, Austria, Czechia, Slovakia, Ukraine, Moldovia).
Chorotype: Turano-European (Ponto-Pannonian).

Dorcadion carinatum (Pallas, 1771)

Lamia pigra Schönherr, 1817
Dorcadion morio Fischer-Waldheim, 1824 nec Fabricius
Dorcadion (Carinatodorcadion) carinatum m. *cinereopubescens* Breuning, 1946
Dorcadion (Autodorcadion) carinatum ab. *oligochromium* Plavilstshikov, 1958
Dorcadion (Carinatodorcadion) carinatum m. *rufinipenne* Breuning, 1962

Original combination: *Cerambyx carinatus* Pallas, 1771

Type loc.: Volga river (C Russia)

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

The subspecies structure of this species was revised by Danilevsky (1998). However, he has never mentioned occurrence of *D. carinatum* in Turkey. So it has 5 subspecies. Probably it is represented by the nominotypical subspecies in N Turkey. The other known subspecies *D. carinatum cylindraceum* Reitter, 1886 occurs in East Caucasus (Dagestan, Azerbaijan), *D. carinatum uralense* Danilevsky, 1998 occurs in Kazakhstan, *D. carinatum sunzhenum* Danilevsky, 1998 occurs in North Caucasus and *D. carinatum igrenum* Danilevsky, 1998 occurs in Ukraine, Southern half of European Russia. On the other hand,

according to Danilevsky (1998) distribution patterns of the nominative subspecies *D. carinatum carinatum* never reach to Turkey in South. As seen above, *D. carinatum* is represented by three subspecies in Caucasus (two of them in North Caucasus and the other one in East Caucasus). For this reason, the Turkish populations of *D. carinatum* may belong to a different subspecies.

Records in Turkey: (AM-AN-AR-KAR-RI)
Amasya prov. (Önalp, 1990); Kars prov., Ardahan prov., East parts of Central Anatolian Region (Lodos, 1998); Ankara prov.: Beynam (Özdikmen & Hasbenli, 2004a); Rize prov.: Çamlıhemşin (Özdikmen, 2007).
Distribution: Europe (Ukraine, Crimea, ?Moldova, European Russia, European Kazakhstan), Caucasus, Azerbaijan, Georgia, Turkey.
Chorotype: Turanian (Ponto-Caspian).

Dorcadion fulvum (Scopoli, 1763)

Lamia morio Fabricius, 1767 (partim.)
Prionus sanguinolentus Scopoli, 1772
Cerambyx scopolii Gmelin, 1790 nec Fuesslins, 1775 (partim.)
Cerambyx morio (Fabricius) Olivier, 1795 nec Fabricius, 1787 (partim.)
Dorcadion erythropteron Fischer-Waldheim, 1823
Dorcadion frontale Mulsant & Rey, 1863
Dorcadion (Carinatodorcadion) fulvum v. *nigripenne* Fleischer, 1894
Dorcadion (Carinatodorcadion) fulvum m. *subsuturale* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *subcompletelineatum* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *latealbovittatum* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *laevetomentosum* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *nigrobasale* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *obscuriscapus* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum m. *obscuripes* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum ssp. *canaliculatum* m. *subsuturaloide* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum ssp. *canaliculatum* m. *nigrohumerale* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum ssp. *canaliculatum* m. *pseudonigripenne* Breuning, 1946
Dorcadion (Carinatodorcadion) fulvum ssp. *canaliculatum* m. *humerocostatum* Breuning, 1946
Dorcadion fulvum ab. *coriaceipenne* Heyrovsky, 1950
Carinatodorcadion fulvum v. *brunneicorne* Podany, 1953
Carinatodorcadion fulvum ssp. *canaliculatum* v. *pseudobrunneicorne* Podany, 1953
Carinatodorcadion fulvum ssp. *canaliculatum* v. *heyrovskyi* Podany, 1953
Carinatodorcadion fulvum ssp. *canaliculatum* v. *lineatotomentosum* Podany, 1953
Carinatodorcadion fulvum ssp. *canaliculatum* v. *apicenotatum* Podany, 1953
Dorcadion (Carinatodorcadion) fulvum ab. *uniformebrunneum* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ssp. *rugipenne* ab. *atrum* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ssp. *rugipenne* ab. *rubrobrunneum* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ab. *nigripenne* m. *gitulinkae* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ab. *nigripenne* m. *bözsinkae* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ab. *nigripenne* m. *breuningi* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ssp. *freyi* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum ssp. *kulzeri* Tippmann, 1958
Dorcadion (Carinatodorcadion) fulvum m. *atrorugipenne* Breuning, 1962
Dorcadion (Carinatodorcadion) fulvum m. *tippmannianum* Breuning, 1962
Dorcadion (Carinatodorcadion) fulvum m. *heyrovskyanum* Breuning, 1962

Original combination: *Cerambyx fulvus* Scopoli, 1763

Type loc.: Slovenia, Agrum Vipascensis

ssp.
***D. fulvum fulvum* (Scopoli, 1763)**
***D. fulvum canaliculatum* Fischer-Waldheim, 1823**
***D. fulvum cervae* Frivaldsky, 1892**

This species is doubtful for Turkey because of absence of any record with exact locality.If present in Turkey in real, it probably occurs only in European Turkey

(NW Turkey) and it can be represented only by the subspecies *D. fulvum canaliculatum* on the contrary of some old Turkish records. *D. frontale* Mulsant & Rey, 1863 is a morpha of the nominotypical subspecies according to Breuning (1962). The species has 3 subspecies as the nominotypical subspecies occurs in Slovenia, ?Germany, Hungary, Austria, Czechia, Slovakia, Ukraine, *D. fulvum canaliculatum* Fischer-Waldheim, 1823 occurs in Croatia and Bosnia-Herzegovina, Serbia, Macedonia, Bulgaria, Romania, Poland, Ukraine, Crimea, Moldovia and *D. fulvum cervae* Frivaldsky, 1892 occurs in Hungary, Slovakia.

Records in Turkey: (TRA-TUR)
Turkey: İstanbul as *D. frontale* (Ganglbauer, 1884); Turkey and European Turkey as *D. frontale* Mulsant et Rey, 1863 (Aurivillius, 1921; Winkler, 1924-1932); Turkey (Acatay, 1948, 1961, 1968; Lodos, 1998); Turkey as *D. frontale* Mulsant et Rey, 1863 and *D. cervae* Frivaldsky, 1892 (Lodos, 1998).
Distribution: Europe (Slovenia, Croatia and Bosnia-Herzegovina, Serbia, Macedonia, Bulgaria, Romania, ?Germany, Hungary, Austria, Czechia, Slovakia, Poland, Ukraine, Crimea, Moldovia).
Chorotype: Turano-European (Ponto-Pannonian).

Dorcadion hybridum Ganglbauer, 1884

Dorcadion (Carinatodorcadion) hybridum m. *niveisuturale* Breuning, 1962

Type loc.: Rumelia (=Thracia)

ssp.
***D. hybridum hybridum* Ganglbauer, 1884**
***D. hybridum hedwigae* Jurecek, 1923**

This species has 2 subspecies. *D. hybridum hedwigae* Jurecek, 1923 occurs only in Greece. It is represented by the nominotypical subspecies in NW Turkey.

Records in Turkey: (TRA-TUR)
Thracia (Breuning, 1962); European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998); European Turkey (Danilevsky in Löbl & Smetana (2010)).
Distribution: Europe (Greece, European Turkey).
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion ingeae Peks, 1993

Type loc.: European Turkey: Edirne prov.: Keşan

This species is distributed only in NW Turkey (European Turkey). It is endemic to Turkey. However, Steiner (2003) listed it as possible for Greece.

Records in Turkey: (ED-TRA)
Edirne prov.: SW Keşan (Peks, 1993); European Turkey (Althoff & Danilevsky, 1997); European Turkey (Danilevsky in Löbl & Smetana (2010)).
Distribution: Turkey.
Chorotype: Anatolian.

Subgenus *CRIBRIDORCADION* Pic, 1903

Pedestredorcadion Breuning, 1943
Autodorcadion Plavilstshikov, 1958
Dzhungarodorcadion Danilevsky, 1993
Bergerianum Pesarini et Sabbadini, 2004
Megalodorcadion Pesarini et Sabbadini, 1998

Type sp.: *Dorcadion mniszechii* Kraatz, 1873

In this subgenus, according to Breuning (1962), the first antennal segment normally pubescencent. 3-nd antennal segment considerably shorter than the first.

Penis wide, moderately or strongly narrowed apically, in apical broadly rounded, or sharpened or slightly blunted, but never truncate, the lower lamella not projecting forwardly.

D. (*Cribridorcadion*) Pic, 1901 was revalidated by Danilevsky et al. (2004).

According to Danilevsky et al. (2004), *D.* (*Pedestredorcadion*) Breuning, 1943 (type sp.: *Lamia pedestris* Poda, 1761) and *D.* (*Dzhungarodorcadion*) Danilevsky, 1993 (type sp.: *D. jacobsoni* Jakovlev, 1899) are synonyms of *D.* (*Cribridorcadion*) Pic, 1901 on the base of endophallic structures.

On the other hand, according to Danilevsky & Kasatkin (2006) *D.* (*Megalodorcadion*) Pesarini & Sabbadini, 1998 (type sp.: *D. ledereri* Thomson, 1865) and *D.* (*Bergerianum*) Pesarini & Sabbadini, 2004 (type sp.: *D. chrysochroum* Breuning, 1943) are also synonyms of *D.* (*Cribridorcadion*) Pic, 1901 on the base of endophallic structures. However, Danilevsky in Löbl & Smetana (2010) accepted *D.* (*Megalodorcadion*) Pesarini & Sabbadini, 1998 as a separate subgenus.

195 species of this subgenus have been recorded from Turkey. However, the most of 18 species have been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. So, these records are not confirmed for Turkey. Finally, this subgenus is represented by 177 species in Turkey. 128 species among them are endemic to Turkey.

Dorcadion abstersum Holzschuh, 1982

Type loc.: Turkey: Hakkari prov.: Sat Mt.

This species was described on the base of only 1 male specimen (as holotype). It has been known only from the description locality. It is endemic to SE Turkey.

Records in Turkey: (HA)
Hakkari prov.: Sat Mt. (Holzschuh, 1982); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion accola Heyden, 1894

Dorcadion accola v. *mardinense* Pic, 1900
Dorcadion glabrolineatum Pic, 1927

Type loc.: Turkey: Mardin prov.

This species is endemic to SE Turkey.

Records in Turkey: (DI-MR-TUR)
Mardin prov. (Heyden, 1894); Turkey (Winkler, 1924-1932; Lodos, 1998); Mardin prov. as *D. accola* a. *mardinense* Pic, 1900 (Winkler, 1924-1932); Mardin prov. (Breuning, 1962); Diyarbakır prov.: Karacadağ (Braun, 1978); Mardin prov. (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion afflictum Pesarini & Sabbadini, 1998

Type loc.: Turkey: Çorum prov.

This species is endemic to NC Turkey. It has been known only from the description locality.

Records in Turkey: (CO)
Çorum prov. (Pesarini & Sabbadini, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion albicolle Breuning, 1943

Type loc.: Turkey: Konya prov..

This species is endemic to CS Turkey. It has been known only from type locality until now. Recently, Danilevsky in Löbl & Smetana (2010) accepted it as a synonym of *D. iconiense*.

Records in Turkey: (KN)
Konya prov. (Breuning, 1943, 1962).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion albolineatum Küster, 1847

Dorcadion byzantinum Thomson, 1867
Dorcadion (Pedestredorcadion) albolineatum m. *abbreviatolineatum* Breuning, 1946

Type loc.: Turkey: Istanbul prov.

This species is endemic to Turkey. Probably it is distributed rather widely in Turkey (European Turkey to SE Turkey).

Records in Turkey: (BI-DI-IS-KO-TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); European Turkey (Winkler, 1924-1932); İstanbul prov., Kocaeli prov.: İzmit, Bilecik prov. (Breuning, 1962); Diyarbakır prov. (Tuatay et al., 1972); Turkey (Lodos, 1998); Diyarbakır prov. (Özdikmen et al., 2005); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion albonotatum Pic, 1895

Type loc.: Turkey: Bitlis prov.: Sipan Mt.

This species was described on the base of only 1 male specimen (as holotype). It has been known only from the description locality. It is endemic to E Turkey.

Records in Turkey: (BT-TUR)
Bitlis prov. (Aurivillius, 1921; Winkler, 1924-1932; Plavilstshikov, 1958); Bitlis prov.: Sipan Mt. as type loc. (Breuning, 1962); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion amanense Breuning, 1943

Type loc.: Turkey: Amanos Mts. (not Syria).

This species is endemic to Amanos Mts. in SC Turkey. It has been known only from type locality until now.

Records in Turkey: (TUR)
S Turkey: Amanos Mts. (Breuning, 1943, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion anatolicum Pic, 1900

Dorcadion anatolicum v. *ininterruptum* Pic, 1900
Dorcadion semilineatum v. *mediointerruptum* Pic, 1901
Dorcadion anatolicum v. *subuniforme* Pic, 1902
Dorcadion brevipenne Pic, 1902
Dorcadion brevipenne v. *chehirense* Pic, 1902
Dorcadion (Pedestredorcadion) anatolicum m. *humeraliinterruptum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *anatolicum* m. *postapertum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *anatolicum* m. *pseudomerkli* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *anatolicum* m. *flavosignatum* Breuning, 1946

Type loc.: Turkey: Konya prov.

ssp.
***D. anatolicum anatolicum* Pic, 1900**
?*D. anatolicum seydisehirense* Breuning (in Sama, 1982)
?*D. anatolicum brignolii* Breuning (in Sama, 1982)

According to Sama (1982), this species has 3 subspecies. He gave in his work, 2 new subspecies as *D. anatolicum seydisehirense* from Konya province (Seydişehir, Tınaztepe) and *D. anatolicum brignolii* from Konya province (Beyşehir Lake, Acıkır) and Isparta province (Beyşehir Lake, Belgeyik) described by Breuning Moreover, Sama (1982) gave *postapertum* Breuning, 1946 from Konya province (Çamlık) as another subspecies. As seen above, all known subspecies were described only from Konya province. Subspecific status of this species, therefore, needs to be clarified. This species is endemic to CS and SC Turkey.

Records in Turkey: (AD-ANT-IP-KA-KN-TUR)
Konya prov. (Pic, 1900); Anatolia as *D. brevipenne* (Aurivillius, 1921); Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Turkey as *D. brevipenne* Pic, 1902 (Winkler, 1924-1932; Lodos, 1998); Konya prov. (Breuning, 1962); Konya prov.: Akşehir (Demelt, 1963); Konya prov.: Akşehir, Sultan Mts., Ilgın and Kızılören, Antalya prov.: Irmasan pass, Adana prov.-Kahramanmaraş prov.: between Tufanbeyli and Göksun (Braun, 1978); Konya prov.: Dedegöl Mts. (Adlbauer, 1988); Isparta prov.: Eğirdir, Konya prov. (Önalp, 1990); Konya prov.: Taşkent (Çukuryurt pass) (Özdikmen & Hasbenli, 2004a); Kahramanmaraş prov.: Göksun (Özdikmen & Okutaner, 2005); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion angorense Ganglbauer, 1897

Dorcadion escherichi m. *angorense* Breuning, 1962
Dorcadion escherichi v. *posticedisjunctum* Pic, 1909

Type loc.: Turkey: Ankara prov.

According to Breuning (1962), this species is a morpha of *D. escherichi* Ganglbauer, 1897. He stated that this taxon is similar to *D. escherichi*. It differs from *D. escherichi* by backward freely ending dorsal band. Pesarini & Sabbadini (1998) gave it as a separate species for Turkey. This species is endemic to CN Turkey.

Records in Turkey: (AN-TUR)
Ankara prov. (Ganglbauer, 1897; Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998; Pesarini & Sabbadini, 1998).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion apicerufum Breuning, 1943

Dorcadion sanguinolentum Thomson, 1865
Dorcadion thomsonianum Plavilstshikov, 1948
Dorcadion (*Pedestredorcadion*) *apicerufum* m. *lineiferum* Breuning, 1946

Type loc.: Armenia

The species distributes only in NE Turkey.

Records in Turkey: (EZ-TB-TUR)
Trabzon prov.: Soğanlı pass, Erzurum prov.: Central (Breuning & Villiers, 1967); NE Turkey: Kars to Erzurum prov. (Plavilstshikov, 1958); N Turkey (Danilevsky & Miroshnikov, 1985); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Armenia, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion arcivagum Thomson, 1867

Dorcadion arcivagum v. *cilicium* Pic, 1904

Type loc.: Turkey: Cilicia: İçel prov.: Gülek

This species is endemic to SCW Turkey (Cilician Taurus).

Records in Turkey: (AN-TUR)
İçel prov.: Gülek (Thomson, 1867); Turkey: Cilician Taurus (Ganglbauer, 1884; Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998); İçel prov: Gülek, Adana prov. (Missis) (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).

Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ardahense Breuning, 1975

Type loc.: Turkey: Ardahan prov.: Yalnızçam

This species is endemic to NE Turkey.

Records in Turkey: (AR)
Ardahan prov. (Breuning, 1975); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion arenarium (Scopoli, 1763)

Cerambyx pedestris Linnaeus, 1767 (nec Poda)
Lamia pedestre Fabricius, 1775 (nec Poda)
Lamia vittigera Panzer, 1797
Dorcadion cinerarium Küster, 1848 (nec Fabricius)
Dorcadion arenarium v. *seductor* Kraatz, 1871
Dorcadion arenarium v. *fuscovestitum* Pic, 1905
Dorcadion arenarium subcarinatum Müller, 1905
Dorcadion arenarium istrianum Depoli, 1912
Dorcadion arenarium mulleri Depoli, 1912
Dorcadion arenarium liburnicum Depoli, 1912
Dorcadion arenarium ab. *volvulum* Aurivillius, 1921
Dorcadion arenarium latiale Depoli, 1926
Dorcadion arenarium aemilianum Depoli, 1926
Dorcadion arenarium f. *beszedesi* Depoli, 1926
Dorcadion arenarium f. *luigionii* Depoli, 1926
Dorcadion arenarium f. *cellesiae* Depoli, 1926
Dorcadion arenarium f. *schatzmayri* Depoli, 1926
Dorcadion arenarium ab. *meyeri* Depoli, 1938
Dorcadion arenarium m. *mostarense* Pic, 1942
Dorcadion arenarium v. *sabaudum* Pic, 1945
Dorcadion (*Pedetredorcadion*) *arenarium* m. *albanense* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* ssp. *arenarium* m. *fulvotomentosum* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* ssp. *arenarium* m. *pseudosabaudum* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* ssp. *arenarium* m. *subvittigerum* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* ssp. *neapolitanum* m. *pseudoseductor* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* ssp. *neapolitanum* m. *pseudovolvulum* Breuning, 1946
Dorcadion (*Pedetredorcadion*) *arenarium* m. *pseudofulvotomentosum* Breuning, 1947
Dorcadion arenarium ssp. *subcarinatum* v. *subsabaudum* Breuning, 1957

Original combination: *Cerambyx arenarius* Scopoli, 1763

Type loc.: Slovenia: Carniola

ssp.
***D. arenarium arenarium* (Scopoli, 1763)**
***D. arenarium abruptum* (Germar, 1839)**
***D. arenarium lemniscatum* (Küster, 1847)**
***D. arenarium subcarinatum* Müller, 1905**
***D. arenarium dalmatium* Müller, 1905**
***D. arenarium velebiticum* Müller, 1905**
***D. arenarium brattiense* Müller, 1905**
***D. arenarium hypsophilum* Müller, 1905**
***D. arenarium marsicanum* Fracassi, 1905**
***D. arenarium mülleri* Depoli, 1912**
***D. arenarium rubrimembris* Pic, 1917**
***D. arenarium shkypetarum* Heyrovsky, 1937**

As commonly accepted that this species has 11 subspecies. It is represented by the nominotypical subspecies in Turkey. Probably it distributes at least in NW and NC 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 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 marsicanum* Fracassi, 1905 occurs only in France and Italy, *D. arenarium mülleri* Depoli, 1912 occurs in Quernero, Cherso Island, Ossero (Bosnia and Herzegovina, Croatia), *D. arenarium rubrimembris* Pic, 1917 occurs in Southern Dalmatia, Montenegro, Northern Albania (Bosnia and Herzegovina, Albania, Yugoslavia, Croatia), *D. arenarium shkypetarum* Heyrovsky, 1937 occurs in Albania.

Records in Turkey: (AM-AN-KS-TUR)
Turkey as v. *kraatzi* Tournier (Ganglbauer, 1884); Kastamonu prov.: Halkalıkar (Schimitschek, 1944); Turkey, Amasya prov., Ankara prov.: Çubuk dam (Önalp, 1990); Central Anatolian Region, Aegean Region, Eastern Black Sea Region (Lodos, 1998).
Distribution: Europe (France, Italy, Albania, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Romania, ?Hungary, ?Poland).
Chorotype: Turano-European (Ponto-Pannonian).

Dorcadion atritarse Pic, 1931

Dorcadion (*Pedestredorcadion*) *atritarse* m. *apicenudum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *atritarse* m. *mediolatevittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *atritarse* m. *albidofasciatum* Breuning, 1946
Dorcadion (Pedestredorcadion) atritarse m. *discovestitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *atritarse* m. *discoabbreviatum* Breuning, 1962
Dorcadion (Pedestredorcadion) atritarse m. *discosubvestitum* Breuning, 1962
Dorcadion (Pedestredorcadion) atritarse m. *discorevestitum* Breuning, 1962

Original combination: *Dorcadion pedestre* v. *atritarse* Pic, 1931

Type loc.: Greece.

This species is distributed only in NW Turkey for Turkey. It was regarded as a subspecies of *D. gallipolitanum* Thomson, 1867 by some authors (e.g. Danilevsky, 2010a). According to Breuning (1962) and Steiner (2003), it is a separate species.

Records in Turkey: (CA-ED-TRA)
European Turkey: Edirne prov.: Havsa (Adlbauer, 1988); European Turkey (Althoff & Danilevsky, 1997); Çanakkale prov.: Çan (Özdikmen & Demir, 2006).
Distribution: Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion atticum Kraatz, 1873

Dorcadion atticum v. *multinigronotatum* Pic, 1927
Dorcadion atticum v. *luteovittatum* Pic, 1942
Dorcadion (*Pedestredorcadion*) *atticum* m. *flavoirroratum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *atticum* m. *pseudobrenskei* Breuning, 1946

Original combination: *Dorcadion saulcyi* v. *atticum* Kraatz, 1873

Type loc.: Greece: Attika

This species has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from Greece now. It is endemic to Greece. So, this record is not confirmed and is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Greece.
Chorotype: Greek.

Dorcadion auratum Tournier, 1872

Dorcadion lederi Kraatz, 1878
Dorcadion (Pedestredorcadion) auratum m. *apiceconjunctum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *auratum* m. *inauratum* Breuning, 1947
Dorcadion (*Pedestredorcadion*) *auratum* m. *sublederi* Breuning, 1947
Dorcadion (*Autodorcadion*) *auratum* ab. *desauratum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *auratum* ab. *desuniatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *auratum* ab. *evanescens* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *auratum* ab. *semipoliatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *auratum* ab. *simplicicornis* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *auratum* ab. *zaitzevi* Plavilstshikov, 1958

Type loc.: Transcaucasia: Suram.

This species is distributed in NE Anatolia for Turkey.

Records in Turkey: (SV-TUR)
Turkey: Sivas prov. (Ganglbauer, 1884); Turkey as *D. lederi* Kraatz (Lodos, 1998).
Distribution: Caucasus, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion bangi Heyden, 1894

Dorcadion (*Pedestredorcadion*) *bangi* m. *sanguinimembre* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *bangi* m. *substriatipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *bangi* m. *fuscorevestitum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *bangi* m. *postconjunctum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *bangi* m. *rufofemorale* Breuning, 1962

Type loc.: Turkey: Kastamonu prov.

ssp.
***D. bangi bangi* Heyden, 1894**
***D. bangi heinzorum* Braun, 1975**
***D. bangi roridum* Pesarini & Sabbadini, 1998**

This species is endemic to CN and NCW Turkey. According to Braun (1978 and 1979), *D. heinzorum* Braun, 1975 is a subspecies of *D. bangi* Heyden, 1894. So it is represented by three subspecies. The nominotypical subspecies *D. bangi bangi* Heyden, 1894 occurs only in West parts of Western Black Sea Region (Kastamonu and Bolu provinces). *D. bangi heinzorum* Braun, 1975 occurs in Kastamonu and Çorum provinces. *D. bangi roridum* was described by Pesarini & Sabbadini (1998) from Bolu province (Gerede). Özdikmen (2007) gave *D. heinzorum* Braun, 1975 as a subspecies of *D. bangi* Heyden, 1894.

Records in Turkey: (AN-BO-CO-KR-KS-TUR)
Anatolia (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Kastamonu prov. as *D. bangi*, *D. bangi* m. *sanguinimembre*, *D. bangi* m. *substriatipenne*, *D. bangi* m. *fuscorevestitum*, *D. bangi* m. *postconjunctum* and *D. bangi* m. *rufofemorale* (Breuning, 1962); Kastamonu prov.: Ilgaz Mountain (Demelt, 1967); Holotype and paratypes: Çorum prov.: İskilip as *D. bangi heinzorum* Braun, 1975 (Braun, 1975); Bolu prov.: Gerede, Kastamonu prov.: Central / Yukarıyuva / Devrekani / Ilgaz Mountain (Yılancı village) (Braun, 1978 and 1979); Çorum prov.: İskilip, Kastamonu prov.: Ilgaz Mountain (Bürnük, Tosya) as *D. bangi heinzorum* Braun, 1975 (Braun, 1978, 1979); Kastamonu prov.: Ilgaz Mountain (Sama, 1982); Kastamonu prov. (Önalp, 1990); Kastamonu prov.: Central / Yukarıyuva / Ilgaz pass (Tosya) / Tosya-İskilip (Domkayatepe pass) (Adlbauer, 1992); Ankara prov.: Elmadağ (Özdikmen et al., 2005); Karabük prov.: Eflani–Daday road, Kastamonu prov.: Araç road (Özdikmen, 2007); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion banjkovskyi Plavilstshikov, 1958

Type loc.: Turkey: Erzurum prov.

The species is endemic to NE Turkey.

Records in Turkey: (EZ)
Erzurum prov. (Plavilstshikov, 1958; Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion beckeri Kraatz, 1873

Dorcadion impressipenne Jakovlev, 1897
Dorcadion (*Pedestredorcadion*) *beckeri* m. *stramentosovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *königi* m. *invitticolle* Breuning, 1947
Dorcadion (*Pedestredorcadion*) *beckeri* m. *subpubescens* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *beckeri* ab. *intergriseum* Plavilstshikov, 1958

Type loc.: Daghestan: Derbent

ssp.
***D. beckeri beckeri* Kraatz, 1873**
***D. beckeri königi* (Jakovlev, 1897) (Daghestan)**

This species has 2 subspecies. It is represented by nominotypical subspecies in NC, NE and E Turkey. The other known subspecies *D. beckeri königi* (Jakovlev, 1897) occurs only in Daghestan. However, according to personal communication of M. L. Danilevsky, this speces is impossible for Turkey.

Records in Turkey: (AM-YO-VA-TUR)
Amasya prov., Van prov. (Önalp, 1990); Turkey (Lodos, 1998); Yozgat prov.: Yozgat National Park (Özdikmen & Hasbenli, 2004a).
Distribution: Caucasus (Daghestan, Azerbaijan, Armenia), Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion bisignatum Jakovlev, 1899

Dorcadion (*Autodorcadin*) *bisignatum* ab. *artvinicum* Plavilstshikov, 1958

Type loc.: Turkey: Artvin prov.

The species is endemic to NE Turkey.

Records in Turkey: (ART)
Artvin prov. (Jakovlev, 1900; Plavilstshikov, 1958; Breuning, 1962; Breuning & Villiers, 1967); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion bistriatum Pic, 1898

Type loc.: Caucasus.

The species probably is distributed only in NE Anatolia for Turkey. It has been recorded only by Breuning (1962) for Turkey.

Records in Turkey: (ART)
Iğdır prov.: Tuzluca: Kazkoparanvillage (Breuning, 1962).
Distribution: Caucasus, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion bithyniense Chevrolat, 1856

Dorcadion serotinum Thomson, 1865
Dorcadion (*Pedestredorcadion*) *bithyniense* m. *dorsoplagiatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *bithyniense* m. *superserotinum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *bithyniense* m. *dorsosubplagiatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *bithyniense* m. *dorsolateprolongatum* Breuning, 1962

Type loc.: Turkey: Bursa prov.

This species is endemic to Turkey. It probably distributes in W half of Turkey.

Records in Turkey: (BL-BS-IS-IZ-KN-KS-SA-TUR)
Bursa prov., İzmir prov. (Ganglbauer, 1884); Turkey: Bursa prov. (Ganglbauer, 1884); Bursa prov. (Aurivillius, 1921); İzmir prov. as *D. bithyniense* v. *serotinum* (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Anatolia as *D. bithyniense* v. *serotinum* (Winkler, 1924-1932); Bursa prov.: Olympos Mt. and Smyrna (İzmir prov.) (Breuning, 1962); Anatolia as *D. bithyniense* v. *serotinum* Thomson, 1865 (Winkler, 1924-1932); Balıkesir prov. as *D. bithyniense* m. *dorsolateprolongatum* and West Anatolia as *D. bithyniense* m. *superserotinum* (Breuning, 1962); İstanbul prov.: Alem Mt. (Demelt & Alkan, 1962; Demelt, 1963); Bursa prov.: Uludağ (Breuning & Villiers, 1967); İzmir prov.: Bergama (Kozak pass) (Adlbauer, 1988); Bursa prov.: Uludağ / Central, Konya prov.: Akşehir, Sakarya prov.: Sapanca, Kastamonu prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion blanchardi Mulsant & Rey, 1863

Type loc.: Iran.

This species is distributed only in Iran and E Turkey.

Records in Turkey: (MA)
Malatya prov. (Heyden, 1888; Kraatz, 1888; Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Iran, Turkey.

Chorotype: SW-Asiatic (Irano-Anatolian).

Dorcadion blandulus Holzschuh, 1977

Type loc.: Turkey: Bingöl prov.

This species is endemic to Turkey. It probably distributes only in E Turkey.

Records in Turkey: (BN)
Bingöl prov.: E Kuruca pass as the type loc. (Holzschuh, 1977); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion bodemeyeri Daniel, 1900

Dorcadion (*Pedestredorcadion*) *bodemeyeri* m. *rubricolle* Breuning, 1946

Type loc.: Turkey: Phyrigia and Lycaonia.

This species is endemic to Turkey. It probably distributes mostly in W half of Turkey.

Records in Turkey: (AF-AM-AN-ES-IZ-KN-TUR)
Turkey: Anatolia: İzmir prov.: Ödemiş, Bozdağ as the type loc. of D. bodemeyeri Daniel, 1900; Eskişehir prov.: Central / Kocakır, Konya prov.: Akşehir (Bodemeyer, 1900); Konya prov.: Akşehir (Aurivillius, 1921); Turkey: Anatolia (Winkler, 1924-1932; Lodos, 1998); Phyrigia and Lycaonia, Eskişehir prov., İzmir prov.: Bozdağ (Breuning, 1962); Ankara prov.: Gölbaşı (Demelt, 1963); Eskişehir prov.: Sultandere, Afyon prov.: Bayramgazi (Braun, 1978); Konya prov.: Sertavul pass (Sama, 1982); İzmir prov.: Gökdağ / Bozdağ, Eskişehir prov.: Central / Kocakır, Amasya prov., Ankara prov., Ankara prov.: Gölbaşı (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion boluense Breuning, 1962

Dorcadion boluense m. *nigrobasipenne* Breuning, 1962

Type loc.: Turkey: Bolu prov.: Bolu Mts.

ssp.
***D. boluense boluense* Breuning, 1962**
***D. boluense imitator* Pesarini & Sabbadini, 1998**
***D. boluense corallinum* Pesarini & Sabbadini, 1998**

This species is endemic to Turkey. It has 3 subspecies. All of them are distributed only in NCW Turkey. The nominotypical subspecies occurs in Bolu province (Bolu Mountains, Gerede, Çifkan Mt., Akyarma pass). *D. boluense imitator* was described by Pesarini & Sabbadini (1998) from Ankara province (Karagöl) and Çankırı province (Işık Mountain). Also *D. boluense corallinum* was described by Pesarini & Sabbadini (1998) from Ankara province (Kızılcahamam, Çamlıdere).

Records in Turkey: (AN-BO-CN-TUR)
Ankara prov.: Işık Mountain (Güvem) / Çamlıdere / Çifkan Mountain / Akyarma pass (Braun, 1978); Ankara prov.: Kızılcahamam (Sama, 1982); Bolu prov.: Akyarma pass (Adlbauer, 1992); Turkey (Lodos, 1998); Bolu prov.: Bolu Mountains, Gerede, Çifkan Mt., Akyarma pass, Ankara prov.: Karagöl, Çamlıdere, Çankırı prov.: Işık Mountain (Pesarini &

Sabbadini, 1998); Ankara prov.: Çal Mountain (Özdikmen & Demir, 2006); Ankara prov.: Ankara –Ayaş road, Kızılcahamam (Salin village), Şereflikoçhisar (Kale district) (Özdikmen et al., 2009); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion boszdaghense Fairmaire, 1866

Dorcadion grammophilum Thomson, 1867
Dorcadion divisum v. *grammophilum* Pic, 1899 (nec Thomson, 1867)
Dorcadion (*Pedestredorcadion*) *boszdaghense* m. *rufobasale* Breuning, 1946

Type loc.: Turkey: İzmir prov.: Bozdağ.

This species is endemic to Turkey. After its description, it was regarded as a variety of *D. divisum* by many authors (e.g. Ganglbauer, 1884; Winkler, 1924-1932). Breuning (1962) gave it as a separate species again. It is distributed only in W Turkey.

Records in Turkey: (IZ-TUR)
İzmir prov.: Bozdağ as the type loc. (Fairmaire, 1866); Turkey: İzmir prov.: Ovacık as *D. divisum* v. *boszdaghense* (Ganglbauer, 1884; Aurivillius, 1921); Anatolia as *Dorcadion divisum* v. *boszdaghense* Fairmaire, 1866 (Winkler, 1924-1932); İzmir prov.: Bozdağ (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion bouilloni Breuning & Ruspoli, 1975

Type loc.: Turkey: Ordu prov.: Mesudiye.

This species is endemic to Turkey. It probably distributes only in NCE Turkey.

Records in Turkey: (OR)
Ordu prov.: Mesudiye as the type loc. (Breuning & Ruspoli, 1975); (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion brauni Breuning, 1979

Type loc.: Turkey: Denizli prov.: Tavas valley.

This species is endemic to Turkey. It probably distributes only in SW Turkey.

Records in Turkey: (DE)
Denizli prov.: Tavas valley as the type loc. (Breuning, 1979); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion bremeri Breuning, 1981

Type loc.: Turkey: Afyonkarahisar prov.: Akyarma.

This species is endemic to Turkey. It probably distributes only in CW Turkey.

Records in Turkey: (AF)
Afyonkarahisar prov.: Akyarma as the type loc. (Breuning, 1981); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion breuningi Heyrovsky, 1943

Dorcadion (*Pedestredorcadion*) *breuningi* m. *discoobliteratum* Heyrovsky, 1943
Dorcadion (*Pedestredorcadion*) *breuningi* m. *xanthicum* Heyrovsky, 1952

Type loc.: Thracia: N Greece: Xanthi, Ferre, Bodona.

This species is endemic to Thracia. It probably is distributed only in European Turkey for Turkey.

Records in Turkey: (TRA)
European Turkey (Althoff & Danilevsky, 1997; Danilevsky, 2010a); European Turkey (Danilevsky in Löbl & Smetana, 2010).
Distribution: Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion bulgharmaadense Breuning, 1946

Type loc.: Turkey: Niğde prov.: Ulukışla (Maden village).

This species is endemic to SCW Turkey. It probably is distributed only in Bolkar Mountains (Cilician Taurus).

Records in Turkey: (NI)
Niğde prov.: Ulukşıla (Maden village) as the type loc. (Breuning, 1946, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion cachinno Thomson, 1868

Dorcadion immersum Tournier, 1872
Dorcadion (*Pedestredorcadion*) *cachinno* m. *fuscoflavum* Breuning, 1946

Type loc.: Turkey: Karaman prov.

This species is endemic to Turkey. It probably is distributed only in CS and CW Turkey.

Records in Turkey: (KR-US-TUR)
Karaman prov. as the type loc. (Thomson, 1867); Karaman prov. and W Anatolia (Breuning, 1962); Uşak prov. (Demelt, 1963); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion carinipenne Pic, 1900

Dorcadion (*Pedestredorcadion*) *carinipenne* m. *quinquevittatum* Breuning, 1946

Type loc.: Turkey: Hatay prov.: Akbez (not Syria).

This species is endemic to central parts of S Turkey (Amanos Mts. and near).

Records in Turkey: (GA-HT)
Hatay prov.: Akbez (Aurivillius, 1921); Hatay prov.: Akbez, Gaziantep prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion carolisturanii Breuning & Ruspoli, 1971

Dorcadion (Pedestredorcadion) carolisturanii m. *baiburtense* Breuning, 1975

Type loc.: Turkey: Giresun prov.: Kümbet plateau.

This species is endemic to Turkey. It probably is distributed only in NE Turkey.

Records in Turkey: (BY-GI-OR)
Giresunprov.: Kümbet plateau as the type loc. (Breuning & Ruspoli, 1971); Bayburt prov. as the type loc of *Dorcadion (Pedestredorcadion) carolisturanii* m. *baiburtense* (Breuning, 1975); Ordu prov.: Mesudiye (Gölköy) (Braun, 1978); Ordu prov.: from Mesudiye to Gölköy (Sama, 1982); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion cinctellum Fairmaire, 1866

Dorcadion (*Pedestredorcadion*) *cinctellum* m. *quadrifuscoplagiatum* Breuning, 1947
Dorcadion (*Pedestredorcadion*) *cinctellum* m. *aureofasciatum* Breuning, 1947
Dorcadion (*Pedestredorcadion*) *cinctellum* m. *reductum* Breuning, 1947

Type loc.: Turkey: İzmir prov.: Bozdağ (Kisilgye-Aole).

This species is endemic to Turkey. It probably is distributed only in W and CW Turkey.

Records in Turkey: (IZ-KN-TUR)
İzmir prov.: Bozdağ (Kisilgye-Aole) as the type loc. (Fairmaire, 1866; Ganglbauer, 1884; Breuning, 1962); Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Konya prov.: Akşehir (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion cinerarium (Fabricius, 1787)

Lamia tricolor Fischer-Waldheim, 1806
Dorcadion sericatum Krynicki, 1832 (part.)
Dorcadion euxinum Suvorov, 1915
Dorcadion caucasicum v. *macropoides* Plavilstshikov, 1932 Charkov
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *densevestitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *densealbovestitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *disconigromaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *sericeovestitum* Breuning, 1962

Original combination: *Lamia cineraria* Fabricius, 1787

Type loc.: Unknown. ?Ukraine and South Russia (ex Lazarev, 2009).

ssp.
***D. cinerarium cinerarium* (Fabricius, 1787)**
***D. cinerarium panticapaeum* (Plavilstshikov, 1951)**
***D. cinerarium gorodinskii* Danilevsky, 1996**

This species has 3 subspecies as the nominotypical subspecies occurs in Europe (Moldova, Ukraine, Crimea, European Russia) and Turkey, *D. cinerarium panticapaeum* (Plavilstshikov, 1951) occurs only in Crimea, Caucasus (Taman peninsula) and *D. cinerarium gorodinskii* Danilevsky, 1996 occurs only in Ukraine.

According to Danilevsky & Miroshnikov (1985), *Dorcadion caucasicum* Küster, 1847 is a synonym of *Dorcadion cinerarium*. According to Danilevsky et al. (2004) *Dorcadion caucasicum* Küster, 1847 is a subspecies of *Dorcadion cinerarium*. So it was given as a subspecies of *Dorcadion cinerarium* by Özdikmen (2007). However, Danilevsky (2010b) stated that "*the nature of D. caucasicum is not quite clear (types are not available). Most probably two closely related, but different populations of one species from near Tbilisi (with pubescent and with glabrous elytrae) were described as D. caucasicum and D. sulcipenne"*. So he accepted *D. caucasicum* as a subspecies of *D. sulcipenne*. Recently, Lazarev (2009) gave *D. caucasicum* as a subspecies of *D. sulcipenne* as stat. nov.. Also, according to Danilevsky (2010b), *D. cinerarium danczenkoi* Danilevsky, 1996 is a separate species.

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 (Sivas prov.: Suşehri) 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.

Moreover, this species can not be represented in Turkey. According to Lazarev (2009), *Dorcadion* populations from Turkey were wrongly regarded as different forms of *D. cinerarium* (*D. micans* Thomson, 1867; *D. sericatulum* Kraatz, 1873; *D. macropus* Kraatz, 1873). He also stated *Dorcadion* populations that were attributed before to *D. cinerarium* from Turkey (as subspecies, variations, morphs, forms or aberrations) belong to another partly not described species. Also Danilevsky (2010b) stated that "*D. cinerarium absent in Transcaucasia and in Turkey. Transcaucasian and Turkish species of "cinerarium-group" are all very different, but in general their autochromal females are less pronounced and sometimes absent*".

Records in Turkey: (AN-BS-CN-ES-GA-IC-KA-KI-KS-KY-OR-SM-SV-TO-YO-TUR) Turkey as *D. c.* m. *subcinerarium* / West Anatolia as *D. c.* m. *extremum* (Breuning, 1962); Ankara prov.: Gölbaşı as *D. cinerarium* m. *cinerarium* (Perissinotto & Luchini, 1966); Ankara prov.: Gölbaşı / Central / Elmadağ, Yozgat prov.: Central, Çorum prov.: Yazılıkaya / Mecitözü / Alaca, Kayseri prov.: Bakırdağı, Kastamonu prov.: Saraycık, Kırıkkale prov.: Keskin, Sivas prov.: Central / Gürün (Ziyaret pass) / Akarsu (Kızıldağ pass), Samsun prov.: Ladik (Aslantaş / Ak Mountain), Tokat prov.: Dumanlı-Karadere (Braun, 1978); Bursa prov., Eskişehir prov., Ankara prov., Çankırı prov., Yozgat prov., Tokat prov., Sivas prov., Kayseri prov., İçel prov. (from map in Braun, 1979); Turkey as *D. c. densevittatum* (Braun, 1979); Turkey (Danilevsky & Miroshnikov, 1985); Sivas prov. (Adlbauer, 1988); Gaziantep prov.: Islahiye (Özdikmen et al., 2005); Kahramanmaraş prov.: Göksun (Özdikmen & Okutaner, 2006); Ankara prov.: Keçiören (Bağlum) / Çal Mt., Ordu prov.: Perşembe (Çaytepe) (Özdikmen & Demir, 2006).
Distribution: Europe (Moldova, Ukraine, Crimea, European Russia), Turkey.

Chorotype: E-Mediterranean (NE-Mediterranean).

Dorcadion cingulatum Ganglbauer, 1884

Dorcadion invicinum Pic, 1902
Dorcadion persianum Breuning, 1943
Dorcadion (*Pedestredorcadion*) *cingulatum* m. *nigrobivittatum* Breuning, 1946
Dorcadion (*Autodorcadion*) *cingulatum* ab. *clarocaudatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *cingulatum* ab. *superobscuratum* Plavilstshikov, 1958

Type loc.: Iran.

This species is distributed only in SE and probably E Anatolia for Turkey.

Records in Turkey: (DI-TUR)
Diyarbakır prov. (Aurivillius, 1921); Diyarbakır prov. as *D. invicinum* (Aurivillius, 1921; Breuning, 1962); Turkey (Winkler, 1924-1932; Lodos, 1998); Turkey as *D. invicinum* (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Iran, Turkey.
Chorotype: SW-Asiatic (Irano-Anatolian).

Dorcadion coiffaiti Breuning, 1962

Dorcadion (*Pedestredorcadion*) *coiffaiti* m. *balikesiranum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *coiffaiti* m. *conjunctevittipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *coiffaiti* m. *dorsoreductipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *coiffaiti* m. *separatevittatum* Breuning, 1962

Type loc.: Turkey: Balıkesir prov.: Manyas

This species is endemic to Turkey. It probably is distributed only in NW Anatolia.

Records in Turkey: (BL)
Balıkesir prov.: Manyas, Central and Demirci (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion complanatum Ganglbauer, 1884

Dorcadion (*Autodorcadion*) *complanatum* m. *perhebetatum* Plavilstshikov, 1958

Type loc.: Iran.

This species probably is distributed only in NE Anatolia.

Records in Turkey: (TUR)
NE Turkey (Plavilstshikov, 1958).
Distribution: Iran, Turkey.
Chorotype: SW-Asiatic (Irano-Anatolian).

Dorcadion condensatum Küster, 1852

Dorcadion condensatum m. *punctatissimum* Ganglbauer, 1884
Dorcadion condensatum v. *inlineatum* Pic, 1917
Dorcadion condensatum v. *adampolum* Pic, 1917

Type loc.: Turkey.

This species probably is distributed only in NW Turkey (European Turkey + NW Anatolia).

Records in Turkey: (IS-KO-TRA-TUR)
Turkey: İstanbul prov. (Ganglbauer, 1884; Aurivillius, 1921); İstanbul prov.: Alem Mt. (Bodemeyer, 1906; Demelt & Alkan, 1962; Demelt, 1963; Önalp, 1990); European Turkey (Winkler, 1924-1932; Althoff & Danilevsky, 1997); European Turkey and North-West Anatolia (Breuning, 1962); Kocaeli prov.: İzmit (Gebze) (Braun, 1978; Adlbauer, 1992); Turkey (Lodos, 1998); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: ?Greece, Bulgaria, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion confluens Fairmaire, 1866

Dorcadion subobscuripes Pic, 1914

Type loc.: Turkey: İzmir prov.: Bozdağ.

This species is endemic to Turkey. It probably is distributed from W to SE Turkey. This species was described by Fairmaire (1866) as a separate species. Then it was regarded by some authors (e.g. Breuning, 1962) as a morpha of *D. divisum*. Finally, it was accepted by Pesarini & Sabbadini (1998) as a distinct species again.

Records in Turkey: (DI-IZ-TUR)
İzmir prov.: Bozdağ (Fairmaire, 1866; Aurivillius, 1921; Pesarini & Sabbadini, 1998); İzmir prov.: Bozdağ, Diyarbakır prov. as *D. divisum* v. *confluens* (Aurivillius, 1921); Anatolia as *D. divisum* v. *confluens* Fairmaire, 1866 (Winkler, 1924-1932); Turkey as *D. subobscuripes* Pic, 1914 (Winkler, 1924-1932; Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion culminicola Thomson, 1868

Type loc.: Turkey: Cilician Taurus.

This species is endemic to Turkey. It probably is distributed only in SCW Turkey (Cilician Taurus).

Records in Turkey: (TUR)
Turkey: Taurus (Ganglbauer, 1884; Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Cilician Taurus (Breuning, 1962); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion decipiens (Germar, 1824)

Dorcadion (*Pedestredorcadion*) *decipiens* m. *jacqueti* Pic, 1902
Dorcadion (*Pedestredorcadion*) *decipiens* m. *distinctevittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *decipiens* m. *confluentinum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *decipiens* m. *subfemininum* Breuning, 1958

Original combination: *Lamia decipiens* Germar, 1824

Type loc.: Hungary.

This species is distributed in Eastern Europe. Önalp (1990) stated a male specimen in Senckenberg Museum and 1 female specimen in her collection from Turkey.

Records in Turkey: (TUR)
Turkey (Önalp, 1990; Lodos, 1998).
Distribution: Serbia, Romania, Hungary, ?Bulgaria, Slovakia, Ukraine, Moldova, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion delagrangei Pic, 1894

Dorcadion delagrangei v. *fuscopubescens* Pic, 1900

Type loc.: Turkey: Hatay prov.: Akbez.

This species is endemic to SC Turkey.

Records in Turkey: (GA-HT-KL-OS-TUR)
Hatay prov.: Akbez (Aurivillius, 1921); Gaziantep prov., Bolkar Mts., Amanos Mts. as *D. accola* (Breuning, 1962); Hatay prov.: Akbez as *D. delagrangei* (Pic, 1894) (Ex. Braun, 1978); Kilis prov., Osmaniye prov.: Nurdağ (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion deyrollei Ganglbauer, 1884

Dorcadion (*Pedestredorcadion*) *deyrollei* m. *melas* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *deyrollei* m. *subalbipenne* Breuning, 1946

Type loc.: Turkey: Bitlis prov.

This species is endemic to Turkey. This species is distributed in SC to E Turkey mainly.

Records in Turkey: (BI-KA-VA-TUR)
Bitlis prov. as the type loc. (Ganglbauer, 1884); NE Turkey (Plavilstshikov, 1958); Bitlis prov., Van prov., Kahramanmaraş prov.: Ahır Mt. (Breuning, 1962); Van prov.: Kuzgunkıran (Fuchs & Breuning, 1971; Holzschuh, 1980; Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion dimidiatum Motschulsky, 1838

Dorcadion erivanicum Pic, 1901
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *plaviltschikovi* Heyrovsky, 1932
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *nigroreductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *reductemaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *unimaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *flavescens* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *dimidiatum* m. *nigrovittatum* Breuning, 1946
Dorcadion dimidiatum v. *degaullei* Pic, 1948
Dorcadion dimidiatum v. *transitorium* Pic, 1948
Dorcadion (*Autodorcadion*) *dimidiatum* ab. *arkazonicum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *dimidiatum* ab. *simplex* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *dimidiatum* ab. *sophisticum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *dimidiatum* ab. *supravirgatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *dimidiatum* ab. *venustatum* Plavilstshikov, 1958

Type loc.: Armenia: Erivan.

ssp.
***D. dimidiatum dimidiatum* Motschulsky, 1838**
***D. dimidiatum kelkiticum* Özdikmen & Hasbenli, 2004**
***D. dimidiatum korgei* Breuning, 1966**

This species has 3 subspecies or no subspecies. It is distributed in NE Anatolia for Turkey and represented by all subspecies in Turkey. The nominotypical subspecies (eastern phenotype) occurs in Caucasus (Armenia), Iran and NE Turkey, and *D. dimidiatum korgei* Breuning, 1976 and *D. dimidiatum kelkiticum* Özdikmen & Hasbenli, 2004 (western phenotype) occurs only in Turkey. According to Danilevsky in Löbl & Smetana (2010), *D. dimidiatum kelkiticum* is a synonym of the nominotypical subspecies. Breuning (1966) described *D. dimidiatum korgei* using by only the characters: the punctuation of pronotal disc is a little less dense and lateral tubercles of pronotum are less obtuse than nominative form. In this status, *D. dimidiatum kelkiticum* is not a synonym of the nominotypical subspecies. Since, the punctuation of pronotal disc is denser than nominative form and korgei, and lateral tubercles of pronotum are less obtuse than nominative subspecies. Besides, the distribution area of *D. dimidiatum korgei* is closer to nominative subspecies than *D. dimidiatum kelkiticum*. Also *D. dimidiatum kelkiticum* is distributed west point of the distribution area of the species. Therefore, this species do not includes any subspecies according to the approach of Danilevsky in Löbl & Smetana (2010). The described taxa fall in variations of the species. The real status of these taxa needs to be clarified for final decision.

Records in Turkey: (AG-ER-EZ-GU-MA-TU-TUR)
NE Turkey: to Erzurum prov. (Plavilstshikov, 1958); Malatya prov.: Arguvan (Gfeller, 1972); Tunceli prov.: Pülümür as the type loc. of *D. dimidiatum korgei* (Breuning, 1966); Erzurum prov.: İspir and Ovacık (Braun, 1978); Erzurum prov. and near (Özbek, 1978); NE Turkey (Danilevsky & Miroshnikov, 1985); Ağrı prov.: N of Bayazıt, Doğu Beyazıt, Ağrı Mountain, Erzurum prov.: Çat (Önalp, 1990); Turkey (Lodos, 1998); Erzincan prov.: Refahiye (Kızıleniş village), Erzurum prov.: Nenehatun (Özdikmen & Hasbenli, 2004a); Gümüşhane prov.: Kelkit (Başköy village) as the type loc. of *D. dimidiatum kelkiticum* (Özdikmen & Hasbenli, 2004b); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Iran, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian, Irano-Caucasian, Irano-Anatolian).

Dorcadion divisum Germar, 1839

Dorcadion catenatum Waltl, 1838
Dorcadion mancum Gistel, 1848
Dorcadion confluens Fairmaire, 1866
Dorcadion loratum Thomson, 1867
Dorcadion divisum v. *intercisum* Kraatz, 1873
Dorcadion latevittatum Kraatz, 1873
Dorcadion divisum v. *dissimile* Ganglbauer, 1884
Dorcadion divisum v. *koechlini* Pic, 1898
Dorcadion divisum v. *subobliteratum* Pic, 1899
Dorcadion divisum v. *uninterruptum* Pic, 1899
Dorcadion divisum v. *dorsale* Pic, 1907
Dorcadion divisum v. *diversejunctum* Pic, 1907
Dorcadion divisum v. *sparsedivisum* Pic, 1911
Dorcadion subobscrupes Pic, 1914
Dorcadion divisum v. *smyrnense* Pic, 1917
Dorcadion divisum v. *oedemischense* Heyrovsky, 1932
Dorcadion divisum v. *thebesianum* Pic, 1942
Dorcadion divisum v. *bonyi* Pic, 1942
Dorcadion (*Pedestredorcadion*) *divisum* m. *smyrnanum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *divisum* m. *postmediomaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *divisum* m. *tenebripes* Breuning, 1946
Dorcadion divisum ssp. *subdivisum* v. *submediomaculatum* Breuning, 1955
Dorcadion (*Pedestredorcadion*) *divisum* m. *subatrum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *divisum* m. *peratrum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *divisum* m. *submytilinense* Breuning, 1962

Type loc.: Turkey: Smyrna (= İzmir prov.).

ssp.
***D. divisum divisum* Germar, 1839** (Turkey: İzmir prov.)
***D. divisum mytilinense* Kraatz, 1873** (Greece: Lesbos and Samos Islands, Turkey)
***D. divisum bleusei* Pic, 1899** (Greece)
***D. divisum rhodicum* Della Buffa, 1924** (Greece: Rhodos Island)
***D. divisum chioticum* Breuning, 1946** (Greece: Chios Island)
***D. divisum subdivisum* Breuning, 1955** (Turkey: Ankara prov.)
***D. divisum parteinterruptum* Breuning, 1962** (NW Turkey: Demirci, Lesbos Is.: Mandamados)

This species is very variable. It is distributed rather widely in Turkey. It has at least 7 subspecies in the world as above. According to Breuning (1962), *D. divisum subdivisum* Breuning, 1955 that described from Ankara prov (Turkey) is a subspecies of this species. Moreover, according to Danilevsky in Löbl & Smetana (2010), *D. divisum* v. *dissimile* Ganglbauer, 1884, *D. loratum* Thomson, 1867 and *D. divisum* v. *oedemischense* Heyrovsky, 1932 that occur only in Turkey are also regarded as subspecies of *D. divisum*. Besides, he gave *D. divisum rhodicum* Della Buffa, 1924 (Greece: Rhodos Island) as a synonym of *D. divisum bleusei* Pic, 1899 (Greece). He accepted 8 subspecies for this species as *D. d. divisum* Germar, 1839; *D. d. loratum* Thomson, 1867; *D. d. intercisum* Kraatz, 1873; *D. d. mytilinense* Kraatz, 1873; *D. d. dissimile* Ganglbauer, 1884; *D. d. bleusei* Pic, 1899; *D. d. oedemischense* Heyrovsky, 1932 and *D. d. subdivisum* Breuning, 1955. So the real status of the taxa belonging to the species needs to clarify by future works. Anyway, the nominotypical taxa described from W Turkey. According to Danilevsky (2010a), *D. divisum* was recorded by Montandon (1908) for Romania, is another subspecies of the species. However, it has not been named until now.

Records in Turkey: (AD-ADY-AN-BL-BS-BU-CA-DI-ES-IC-IP-IZ-KN-MN-MR-NI-OS-SV-TRA-TUR)
Turkey: İzmir prov., Bursa prov. (Ganglbauer, 1884; Aurivillius, 1921); Turkey: İzmir prov. as *D. divisum* v. *loratum* (Ganglbauer, 1884); Turkey: İzmir prov. as *D. divisum* v. *mytilenense* (Ganglbauer, 1884); Turkey: İzmir prov. as *D. divisum* v. *intercisum* (Ganglbauer, 1884); Turkey: İzmir prov.: Bozdağ, Diyarbakır prov. as *D. divisum* v. *confluens* (Ganglbauer, 1884); European Turkey as *D. divisum* v. *dissimile* (Ganglbauer, 1884); Eskişehir prov.: Kocakır (Bodemeyer, 1900); İçel prov.: Burna as *D. köchlini* Pic (Bodemeyer, 1900); İzmir prov. as *D. divisum* v. *dorsale*, *D. divisum* ab. *mytilinnense,* Diyarbakır prov. as *D. divisum* v. *intercisum*, Turkey as *D. divisum* v. *dissimile* and *D. divisum* v. *koechlini* (Aurivillius, 1921); (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Anatolia as *D. divisum* v. *koechlini* Pic, 1898; *D. divisum* v. *confluens* Fairmaire, 1866 (Winkler, 1924-1932); European Turkey as *D. divisum* v. *dissimile* Ganglbauer, 1884 (Winkler, 1924-1932); Diyarbakır prov. as *D. divisum* v. *intercisum* Kraatz, 1873 (Winkler, 1924-1932); İzmir prov., Balıkesir prov., Sivas prov., Cilicia, West and South Anatolia eastwards to South-Eastern Anatolian Region (Breuning, 1962); İzmir prov.: near central (Demelt & Alkan, 1962); İzmir prov.: Karşıyaka, Burdur prov. (Demelt, 1963); Ankara prov.: Gölbaşı as *D. divisum ssp. subdivisum* Breuning, 1955 (Fuchs et Breuning, 1971); Burdur prov. – Demelt, 1963 (Ex. Gül-Zümreoğlu, 1975) and Manisa prov.: Helvacıköy as *D. divisum* m. *subatrum* (Gül-Zümreoğlu, 1975); Çanakkale prov.: Çan as *D. divisum* m. *loratum,* Mardin prov.: Ahreski pass, Adana prov.: Tufanbeyli, Adıyaman prov.: Börgenek as *D. divisum* m. *intercisum* (Braun, 1978); İzmir prov. (Sama, 1982); West Turkey (Adlbauer, 1988); İzmir prov.: Central, Ödemiş, Isparta prov.: Eğirdir, Eskişehir prov., Konya prov., Niğde prov.: Ulukışla, Bursa prov.: Mustafa Kemal Paşa, Balıkesir prov.: Susurluk (Önalp, 1990); Turkey (Lodos, 1998); Ankara prov., Osmaniye prov.: Between Kaypak-Alamanpınarı (Özdikmen, 2006); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, European Turkey, Romania), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion dobrovljanskii Suvorov, 1915

Type loc.: Turkey.

Danilevsky (2010b) stated that "*Dorcadion dobrovljanskii Suvorov, 1915 (see "Gallery" in www.cerambycidae.net) was described from "Erivanskaya gub., sel. Kuki[?]" (or "sel. Kiuku" according to the original label) on the base of a single male (ZMM). Another available specimen (ZMM) of the species is a female from "Erivanskaya gub., sel. Gemur[?]" with same type label as the holotype, but this specimen was not mentioned in the original description. N. N. Plavilstshikov (1958) regarded this name as a synonym of "D. sevangense" and believed that the absence of dense elytral pubescence (typical for D. scabricolle sevangense) was just the result of too hard cleaning of elytra. S. Breuning (1958: 30) placed the name among synonyms of D. scabricolle. Both known specimens of D. dobrovljanskii are in relatively good condition and represent a very distinct peculiar species distributed somewhere in NE Turkey*". So, it is endemic to NE Turkey.

Records in Turkey: (TUR)
NE Turkey (Danilevsky (2010b); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion drusoides Breuning, 1962

Type loc.: Turkey: Amanos Mts. (not Syria).

This species is endemic to Amanos Mts. in SC Turkey. It has been known only from type locality until now.

Records in Turkey: (TUR)
Turkey (not Syria): Amanos Mts. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion elazigi Breuning, 1971

Type loc.: Turkey: Elazığ and Muş prov.

It is endemic to Turkey. This species is distributed in E Turkey.

Records in Turkey: (BN-EL-MU)
Muş prov: Buğlan pass, Elazığ prov. as the type loc. (Breuning, 1971); Muş prov: Buğlan pass, Elazığ prov. as the type loc. and Bingöl prov.: Central (Fuchs & Breuning, 1971); Bingöl prov. (Holzschuh, 1980); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion elegans Kraatz, 1873

Dorcadion viturati Pic, 1903
Dorcadion (*Pedestredorcadion*) *elegans* m. *kirghisicum* Breuning, 1946

Type loc.: Russia: Stalingrad.

This species has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from European Russia, Kazakhstan, Ukraine and Caucasus now. So, this record is not confirmed and is impossible for Turkey. According to Danilevsky (2010b), *D. elegans* m. *crimeense* Breuning, 1946 is a synonym of *D. mokrzeckii* Jakovlev, 1902.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: European Russia, Ukraine, European Kazakhstan, Caucasus.
Chorotype: E-European.

Dorcadion enricisturanii Breuning & Ruspoli, 1971

Type loc.: Turkey: Kastamonu prov.: Tosya.

ssp.
***D. enricisturanii enricisturanii* Breuning & Ruspoli, 1971**
***D. enricisturanii densepunctatum* Braun, 1978**

The species is endemic to NC Anatolia of Turkey. It is represented by two subspecies in Turkey. Both subspecies distribute in Central parts of North Turkey. The nominative *D. enricisturanii enricisturanii* Breuning et Ruspoli, 1971 is the Western subspecies. *D. enricisturanii densepunctatum* Braun, 1978 (Eastern subspecies) occurs probably eastward from the distribution patterns of nominative subspecies.

Records in Turkey: (CO-KS-SM)
Çorum prov.: İskilip (Braun, 1978); Holotype and paratypes: Samsun prov.: Vezirköprü as *D. enricisturanii densepunctatum* Braun, 1978 (Braun, 1978); Kastamonu prov.: Between Tosya and İskilip / Domkayatepe pass (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion equestre (Laxmann, 1770)

Cerambyx cruciferum Lepechin, 1774
Lamia cruciata Fabricius, 1787
Lamia pallasi Fischer-Waldheim, 1805
Lamia razumoffskii Fischer-Waldheim, 1805
Dorcadion nogelli v. *exclamationis* Thomson, 1867
Dorcadion equestre v. *immaculatum* Kraatz, 1892
Dorcadion equestre v. *quadristrigatum* Kraatz, 1893
Dorcadion equestre v. *niveoconjunctum* Pic, 1900
Dorcadion equestre v. *romaniense* Pic, 1900
Dorcadion equestris v. *bisuturale* Jurecek, 1933
Dorcadion (*Pedestredorcadion*) *equestre* m. *gigantellum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *cheloniforme* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *bistrigatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *bisbiplagiatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *punctereductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *subcheloniforme* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *dorsopunctatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *bisbimaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *pseudonogelii* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *equestre* m. *albopunctatum* Breuning, 1948
Dorcadion equestre v. *quasiochridense* Podany, 1953
Dorcadion equestre m. *transversum* Podany, 1953
Dorcadion equestre v. *tippmanni* Podany, 1953

Dorcadion (*Pedestredorcadion*) *equestre* v. *klinzigi* Podany, 1954
Dorcadion (*Pedestredorcadion*) *equestre* m. *apicebiconjunctum* Breuning, 1958
Dorcadion (*Pedestredorcadion*) *equestre* m. *subsimile* Breuning, 1958
Dorcadion (*Autodorcadion*) *equestre* ab. *apicesubjunctum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *equestre* ab. *apicetrijunctum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *equestre* ab. *kozlovi* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *equestre* ab. *lebedevi* Plavilstshikov, 1958

Original combination: *Cerambyx equestris* Laxmann, 1770

Type loc.: S Russia.

ssp.
***D. equestre equestre* (Laxmann, 1770)**
***D. equestre nogelli* Fairmaire, 1866**
***D. equestre transsilvanicum* Ganglbauer, 1884**
***D. equestre reclinatum* Kraatz, 1892**
***D. equestre ochridense* Heyrovsky, 1935**

There are five distinct subspecies in the World. In Turkey, it is represented by two subspecies as *D. equestre nogelli* Fairmaire, 1866 which occurs only in W Turkey and *D. equestre reclinatum* Kraatz, 1892 which occurs in Serbia, Albania, Macedonia, Greece, Bulgaria, and European Turkey. *D. equestre transsilvanicum* Ganglbauer, 1884 distributes in Hungary, Romania and Moldova. *D. equestre ochridense* Heyrovsky, 1935 is in Serbia, Albania and Macedonia. The nominotypical subspecies, *D. equestre equestre* (Laxman, 1770), is in remaining parts of the distributional area of the species.

Records in Turkey: (EZ-IZ-TRA-TUR)
Turkey as *D. equestre* v. *nogelli* (Ganglbauer, 1884; Aurivillius, 1921); ?İzmir prov.: Ovacık as *D. equestre* v. *exclamationis* (Aurivillius, 1921); Anatolia as *D. equestre* v. *nogelli* and *D. equestre* v. *exclamationis* (Winkler, 1924-1932); Turkey: Noertern parts mainly (Plavilstshikov, 1958); European Turkey and W Anatolia (Breuning, 1962); İzmir prov.: Ödemiş (Bozdağ) as *D. equestre* m. *nogelli* (Breuning, 1962; Pesarini & Sabbadini, 1998); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998; Sama, 2002); Erzurum prov., İzmir prov.: Ödemiş (Bozdağ) (Önalp, 1990); European Turkey (Althoff & Danilevsky, 1997); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Serbia, Macedonia, Albania, Greece, Bulgaria, European Turkey, Romania, Hungary, Poland, Ukraine, Crimea, Moldavia, European Russia), Caucasus, Transcaucasia, Turkey.
Chorotype: E-European.

Dorcadion escherichi Ganglbauer, 1897

Dorcadion egregium Ganglbauer, 1897
Dorcadion escherichi v. *obliquesignatum* Pic, 1900
Dorcadion (*Pedestredorcadion*) *ledereri* m. *cappadocicum* Breuning, 1946

Type loc.: Turkey: Ankara prov.

This species is endemic to C Turkey and near of N parts of C Turkey. Danilevsky in Löbl & Smetana (2010) gave it under the subgenus *Megalodorcadion* and also *D. angorense* as a synonym of this species.

Records in Turkey: (AM-AN-BI-KN-TO-TUR)
Ankara prov. (Ganglbauer, 1897; Aurivillius, 1921); Bilecik prov. (Bodemeyer, 1900); Ankara prov. as *D. egregium* and Konya prov. as as *D. escherichi* ab. *obliquesignatum* (Aurivillius, 1921); Turkey as *D. egregium* Ganglbauer, 1897 (Winkler, 1924-1932; Lodos, 1998); Ankara prov., Konya prov. (Breuning, 1962); Ankara prov.: Gölbaşı (Braun, 1978); Ankara prov.:

Central / Hüseyin Gazi Mountain, Konya prov., Amasya prov., Tokat prov.: Turhal / Niksar (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion etruscum (Rossi, 1790)

Dorcadion femoratum Brulle, 1832
Dorcadion italicum Küster, 1847
Dorcadion nudum Küster, 1852
Dorcadion fuscifrons Chevrolat, 1882
Dorcadion femoratum v. *romanorum* Pic, 1917
Dorcadion femoratum v. *subiacum* Pic, 1917
Dorcadion femoratum v. *apenninum* Depoli, 1926
Dorcadion femoratum v. *apulum* Depoli, 1926
Dorcadion olympianum v. *beieri* Pic, 1932
Dorcadion apulum m. *pseudotruscum* Breuning, 1942
Dorcadion calabricum Breuning, 1942
Dorcadion epirense Breuning, 1942
Dorcadion (*Pedestredorcadion*) *valonense* m. *albosuturale* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *femoratum* m. *apiceseparatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *femoratum* m. *obscurevittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *valonense* m. *apicesignatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *valonense* m. *femorale* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *apulum* m. *pugliense* Breuning, 1956
Dorcadion calabricum m. *apulense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *fiorii* m. *etrusciforme* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *valonense* m. *completevittipenne* Breuning, 1962
Dorcadion tassii Breuning, 1964
Dorcadion pindicum Breuning, 1966

Original combination: *Lamia molitor etrusca* Rossi, 1790

Type loc.: Italy.

ssp.
***D. etruscum etruscum* (Rossi, 1790)**
***D. etruscum bravardi* Pic, 1916**
***D. etruscum fiorii* Breuning, 1942**

This species has three subspecies as the nominotypical subspecies that is distributed only in Italy and Sicily, *D. etruscum fiorii* Breuning, 1942 that is distributed only in S Italy and *D. etruscum bravardi* Pic, 1916 that is distributed in Albania and Greece. It has been reported only by Lodos (1998) from Turkey as *D. nudum* Küster, 1852 in his unrelistic list without any exact locality. However, it is distributed only in Europe (Italy to Greece) now. So, this record is impossible for Turkey.

Records in Turkey: (TUR)
Turkey as *D. nudum* (Lodos, 1998).
Distribution: Italy, Sicily, Albania, Greece.
Chorotype: S-European (SE-European).

Dorcadion ferruginipes Ménétriés, 1836

Dorcadion thracicum Küster, 1846
Dorcadion ferruginipes v. *sublineatum* Pic, 1909
Dorcadion ferruginipes v. *subfuscopubescens* Pic, 1911

Type loc.: Turkey: İstanbul prov.

This species is distributed in NW Turkey. It was listed by Steiner (2003) as possible for Greece.

Records in Turkey: (IS-KO-SA-TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); İstanbul prov.: Alem Mt. as *D. ferruginipes* ab. *subfuscopubescens* (Aurivillius, 1921); Anatolia and European Turkey (Winkler, 1924-1932); İstanbul prov.: Alem Mt., European Turkey (Breuning, 1962); Kocaeli prov.: İzmit (Gebze) (Braun, 1978); İstanbul prov.: Alem Mt., Sakarya prov.: Sapanca (Önalp, 1990); European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, European Turkey), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion formosum Kraatz, 1870

Dorcadion (*Pedestredorcadion*) *formosum* m. *inincisum* Breuning, 1946
Dorcadion (*Autodorcadion*) *formosum* ab. *concomitatum* Plavilstshikov, 1958

Type loc.: ?Caucasus (There was no exact locality in the original description. Kraatz only said that the materials were received by him together with Caucasian insects).

ssp.
***D. formosum formosum* Kraatz, 1870**
***D. formosum ponticum* Breuning, 1970**

This species has two subspecies. It is represented by both subspecies in Turkey. Probably it is distributed in Eastern half of Anatolia. The absence of *D. formosum* in Transcaucasia was underlined by Plavilstshikov (1958: 206). So Danilevsky & Miroshnikov (1985) never mentioned it for Caucasus. It is known up to now from Syria and Turkey only.

Records in Turkey: (GA-GI-TO-TUR)
Tokat prov., Gaziantep prov. (Breuning, 1962); NE Turkey: Pontic Alpes as the type loc. of ssp. *ponticum* (Breuning, 1964); Giresun prov.: Eğribel pass as *D. formosum ponticum* (Braun, 1978); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey, Syria.
Chorotype: SW-Asiatic (Syro-Anatolian).

Dorcadion gallipolitanum Thomson, 1867

Dorcadion suturaalba Desbrochers, 1870
Dorcadion gallipolitanum v. *potamense* Jurecek, 1931
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *biapicevittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *latesuturale* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *subregulare* Breuning, 1948
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *plurivittatum* Breuning, 1948
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *stramentosopubescens* Breuning, 1948
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *anormale* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *fuscosubpubescens* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *regularesuturale* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *parapotamense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *parterufum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *plurialbovittatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *pseudogandolphei* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *pseudopotamense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *subpotamense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *gallipolitanum* m. *subgandolphei* Breuning, 1962

Type loc.: Turkey: Çanakkale prov.: Gelibolu (=Gallipoli).

ssp.
***D. gallipolitanum gallipolitanum* Thomson, 1867**

***D. gallipolitanum gandolphei* Tournier, 1872**
***D. gallipolitanum samothrakeanum* Breuning, 1962**

This species has three subspecies. It is represented by two subspecies in Turkey as nominotypical subspecies and *D. gallipolitanum gandolphei* Tournier, 1872 occurs in NE Greece and NW Turkey (Thrace). The other known subspecies *D. gallipolitanum samothrakieanum* Breuning, 1962 occurs only in Greece (Samothrace Island). In addition to this, *D. atritarse* Pic, 1931 is given by Danilevsky (2010a) as a subspecies of this species. However, according to Breuning (1962) and Steiner (2003), *D. atritarse* is a separate species. According to Danilevsky in Löbl & Smetana (2010), *D. gandolphei* is a synonym of the nominotypical subspecies.

Records in Turkey: (CA-ED-IS-TRA-TUR)
Type loc.: Turkey: Çanakkale prov.: Gelibolu (Thomson, 1867); Turkey: Çanakkale prov.: Gelibolu (Ganglbauer, 1884; Aurivillius, 1921); Turkey: Çanakkale prov.: Gelibolu as *D. gandolphei* (Ganglbauer, 1884); European Turkey (Winkler, 1924-1932; Althoff & Danilevsky, 1997); Çanakkale prov.: Gelibolu, European Turkey (Breuning, 1962); Edirne prov.: Keşan (Braun, 1978; Adlbauer, 1988); İstanbul prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, European Turkey), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion gebzeense Breuning, 1974

Dorcadion tosyense Breuning

Type loc.: Turkey: Kocaeli: İzmit: Gebze.

This species is endemic to NW Anatolia of Turkey. It was originally described as a separate species and was placed by Braun (1978) as a morpha of *D. punctipenne* Küster, 1852. Then, Sama (1982) gave it as a subspecies of *D. punctipenne* Küster, 1852 and he stated its attribution to *D. punctipenne* Küster, 1852 was carried out by Braun. Sama (1982) reported it from Kastamonu province (Ilgaz: Tosya) and he mentioned that this specimen was labelled by Breuning's hand writing as "*Dorcadion tosyense* mihi, type".

Records in Turkey: (KO-KS)
Kocaeli prov.: İzmit (Gebze) (Breuning, 1974; Braun, 1978); Kastamonu prov.: Ilgaz (Tosya) as *D. punctipenne gabzeense* (Sama, 1982).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion glabricolle Breuning, 1943

Type loc.: Turkey: Anatolia (presumably Kurdistan ex Breuning, 1962).

It is endemic to Turkey. This species probably is distributed in E Turkey.

Records in Turkey: (TUR)
Anatolia (Breuning, 1943); Anatolia (presumably Kurdistan) (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion glabrofasciatum Daniel, 1901

Dorcadion (*Pedestredorcadion*) *glabrofasciatum* m. *imparivittatum* Daniel, 1901
Dorcadion (*Pedestredorcadion*) *glabrofasciatum* m. *parivittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *glabrofasciatum* m. *glabroseparatum* Breuning, 1962

Type loc.: Turkey: Bithynia.

It is endemic to Turkey. This species probably is distributed in W half of Turkey. Danilevsky in Löbl & Smetana (2010) gave it under the subgenus *Megalodorcadion*.

Records in Turkey: (AF-BI-ES-IZ-TUR-US)
Type loc.: Turkey: Bithynia (Daniel, 1901); Bilecik prov. (Bodemeyer, 1900); Bilecik prov. as *D. glabrofasciatum* var. *imparivittatum* (Bodemeyer, 1906); Anatolia: Bythinia (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Bilecik prov., Eskişehir prov.: Bozdağ (Breuning, 1962); Uşak prov. (Demelt, 1963); Afyon prov.: Bayramgazi (Braun, 1978); Bilecik prov., İzmir prov.: Ödemiş (Bozdağ), Eskişehir prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion glaucum Faldermann, 1837

Type loc.: Iran.

ssp.
***D. glaucum glaucum* Faldermann, 1837**
***D. glaucum deschampsi* (Villiers, 1967)**

This species has two subspecies as the nominotypical subspecies and *D. glaucum deschampsi* (Villiers, 1967) of which original combination is *Pedestredorcadion glaucum descampsi* Villiers, 1967. Both subspecies described from Iran. This species has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from Caucasus and Iran now. So, this record is not confirmed for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Iran, Caucasus.
Chorotype: SW-Asiatic (Irano-Caucasian).

Dorcadion haemorrhoidale Hampe, 1852

Dorcadion (*Pedestredorcadion*) *haemorrhoidale* m. *sublineiferum* Breuning, 1946
Dorcadion (*Autodorcadion*) *haemorrhoidale* m. *vittidorsum* Plavilstshikov, 1958

Type loc.: Armenia.

This species is distributed only in N Turkey.

Records in Turkey: (AG-AN-EZ-TUR)
NE Turkey (Plavilstshikov, 1958); Erzurum prov.: Aşkale (Gfeller, 1972); Ağrı prov.: Taşlıçay (Braun, 1978); Northern Turkey (Danilevsky & Miroshnikov, 1985); Ağrı prov.: N of Bayazıt, Ankara prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion halepense (Kraatz, 1873)

Dorcadion saulcyi v. *halepense* Kraatz, 1873
Dorcadion aleppense v. *internesignatum* Pic, 1914
Dorcadion aleppense v. *latealbum* Pic, 1926
Dorcadion aleppense v. *internenotatum* Pic, 1931
Dorcadion aleppense v. *latebivittatum* Pic, 1931
Dorcadion aleppense v. *tabense* Pic, 1931
Dorcadion (*Pedestredorcadion*) *halepense* m. *pseudomardinense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *halepense* m. *brunneosericans* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *halepense* m. *akbesianum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *halepense* m. *pseudosimile* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *halepense* m. *dorsoinvittatum* Breuning, 1948

Original combination: *Dorcadion saulcyi* var. *halepense* Kraatz, 1873

Type loc.: Syria: Aleppo.

This species is distributed only in central parts of S Anatolia for Turkey.

Records in Turkey: (GA-HT-TUR)
Gaziantep prov. (Breuning, 1962); Gaziantep prov.: Sakçagözü, Kilis prov. (Braun, 1978); Gaziantep prov.: Toros Mountains, Hatay prov.: Akbez, Toros Mountains (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Syria, Turkey.
Chorotype: SW-Asiatic (Syro-Anatolian).

Dorcadion hampii Mulsant & Rey, 1863

Dorcadion (*Pedestredorcadion*) *hampei* m. *claresuturale* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *hampei* m. *discofasciatum* Breuning, 1946

Type loc.: Iran (mistaken information). ?Anatolia.

ssp.
***D. hampii hampii* Mulsant & Rey, 1863**
***D. hampii aureovittatum* Kraatz, 1873**

This species has two subspecies as the nominotypical subspecies and *D. hampii aureovittatum* Kraatz, 1873 of which original combination is *Dorcadion aureovittatum* Kraatz, 1873. It was described by Kraatz (1873) from Sivas province (Turkey). This species is represented by both subspecies in Turkey. The nominotypical subspecies is distributed in NE Turkey (eastwards from Erzurum province) and the other subspecies, *D. hampii aureovittatum* Kraatz, 1873, mostly is distributed central parts of N Turkey (westwards from Erzurum province). The type locality is very likely mistaken information as Iran. However, Plavilstshikov (1958) mentioned Iran and Turkey for distribution area of this species. Breuning (1962) stated that the type locality, Iran is mistaken information ("irrige Angabe"). Therefore, this species is distributed only in C and E parts of N Anatolia. It is endemic to Turkey.

Records in Turkey: (AM-EZ-KAR-SV-TO-TUR)
Anatolia: Pontus as *D. aurovittatum* (Aurivillius, 1921);Anatolia (Winkler, 1924-1932); NE Turkey: Kars prov., Erzurum prov. (Plavilstshikov, 1958); Amasya prov., Tokat prov. (Breuning, 1962); Sivas prov. as *D. hampei aureovittatum* Kraatz, 1873 (Breuning, 1962); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion heinzi (Breuning, 1964)

Original combination: *Dorcadion saulcyi* var. *halepense* Kraatz, 1873

Type loc.: Turkey: Giresun prov..

Özdikmen (2007) mentioned that the species distributes only in North-Eastern Turkey. According to Braun (1979), *D. heinzi* Breuning, 1964 that described from Eğribel pass in Giresun province (North Turkey) as a subspecies of *D. cinerarium* is a separate species.

Records in Turkey: (GI)
Giresun prov.: Eğribel pass (Braun, 1978, 1979); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion hellmanni Ganglbauer, 1884

Dorcadion (*Pedestredorcadion*) *hellmanni* m. *ingens* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *hellmanni* m. *postjunctum* Breuning, 1946
Dorcadion (*Autodorcadion*) *hellmanni* ab. *chrysum* Plavilstshikov, 1958

Type loc.: Iran.

This species is distributed only in E Turkey.

Records in Turkey: (HA-VA-TUR)
NE Turkey (Plavilstshikov, 1958); Van prov.: Gürpınar, Hakkari prov.: Bajirgi (Fuchs et Breuning, 1971 ex Holzschuh, 1980); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Armenia, Iran, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion holosericeum Krynicki, 1832

Dorcadion holosericeum v. rossicum Plavilstshikov, 1934
Lamia (*Dorcadion*) *striata* Dalman, 1817
Dorcadion (*Pedestredorcadion*) *holosericeum* m. *bojanense* Breuning, 1962
Dorcadion (*Autodorcadion*) *holosericeum* ab. *beslanicum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *holosericeum* ab. *taciturnum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *tristriatum* ab. *autovirgatum* Plavilstshikov, 1958

Type loc.: Ukraine: Ekaterinoslav.

ssp.
***D. holosericeum holosericeum* Krynicki, 1832**
***D. holosericeum tristriatum* Suvorov, 1913 (Caucasus)**

This species has two subspecies. It has been recorded only by Lodos (1998) from Turkey as *D. striatum* Dalman, 1817 in his unrealistic list without any exact locality. However, it is distributed only in European Russia, Ukraine, Crimea, Caucasus and Kazakhstan now. So, this record is not confirmed and is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: European Russia, Ukraine, Crimea, Caucasus, Kazakhstan.
Chorotype: E-European.

Dorcadion holtzi (Pic, 1905)

Original combination: *Dorcadion culminicola* v. *holtzi* Pic, 1905

Type loc.: Turkey: Dümbelek Dagh.

This species is endemic to SCW Turkey.

Records in Turkey: (IC)
İçel prov.: Bolkar Mts. as *D. culminicola* var. *holtzi* (Bodemeyer, 1906); Cilician Taurus: Funduk-Pungar (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion holzschuhi Breuning, 1974

Type loc.: Turkey: Muş prov..

This species is endemic to E Turkey.

Records in Turkey: (MU)
Muş prov.: Buğlan pass (Breuning, 1974); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion iconiense Daniel, 1901

Dorcadion semisetosum Jakovlev, 1901
Dorcadion iconiense v. *fulvovestitum* Pic, 1903
Dorcadion (*Pedestredorcadion*) *iconiense* m. *posticeapertum* Breuning, 1946

Type loc.: Turkey: Konya prov..

This species is endemic to Turkey. It distributes in Central Anatolia of Turkey. Breuning (1962) stated *D. semisetosum* Jakovlev, 1901 that described from Konya province was a synonym of *D. iconiense*. According to Braun (1978), *D. subatritarse* Breuning, 1966 is a synonym of *D. iconiense*. Also according to Braun (1979), *D. muchei* Breuning, 1962 is a synonym of *D. iconiense* Daniel, 1901.

Records in Turkey: (AK-KIR-KN-KY-YO-TUR)
Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Turkey as *D. semisetosum* (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Konya prov. (Breuning, 1962); Aksaray prov.: Central, Kırşehir prov.: Mucur, Kayseri prov.: Çallıgedik pass, Yozgat prov.: Çiçekdağı (Braun, 1978); Yozgat prov.: Çiçekdağı pass, Aksaray prov., Kırşehir prov.: Mucur, Kayseri prov.: Çallıgedik pass, Konya prov. (from map in Braun, 1979); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion impressicolle Kraatz, 1873

Dorcadion (*Pedestredorcadion*) *impressicolle* m. *diversipes* Breuning, 1946

Type loc.: Syria.

D. impressicolle v. *tokatense* that was described by Pic (1901) from Anatolia (Tokat prov.), was given by Breuning (1962) as a synonym of *D. cinerarium* m.

micans Thonson, 1867. The Anatolian records of Winkler (1924-1932) and Lodos (1998) belong to this taxon. However the species has been recorded only from Syria and Lebanon now. So, this species is not confirmed for Turkey (see *D. cinerarium* for more information).

Distribution: Syria, Lebanon.
Chorotype: E-Mediterranean.

Dorcadion indutum Faldermann, 1837

Dorcadion nigrosuturatum Reitter, 1896
Dorcadion indutum v. *pulchrum* Pic, 1908
Dorcadion griseipenne Breuning, 1943
Dorcadion (*Pedestredorcadion*) *indutum* m. *discolineatum* Breuning, 1946
Dorcadion (*Autodorcadion*) *indutum* ab. *discocontectum* Plavilstshikov, 1958

Type loc.: Transcaucasia.

ssp.
***D. indutum indutum* Faldermann, 1837**
***D. indutum nigrosuturatum* Reitter, 1897**

This species has two subspecies as the nominotypical subspecies and *D. indutum nigrosuturatum* Reitter, 1897 which is only distributed in Caucasus (Armenia: north-westwards Sevan Lake) according to Danilevsky (2010b). He stated that *D. griseipenne* was also described from here (Armenia: Semenovka). So he gave it as a synonym of *D. indutum nigrosuturatum* Reitter, 1897. The nominotypical subspecies is distributed in Caucasus and Iran. This species has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from Caucasus and Iran now. So, this record is not confirmed for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Iran, Caucasus.
Chorotype: SW-Asiatic (Irano-Caucasian).

Dorcadion infernale Mulsant & Rey, 1863

Dorcadion rugosum Thomson, 1867
Dorcadion infernale v. *revestitum* Daniel, 1901
Dorcadion infernale ab. *immutatum* Pic, 1903 [Anatolia: Bozdağ]
Dorcadion infernale ab. *costidorsum* Heyrovsky, 1932
Dorcadion (*Pedestredorcadion*) *infernale* m. *subrevestitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *infernale* m. *murinum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *infernale* m. *irrevestitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *infernale* m. *albosuturatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *infernale* m. *discopartevestitum* Breuning, 1962

Type loc.: Iran (mistaken information). ?Anatolia.

ssp.
***D. infernale infernale* Mulsant & Rey, 1863**
***D. infernale asperatum* Breuning, 1947**
***D. infernale edremitense* Breuning, 1966**

According to Danilevsky in Löbl & Smetana (2010), this species has three subspecies as the nominotypical subspecies, *D. infernale asperatum* Breuning, 1947 which described from Diyarbakır province (SE Turkey) and *D. infernale edremitense* Breuning, 1966 which described from Balıkesir province: Edremit

(NW Anatolia). He stated that *D. griseipenne* was also described from here (Armenia: Semenovka). So he gave it as a synonym of *D. indutum nigrosuturatum* Reitter, 1897. The nominotypical subspecies is distributed in Caucasus and Iran. This species has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from

This species is represented by both subspecies in Turkey. The nominotypical subspecies is distributed rather widely in Turkey and the other subspecies, *D. infernale asperatum* Breuning, 1947 is distributed only in SE Turkey. The type locality is very likely mistaken information as Iran. Breuning (1962) stated that the type locality, Iran is mistaken information ("irrige Angabe"). Therefore, this species is distributed only in Anatolia. It is endemic to Turkey.

Records in Turkey: (AM-AN-ANT-BI-BL-BU-CO-DI-ES-IC-IZ-KA-KN-NI-SV-US-TUR)
Turkey: Amasya prov. (Ganglbauer, 1884; Aurivillius, 1921); Bilecik prov., Eskişehir prov., Burdur prov.: Karakent, Konya prov.: Akşehir as *Dorcadion infernale*; Niğde prov.: Çamardı, Antalya prov.: Toros Mountains as *Dorcadion infernale* var. *revestitum* (Bodemeyer, 1900); Eskişehir prov.: Central / Boz Mountain as *Dorcadion infernale* var. *immutatum*; Eskişehir prov.: Boz Mountain as *Dorcadion infernale* var. *revestitum* (Bodemeyer, 1906); İzmir prov.: Bozdağ as *D. infernale* ab. *immutatum* (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Anatolia as *D. infernale* v. *rugosum* (Winkler, 1924-1932); Bilecik prov., Eskişehir prov., Konya prov.: Akşehir, Niğde prov.: Bolkar-Mağden, Diyarbakır prov. (Breuning, 1962); Uşak prov. (Demelt, 1963); Balkesir prov.: Edremit (Breuning, 1966); Bilecik prov., Çorum prov.: Central / Mecitözü, Eskişehir prov.: Sultandere (Braun, 1978); Eskişehir prov., İzmir prov.: Ödemiş (Bozdağ), Bilecik prov., Ankara prov., Amasya prov., Konya prov., Kahramanmaraş prov.: Ahır Mountain (Önalp, 1990); İçel prov.: Tarsus (Çamlıyayla) (Adlbauer, 1992); Turkey (Lodos, 1998); Ankara prov.: Beynam, Sivas prov.: Karayün village (Özdikmen & Hasbenli, 2004a); Ankara prov.: Bayındır Dam and Ayaş-Polatlı road (Sarıoba env.) (Özdikmen, 2006); Ankara prov.: Ayaş-Polatlı road (Özdikmen et al., 2009); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion inspersum Holzschuh, 1982

Type loc.: Turkey: Van prov.: Kuzgunkıran pass.

This species was described on the base of only 1 male specimen (as holotype). It has been known only from the description locality. It is endemic to E Turkey.

Records in Turkey: (VA)
Van prov.: Kuzgunkıran pass (Holzschuh, 1982); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion investitum Breuning, 1970

Type loc.: Turkey: Erzurum prov.

This species is endemic to NE Turkey.

Records in Turkey: (EZ)
Erzurum prov.: Horasan, Tahir pass (Braun, 1978).

Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ispartense Breuning, 1962

Type loc.: Turkey: Isparta prov.

This species has been known only from the description locality. It is endemic to western Mediterranean Region of Turkey. The distribution was given by Danilevsky in Löbl & Smetana (2010) as only Iran wrongly.

Records in Turkey: (IP)
Isparta prov.: Bozanönü (Breuning, 1962).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion jakovleviellum Plavilstshikov, 1951

Type loc.: Turkey: Erzurum prov.

This species has been known only from the description locality. It is endemic to NE Turkey.

Records in Turkey: (EZ-KAR)
Erzurum prov. and near (Plavilstshikov, 1958); Kars prov.: Kısırdağ/Susuz (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion janatai Kadlec, 2006

Type loc.: Turkey: Tunceli prov.: Karaoğlan Mt.

This species has been known only from the description locality. It is endemic to E Turkey (W parts of Eastern Anatolian Region).

Records in Turkey: (TU-TUR)
Tunceli prov.: Karaoğlan Mt. (Kadlec, 2006); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion johannisfranci Pesarini & Sabbadini, 2007

Type loc.: Greece: Evros.

This species was described by Pesarini & Sabbadini (2007) from Greece (Tracia: Evros: Monastiraki). Paratypes are from Evros (many males and females) and European Turkey: Edirne province (1 male) (Pesarini & Sabbadini, 2007). So this species has been known only from European Turkey for Turkey. It is endemic to Thracia.

Records in Turkey: (ED-TUR)
Edirne prov. (Pesarini & Sabbadini, 2007); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian) or Thracian.

Dorcadion kagyzmanicum Suvorov, 1915

Type loc.: Turkey: Kars prov.: Kağızman.

This species is endemic to NE Turkey. Danilevsky (2010b) stated that "*D. czegodaevi (described from north Azerbajdzhan from the area between Sheki and Maraza) was recorded for Soviet Azerbaidzhan (Plavilstshikov, 1958) as D. kagyzmanicum Suvorov, 1915. D. kagyzmanicum was also recorded for "Leninakan" (now Giumri in Armenia, before Alexandropol) by Plavilstshikov (1948), but later (Plavilstshikov, 1958) the record was not repeated by the author, so, most probably it was connected with wrong identification of D. argonauta. D. kagyzmanicum absent on the territory of the former USSR*". So this species is endemic to NE Turkey. Moreover, according to Danilevsky in Löbl & Smetana (2010), *D. kagyzmanicum* Suvorov, 1915 is a synonym of *D. basale* Kraatz, 1873 which was regarded as a subspecies of *D. sulcipenne* from Armenia by Breuning (1962).

Records in Turkey: (KAR-TUR)
Kars prov.: Kağızman (Plavilstshikov, 1958; Breuning, 1962); NE Turkey (Danilevsky & Miroshnikov, 1985).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion karsense Suvorov, 1915

Type loc.: Turkey: Kars prov.: Kağızman.

This species is endemic to NE Turkey. The type locality that was given by Breuning (1962) as "Russich-Armenien: Kagysman", is mistaken information. Plavilstshikov (1958) mentioned this species only for Kars, Ardahan (Turkey).

Records in Turkey: (AR-KAR-TUR)
Kars, Ardahan prov. (Plavilstshikov, 1958); Kars prov.: Kağızman (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion kasikoporanum Pic, 1902

Type loc.: Turkey: Iğdır prov.: Tuzluca: Kazkoparanvillage.

This species is distributed only in NE Anatolia for Turkey. Danilevsky (2010b) stated that "*the holotype male (13mm) is preserved in Museum National d'Histoire Naturelle (Paris) with the labels: "Russ Armenia, Kasikoporan, 1901, Korb." [printed] and "kasikoporanum Pic" by Pic's hand. I do not see any differences between holotype and two males (12.8-13.5mm) from collection of C.Holzschuh: "TR. bor. or., GÖLE env., 24.5.1992, J. Macek leg." [Göle NW*

Kars?], as well as from Armenian specimens (m: 11.0-14.5mm, f: 11.8-14.6mm)". Göle now is in Ardahan province.

Records in Turkey: (AR-IG)
Iğdır prov.: Tuzluca: Kazkoparan village (Pic, 1902; Plavilstshikov, 1958; Breuning, 1962); N Turkey (Danilevsky & Miroshnikov, 1985); Turkey (Lodos, 1998); Ardahan prov.: Göle (Lazarev, 2009); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus (Armenia), Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian, Irano-Caucasian, Irano-Anatolian).

Dorcadion kindermanni Waltl, 1838

Dorcadion griseum Waltl, 1838
Dorcadion (*Pedestredorcadion*) *kindermanni* m. *fuscoquadriplagiatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *kindermanni* m. *fuscoreductum* Breuning, 1946

Type loc.: Turkey: İzmir prov.: Ödemiş.

This species is endemic to W half of Turkey.

Records in Turkey: (AN-IZ-TRA-TUR-US)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); Anatolia and European Turkey (Winkler, 1924-1932); İzmir prov.: Ödemiş (Breuning, 1962); Uşak prov. (Demelt, 1963); İzmir prov.: Bornova, Uşak prov. (Demelt, 1963 ex Gül-Zümreoğlu, 1975); İzmir prov.: Bornova (Gül-Zümreoğlu, 1975); İzmir prov., Uşak prov., Ankara prov.: Beynam Forest and Hüseyin Gazi Mountain (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion kraetschmeri Bernhauer, 1988

Type loc.: Turkey: Antalya prov.: Akseki.

This species is endemic to SW Turkey. It has been known only from type locality until now.

Records in Turkey: (ANT-TUR)
Antalya prov.: Akseki (Bernhauer, 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion kurdistanum Breuning, 1944

Dorcadion (*Pedestredorcadion*) *kurdistanum* m. *rufulipes* Breuning, 1963

Type loc.: Turkey: Diyarbakır prov..

It is endemic to SE and E Turkey. *D. kurdistanum* m. *rufulipes* Breuning, 1963 was given by Fuchs & Breuning (1971) as an eastern subspecies of this species. However, the taxonomic status of the taxon needs to be clarified.

Records in Turkey: (BN-DI-TUR)
Diyarbakır prov. (Breuning, 1962); Bingöl prov. as *D. kurdistanum rufulipes* (Fuchs & Breuning, 1971); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion kurucanum Holzschuh, 2007

Type loc.: Turkey: Elazığ ğrov..
It is endemic to E Turkey. It has been known only from type locality until now.

Records in Turkey: (TUR)
Elazığ prov.: Kuruca pass (Holzschuh, 2007); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ladikanum Braun, 1976

Dorcadion (*Pedestredorcadion*) *ladikense* Breuning, 1975 [Anatolia: Samsun prov.: Ladik]
Dorcadion paraladikense Breuning, 1977[replacement name]

Type loc.: Turkey: Samsun prov.: Ladik.

This species is endemic to NC Turkey. It has been known only from type locality until now. *Dorcadion* (*Pedestredorcadion*) *ladikense* Breuning, 1975 was described by Breuning (1975) from Ladik. This taxon is a junior homonym of *D. piochardi ladikense* Breuning & Villiers, 1967. So it was replaced by Breuning (1977) as *D. paraladikense*. Danilevsky in Löbl & Smetana (2010) gave it as a synonym of *D. ladikanum* Braun, 1976.

Records in Turkey: (SM-TUR)
Samsun prov.: Ladik (Breuning, 1975 and 1977; Braun, 1976); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion laeve Faldermann, 1837

Dorcadion persicum Faldermann, 1837
Dorcadion plasoni Ganglbauer, 1884 [Iran]
Dorcadion plasoni v. *pernudum* Reitter, 1913
Dorcadion hyrcanum Jakovlev, 1900
Dorcadion discodivisum Pic, 1939
Dorcadion (*Pedestredorcadion*) *persicum* m. *rufofemoratum* Breuning, 1946 [Iran]
Dorcadion (*Autodorcadion*) *laeve* ab. *assuetum* Plavilstshikov, 1958

Type loc.: ?Iran.

ssp.
***D. laeve laeve* Faldermann, 1837**
***D. laeve micula* Plavilstshikov, 1937**
***D. laeve hyrcanum* Jakovlev, 1900**
***D. laeve vladimiri* Danilevsky & Murzin, 2009**

Breuning (1962) did not give the type locality of this species. This species has four subspecies. Danilevsky (2010b) stated that "*according to Danilevsky and Murzin (2009): laeve laeve Faldermann, 1837 (= D. plasoni Ganglbauer, 1884) is distributed in Luristan, Kermanshah and Iranian Kurdistan; D. laeve micula Plavilstshikov, 1937, stat.n. (described from Olty as a species); D. laeve hyrcanum Jakovlev, 1900, stat.n. (described as a species from Mazanderan); D. laeve vladimiri Danilevsky & Murzin, 2009 is known from several localities of south Armenia*". The Gümüşhane province record of Özdikmen & Hasbenli (2004a) and Özdikmen (2007) based on three specimens of *D. dimidiatum*. Therefore it has only been recorded by Plavilstshikov from Turkey until now.

Records in Turkey: (EZ-TUR)
Erzurum prov.: Oltu as *D. micula* (Plavilstshikov, 1958); Anatolia as *D. leave macula* (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus (Armenia), Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion lameeri Théry, 1896

Dorcadion (*Pedestredorcadion*) *lameeri* m. *discoimmaculatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *lameeri* m. *dorsodisjunctum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *lameeri* m. *nigrofemoratum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *lameeri* m. *posthumerovittatum* Breuning, 1962

Type loc.: Turkey: Kastamonu prov..

This species is endemic to Western Black Sea Region of N Turkey. The old records of Gaziantep prov.: Islahiye (Özdikmen et al., 2005) and Kahramanmaraş prov.: Göksun (Özdikmen & Okutaner, 2006) were identified by M. L. Danilevsky as belonging to *D. cinerarium*.

Records in Turkey: (KS-TUR)
Kastamonu prov. (Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998); Kastamonu prov. as *D. l.* m. *nigrofemoratum, D. l.* m. *discoimmaculatum, D. l.* m. *posthumerovittatum, D. l.* m. *dorsodisjunctum* (Breuning, 1962); Kastamonu prov.: Ilgaz Mountain (Demelt, 1967); Kastamonu prov.: paratypes (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ledereri Thomson, 1865

Dorcadion (*Pedestredorcadion*) *ledereri* m. *discoseparatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *ledereri* m. *preconjunctum* Breuning, 1946

Type loc.: Turkey.

This species is endemic to central parts of N Turkey. Danilevsky in Löbl & Smetana (2010) gave it under the subgenus *Megalodorcadion*.

Records in Turkey: (AM-SM-TUR)
Amasya prov. (Ganglbauer, 1884); Amasya prov. as *D. parallelum* v. *ledereri* (Aurivillius, 1921); Samsun prov., Amasya prov. (Breuning, 1962): Anatolia as *D. parallelum* v. *ledereri* Thomson, 1865 (Winkler, 1924-1932); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ledouxi Breuning, 1974

Type loc.: Turkey: Erzurum prov.: Ilıca.

This species is endemic to NE Turkey. It has been known only from type locality until now.

Records in Turkey: (EZ-TUR)
Erzurum prov.: Ilıca (Breuning, 1974); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion linderi Tournier, 1872

Dorcadion kollari Kraatz, 1873
Dorcadion henrici Pic, 1905 [Turkey: Tokat prov.]
Dorcadion (*Pedestredorcadion*) *kollari* m. *anticepunctatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *kollari* m. *quadripunctum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *kollari* m. *unipunctum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *kollari* m. *dorsoimmaculipenne* Breuning, 1966 [Turkey: Çorum prov.: Boğazkale]

Type loc.: Spain (irrige Angabe).

This species is endemic to NC Turkey. According to Breuning (1962), *D. henrici* Pic, 1905 is a synonym of *D. kollari*. Breuning (1962) stated that the type locality, Spain is mistaken information ("irrige Angabe").

Records in Turkey: (AM-CO-TO-TUR)
Amasya prov. (Ganglbauer, 1884; Aurivillius, 1921); Tokat prov. as *D. henrici* (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Turkey as *D. henrici* Pic, 1905 (Winkler, 1924-1932; Lodos, 1998); Amasya prov., Tokat prov. (Breuning, 1962); Çorum prov.: Boğazkale as the type loc. of *Dorcadion kollari* m. *dorsoimmaculipenne* (Breuning, 1966); Amasya prov., Tokat prov. as *Dorcadion kollari*); Çorum prov.: Boğazkale as *Dorcadion kollari* m. *kollari*; Çorum prov.: Boğazkale as *Dorcadion kollari* m. *linderi*; Çorum prov.: Boğazkale as *Dorcadion kollari* m. *dorsoimmaculipenne* (Perissinotto & Luchini, 1966); Tokat prov.: Niksar (Ardıçlı) (Sama, 1982); Turkey (Lodos, 1998).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion lineatocolle Kraatz, 1873

Dorcadion lineatocolle v. *atrofemoratum* Pic, 1917
Dorcadion lineatocolle v. *riveti* Pic, 1927
Dorcadion sinuaticolle Pic, 1927
Dorcadion (*Pedestredorcadion*) *lineatocolle* m. *glabrovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *lineatocolle* m. *femoratoides* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *lineatocolle* m. *rubroapicale* Breuning, 1946

Original combination: *Dorcadion femoratum* v. *lineatocolle* Kraatz, 1873

Type loc.: Greece: Saloniki.

This species has been recorded by Önalp (1990) for Turkey on the base of 2 specimens (1 male and 1 female) in Senckenberg Museum and 2 specimens (1 male and 1 female) in her collection. It probably is distributed only in European Turkey for Turkey.

Records in Turkey: (TRA)
?European Turkey (Önalp, 1990; Lodos, 1998).
Distribution: Serbia, Macedonia, Greece, Bulgaria, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian) or Balkanian.

Dorcadion litigiosum Ganglbauer, 1884

Type loc.: Romania.

ssp.
***D. litigiosum litigiosum* Ganglbauer, 1884**
***D. litigiosum otshakovi* Suvarov, 1913**

This species has two subspecies as nominotypical subspecies and *D. litigiosum otshakovi* Suvarov, 1913 which described from Kherson (Ukraine). This species has been reported only by Lodos (1998) from Turkey in his unrelistic list without any exact locality. However, it is distributed only in Europe (Romania, Ukraine, Moldavia, ?Bulgaria) now. So, this record is not confirmed for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Romania, Ukraine, Moldavia, ?Bulgaria.
Chorotype: Carpathian.

Dorcadion lodosi Sabbadini & Pesarini, 1992

Type loc.: Turkey: Karaman prov.: Bucakkışla.

This species is endemic to CS Turkey. It has been known only from type locality until now.

Records in Turkey: (KM-TUR)
Karaman prov. (Sabbadini & Pesarini, 1992); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion lohsei Braun, 1976

Dorcadion sertavuli Breuning,

Type loc.: Turkey: İçel prov.: Sertavul pass.

This species is endemic to central parts of SCW Turkey (Cilician Taurus).

Records in Turkey: (IC-KM-TUR)
Karaman prov., İçel prov.: Mut (Sertavul pass) (Braun, 1978); İçel prov.: Sertavul pass (Sama, 1982; Adlbauer, 1992); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion longulum Breuning, 1943

Type loc.: Turkey: İzmir prov.: Bozdağ.

This species is endemic to W Turkey. It has been known only from type locality until now.

Records in Turkey: (TUR)
W Turkey: İzmir prov.: Bozdağ (Breuning, 1943, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion lugubre Kraatz, 1873

Dorcadion lugubre v. *sparsepilosum* Pic, 1926
Dorcadion (*Pedestredorcadion*) *lugubre* m. *densepilosum* Breuning, 1946

Type loc.: ?Greece: Saloniki.

ssp.
***D. lugubre lugubre* Kraatz, 1873**
***D. lugubre pseudolugubre* Breuning, 1943**

This species has two subspecies as the nominotypical subspecies and *D. lugubre pseudolugubre* Breuning, 1943 which described from Macedonia (?Greece). Danilevsky (2010b) stated that "*the type locality of D. lugubre Kraatz, 1873 was accepted by Breuning (1962) as "Saloniki" without good reasons. The identification of its real type locality needs further investigations, as the base for Kraatz description were materials of Frivaldszky from "Macedonien" without more precise indication*".

This species is distributed mostly in Northern parts for Turkey.

Records in Turkey: (AM-SV-TRA)
Amasya prov., European Turkey (Önalp, 1990); Sivas prov.: Karayün village (Özdikmen & Hasbenli, 2004a).
Distribution: Europe (Albania, Macedonia, Greece, Bulgaria), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion maceki Holzschuh, 1995

Type loc.: Turkey: Bolu prov.: Abant Lake.

This species is endemic to SCW Turkey. It has been known only from type locality until now.

Records in Turkey: (BO-TUR)
Bolu prov.: Abant Lake (Holzschuh, 1995); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion margheritae Breuning, 1964

Dorcadion (*Pedestredorcadion*) *margheritae* m. *katarense* Breuning, 1969

Type loc.: Greece: Metsovo.

This species is distributed only in NW parts for Turkey. According to Pesarini & Sabbadini (2007), *D. lianokladii* Breuning, 1962; *D. margheritae* Breuning, 1964; *D. johanninae* Breuning, 1967 and *D. wewalkai* Breuning, 1974 are synonyms of *D.* (*Cribridorcadion*) *taborskyi* Heyrovsky, 1941 which described from Oeta Mt. (Greece).

Records in Turkey: (CA-TRA)
Çanakkale prov.: Ezine as *D. margheritae* (Adlbauer, 1988); European Turkey as *D. margheritae* (Althoff & Danilevsky, 1997).
Distribution: Europe (Greece, European Turkey), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion martini Bernhauer, 1988

Type loc.: Turkey: Ankara prov.: Nallıhan.

This species is endemic to CN Turkey. It has been known only from type locality until now.

Records in Turkey: (AN-TUR)
Ankara prov.: Nallıhan, Beydili, Mayıslar and Sarıcakaya (Bernhauer, 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion mediterraneum Breuning, 1942

Type loc.: Italy: Novoli.

This species is endemic to Italy. Turkey. It has been reported only by Lodos (1998) from Turkey in his unrelistic list without any exact locality. However, it is distributed only in Europe (Italy) now. So, this record is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Holzschuh, 1995).
Distribution: Italy.
Chorotype: Italian.

Dorcadion menradi Holzschuh, 1989

Type loc.: Turkey: Kahramanmaraş prov.: Afşin.

This species is endemic to CSE or SC Turkey. It has been known only from type locality until now.

Records in Turkey: (KA-MA-TUR)
Kahramanmaraş prov.: Afşin, Malatya prov. (Holzschuh, 1989); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion merkli Ganglbauer, 1884

Dorcadion (*Pedestredorcadion*) *merkli* m. *humerointerruptum* Breuning, 1946

Type loc.: Turkey: Akdağ.

This species is endemic to W Turkey.

Records in Turkey: (?IZ-TUR)
?İzmir prov.: Akdağ (Ganglbauer, 1884; Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998); Turkey: Akdağ (?İzmir prov.) (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion mesopotamicum Breuning, 1944

Dorcadion (*Pedestredorcadion*) *mesopotamicum* m. *submardinense* Breuning, 1946

Type loc.: ?Turkey: Mesopotamia: Ras Elian.

This species is endemic to SE Turkey.

Records in Turkey: (MR-SU-TUR)
Mardin prov. as *D.* (*P.*) *mesopotamicum* m. *submardinense* Breuning, 1946 (Breuning, 1962); Şanlıurfa prov.: Siverek (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion micans Thomson, 1867

Dorcadion amasinum Pic, 1898
Dorcadion sericatum v. *atripes* Reitter, 1900
Dorcadion sericatum v. *corallicornis* Pic, 1904
Dorcadion subobesum Pic, 1942
Dorcadion macropus Kraatz, 1873
Dorcadion sericatulum Kraatz, 1873
Dorcadion macropus v. *obscurans* Pic, 1892
Dorcadion paracinerarium Breuning, 1974
Dorcadion sericatum v. *subreductum* Pic, 1942
Dorcadion impressicolle v. *tokatense* Pic, 1901

Type loc.: Turkey: Bolkar Mts.

ssp.
***D. micans micans* Thomson, 1867**
***D. micans susheriense* Breuning, 1970**

This species is endemic to Turkey. It has two subspecies. Danilevsky in Löbl & Smetana (2010) gave it as a separate species.

Records in Turkey: (AM-AN-BS-CA-CO-IC-IZ-KM-SV-SU-TO-YO-TUR)
Amasya prov. as *D. amasinum* (Aurivillius, 1921); Anatolia as *D. caucasicum* a. *corallicorne* Pic, 1904, *D. caucasicum* a. *corallicorne* Pic, 1904, *D. caucasicum* v. *macropus* Kraatz, 1873 and *D. amasinum* Pic, 1898 (Winkler, 1924-1932); East Anatolia, southward to Bolkar Mountains as *D. c.* m. *micans* / Amasya prov. and Ankara prov. as *D. c.* m. *corallicorne* / Ankara prov. and Bursa prov. as *D. c.* m. *sericatulum* / Amasya prov. and Tokat prov. as *D. c.* m. *macropus* / North Turkey as *D. c.* m. *subobesum* and *D. c.* m. *subreductum*, *D. c.* m. *perroudi*, *D. c.* m. *amasinum* (Breuning, 1962); Ankara prov.: Elmadağ as *D. c. micans* (Demelt, 1963); Ankara prov.: Gölbaşı as *D. c. micans* (Perissinotto & Luchini, 1966); Çorum prov.: Boğazkale as *D. cinerarium* m. *amasinum* (Perissinotto & Luchini, 1966); Amasya as *D. c. micans* (Breuning et Villiers, 1967); Yozgat prov.: Central as *D. cinerarium amasinum* (Fuchs et Breuning, 1971); Şanlıurfa prov. as *D. sericatum micans* (Gül & Zümreoğlu, 1972); İzmir prov.: Bornova, Çanakkale prov.: Ezine as *D. cinerarium* m. *corallicorne* (Gül-Zümreoğlu, 1975); İçel prov.: Sertavul pass, Karaman prov. as *D. cinerarium* m. *paracinerarium* (Braun, 1978 and 1979); Turkey as *D. c. subobesum, D. c. micans* (Braun, 1979); Sivas prov. as *D. cinerarium susheriense* Breuning, 1970 (Ex. Braun, 1979); Yozgat prov.: Central as *D. c. micans* (Ex. Holzschuh, 1980); Turkey as *D. amasinum* (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion miminfernale Breuning, 1970

Type loc.: Turkey: Kahramanmaraş prov..

This species is endemic to CSE Turkey. Danilevsky in Löbl & Smetana (2010) accepted it as a synonym of *D. infernale infernale*.

Records in Turkey: (KA-KY)
Kahramanmaraş prov.: Binboğa Mts. (Breuning, 1970); Kayseri prov.: Bakırdağı, Kahramanmaraş prov.: Göksun and Yalakköy (Braun, 1978).

Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion minutum Kraatz, 1873

Dorcadion minutum v. *apicale* Kraatz, 1873
Dorcadion minutum m. *irroratum* Kraatz, 1873
Dorcadion atticum v. *multinigronotatum* Pic, 1927
Dorcadion atticum v. *luteovittatum* Pic, 1942
Dorcadion (*Pedestredorcadion*) *atticum* m. *flavoirroratum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *atticum* m. *pseudobrenskei* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *antereductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *discobivittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *discounivittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *doricum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *oxyense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *parnassi* m. *bilineatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *parnassi* m. *subunicolor* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *minutum* m. *thebanicum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *minutum* ssp. *rugicolle* Breuning, 1962
Dorcadion amphissae Breuning, 1974

Type loc.: Greece.

ssp.
***D. minutum minutum* Kraatz, 1873**
***D. minutum atticum* Kraatz, 1873**
***D. minutum brenskei* Ganglbauer, 1884**
***D. minutum mimarenarium* Breuning, 1974**

This species is endemic to Greece. It has four subspecies. *D. lamiae* Breuning, 1962 that was given by Pesarini & Sabbadini (2007) as a separate species, is accepted by some authors as another subspecies of this species (e.g., Danilevsky, 2010b). It has been reported only by Lodos (1998) from Turkey in his unrealistic list without any exact locality. However, it is distributed only in Europe (Greece) now. So, this record is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Greece.
Chorotype: Greek.

Dorcadion mniszechi Kraatz, 1873

Dorcadion (*Cribridorcadion*) *mniszechi* m. *rugulosum* Breuning, 1946

Type loc.: Caucasus (Armenia).

This species is distributed in Caucasus and NE Turkey. On the other side, *D. mniszechi* ssp. *shirvanica* Bogatschew, 1934 which was given by Breuning (1962) as a morpha of *D. mniszechi* regarded as a separate species. Danilevsky (2010b) stated that the species, *D. shirvanicum* Bogatschew, 1934, has two subspecies as the nominotypical subspecies and *D. shirvanicum azerbajdzhanicum*. Both subspecies are distributed only in Caucasus.

Records in Turkey: (AG-EZ-IP-IZ-KAR-SV-TUR)
NE Turkey: Kars prov.: Kağızman, Ağrı prov.: Ağrı Mt., Erzurum prov. (Plavilstshikov, 1958); Turkey (Danilevsky & Miroshnikov, 1985; Lodos, 1998); Sivas prov.: Karayün village (Özdikmen & Hasbenli, 2004a); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus(Armenia), Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion muchei Breuning, 1962

Dorcadion muchei m. *plurivittipenne* Breuning, 1962 [Çankırı prov.]

Type loc.: Turkey: Çankırı prov..

This species is endemic to CN and NCW Turkey. It distributes mostly in Western Black Sea Region of N Turkey. According to Braun (1979), *D. muchei* Breuning, 1962 is a synonym of *D. iconiense* Daniel, 1901 that described from Konya province in Central Anatolian Region of Turkey. Recently, Danilevsky in Löbl & Smetana (2010) also accepted it as a synonym of *D. iconiense*.

Records in Turkey: (CN-CO-KS-YO)
Kastamonu prov.: Ilgaz Mt. as *D. iconiense* m. *muchei* (Demelt, 1967); Çankırı prov.: Kızılırmak, Çorum prov.: Yazılıkaya as *D. iconiense* m. *muchei* (Braun, 1978); Yozgat prov.: Çandır, Çankırı prov. as *D. muchei* - Breuning, 1962 (Ex. Braun, 1979); Yozgat prov.: Central (Holzschuh, 1980).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion multimaculatum Pic, 1932

Dorcadion (*Pedestredorcadion*) *multimaculatum* m. *postbiplagiatum* Breuning, 1946

Type loc.: Turkey: İzmir prov.: Ödemiş.

This species is endemic to W Turkey. It has been known only from type locality until now.

Records in Turkey: (IZ)
İzmir prov.: Ödemiş as the type locality (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion murrayi Küster, 1847

Dorcadion murrayi v. *montandoni* Pic, 1902
Pedestredorcadion mimicum Podany, 1953
Dorcadion murrayi v. *breuningianum* Podany, 1953
Dorcadion murrayi v. *brunneovittatum* Podany, 1953
Dorcadion murrayi m. *humeratum* Podany, 1953
Dorcadion murrayi v. *praesuturatum* Podany, 1953
Dorcadion murrayi v. *rubrum* Podany, 1953
Dorcadion murrayi v. *savulesci* Podany, 1953
Dorcadion (*Pedestredorcadion*) *murrayi* m. *brunneovittipenne* Breuning, 1958
Dorcadion (*Autodorcadion*) *murrayi* ab. *podanyanum* Plavilstshikov, 1958

Type loc.: Hungary.

This species has been recorded only by Lodos (1998) from Turkey in his unrealistic list without any exact locality. However, it is distributed only in Hungary, Serbia and Romania now. So, this record is not confirmed and is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Serbia, Hungary, Romania.
Chorotype: Carpathian.

Dorcadion nigrostriatum Adlbauer, 1982

Type loc.: Turkey: Tunceli prov..

This species is endemic to E Turkey (W parts of Eastern Anatolian Region). It has been known only from type locality until now.

Records in Turkey: (TU-TUR)
Tunceli prov. (Adlbauer, 1982 and 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion nitidum Motschulsky, 1838

Dorcadion suturatum Ferrer, 1864
Dorcadion (*Pedestredorcadion*) *nitidum* m. *bifuscovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *nitidum* m. *trifuscovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *nitidum* m. *multialbovittatum* Breuning, 1946
Dorcadion (*Autodorcadion*) *nitidum* ab. *subilluminatum* Plavilstshikov, 1958

Type loc.: Armenia.

This species is distributed only in N Anatolia for Turkey.

Records in Turkey: (ART-EZ-YO-TUR)
NE Turkey (Plavilstshikov, 1958); Kars prov. (Breuning, 1962); Erzurum prov. and near (Özbek, 1978); N Turkey (Danilevsky & Miroshnikov, 1985); Artvin prov.: Yalnızçam (Adlbauer, 1988); Artvin prov.: Şavşat (Çengel plateau) (Önalp, 1990); Turkey (Lodos, 1998); Yozgat prov.: Yozgat National Park (Özdikmen & Hasbenli, 2004a); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus (Armenia, Azerbaijan), Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion niveisparsum Thomson, 1865

Dorcadion cretosum Ferrer, 1865
Dorcadion niveisparsum v. *sobrinum* Pic, 1898
Dorcadion niveisparsum v. *postobliteratum* Pic, 1942
Dorcadion (*Autodorcadion*) *niveisparsum* ab. *delimitatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *niveisparsum* ab. *devenustatum* Plavilstshikov, 1958

Type loc.: Caucasus.

This species is distributed only in Anatolia (W Anatolia: Manisa prov. to NE Anatolia) for Turkey.

Records in Turkey: (MN-EZ-TUR)
NE Turkey (Plavilstshikov, 1958); Manisa prov.: Akhisar (Sama, 1982); Erzurum prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion nobile Hampe, 1852

Dorcadion (*Pedestredorcadion*) *nobile* m. *binigrovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *nobile* m. *bisbireductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *nobile* m. *chrysescens* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *nobile* m. *maculatum* Breuning, 1946
Dorcadion (*Autodorcadion*) *nobile* ab. *adornatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *nobile* ab. *praelatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *nobile* ab. *semipullatum* Plavilstshikov, 1958

Type loc.: Unknown.

This species is distributed mostly in E half of Anatolia for Turkey. Danilevsky (2010b) mentioned that "*Dorcadion nobile was recorded by Plavilstshikov (1958) for south Azerbaidzhan (montains along Arax River and Talysh Ridge) and for south Georgia. All records need confirmations as no specimens are available from Transcaucasia. The species definitely absent in Talysh Ridge, as the region can be regarded as well investigated*". According to Önalp, 1990, *D. nobile* and *D. semivelutinum* are synonyms of *D. nodicorne* Tournier, 1872!

Records in Turkey: (BT-EZ-VA-TUR)
NE Turkey (Plavilstshikov, 1958; Danilevsky & Miroshnikov, 1985); Van prov.: Başkale (Braun, 1978); Bitlis prov.: Reşadiye (Sama, 1982); Taurus Mts., Van prov. (Önalp, 1990); Turkey (Lodos, 1998); Erzurum prov.: Ilıca (Özdikmen & Hasbenli, 2004a); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: ?Caucasus, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion obsoletum Kraatz, 1873

Dorcadion (*Pedestredorcadion*) *obsoletum* m. *obsoletoides* Breuning, 1946

Type loc.: Turkey.

This species is distributed only in European Turkey (to Bosphorus) for Turkey. According to Sama (1999), *Dorcadion olympicum* = *D. obsoletum*. According to Steiner (2003), *D. obsoletum* is a separate species.

Records in Turkey: (ED-KK-TRA-TUR)
European Turkey as *D. olympicum* a. *obsoletum* Kraatz, 1873 (Winkler, 1924-1932); Edirne prov. (Fuchs et Breuning, 1971); Edirne prov.: Uzunköprü, Kırklareli prov.: Demirköy (Istranca Mts.), Tekirdağ prov.: Bahçeköy (Braun, 1978); European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998).
Distribution: Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian) or Thracian.

Dorcadion obtusum Breuning, 1944

Dorcadion (Pedestredorcadion) obtusum m. *dorsointerruptum* Breuning, 1948

Type loc.: Turkey: Anatolia.

ssp.
***D. obtusum obtusum* Breuning, 1944**
***D. obtusum marashense* Breuning, 1948 [Kahramanmaraş prov.]**

It has two subspecies. *D. obtusum marashense* Breuning, 1948 is western subspecies. This species is endemic to SE Turkey (Kahramanmaraş and Adıyaman provinces to Hakkari province).

Records in Turkey: (ADY-DI-HA-VA)
Kahramanmaraş prov. as the type locality of *D. obtusum marashense* (Breuning, 1962); Hakkari prov.: Bajirgi, Van prov.: Gürpınar (Fuchs et Breuning, 1971); Diyarbakır prov. (Braun, 1978); Adıyaman prov.: Nemrut Mt. (Narince) (Rejzek & Hoskovec, 1999); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion oezdurali Önalp, 1988

Type loc.: Turkey: Kahramanmaraş prov.: Ahır Mt..

This species is endemic to CSE Turkey.

Records in Turkey: (ADY-KA)
Kahramanmaraş prov.: Ahır Mt. (Önalp, 1990); Adıyaman prov.: Nemrut Mt. (Rejzek & Hoskovec, 1999); Kahramanmaraş prov.: Göksun (Mehmetbey) (Özdikmen & Okutaner, 2005); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion olympicum Ganglbauer, 1882

Dorcadion graecum Kraatz, 1873 (not Waltl, 1838)
Dorcadion graecum v. *subalpinum* Kraatz, 1873
Dorcadion olympicum v. *oreophilum* Ganglbauer, 1884
Dorcadion (*Pedestredorcadion*) *olympicum* m. *brussense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *olympicum* m. *quinquefasciatum* Breuning, 1946

Type loc.: Turkey: Bursa prov..

ssp.
***D. olympicum olympicum* Kraatz, 1873**
***D. olympicum convexum* Breuning, 1943**
***D. olympicum flavosuturale* Krätschmer, 1987**

It has three subspecies. It is represented by all subspecies which described from Bursa province and Akdağ, in Turkey. *D. olympicum convexum* Breuning, 1943 of which type locality is Anatolia: Akdağ (?Kütahya prov. or ?Denizli prov. in Egean Region of Turkey), was given by Bruning (1962) as a subspecies of *D. olympicum*. This species is distributed mostly in W and NW parts for Turkey.

Records in Turkey: (AN-BI-BS-IS-KU-TRA-TUR)
Turkey: Bursa prov. (Ganglbauer, 1884; Aurivillius, 1921); Turkey: Bursa prov. as *D. olympicum* v. *oreophylum* (Ganglbauer, 1884); İstanbul prov.: Belgrad Forest, Alem Mt. (Bodemeyer, 1906); Anatolia (Winkler, 1924-1932);?European Turkey as *D. olympicum* a. *subalpinum* Kraatz, 1873 (Winkler, 1924-1932); Anatolia as *D. olympicum* v. *oreophilum* Ganglbauer, 1882 (Winkler, 1924-1932); Bursa prov.: Uludağ, Bilecik prov., ?Kütahya prov.: Akdağ (Breuning, 1962); Bursa prov.: Uludağ as *D. olympicum* morpha *oreophilum* Ganglbauer (Demelt, 1963); Bursa prov.: Uludağ (Braun, 1978; Adlbauer, 1988); Bursa prov.: Uluabat lake as the type locality of *D. olympicum flavosturale* (Krätschmer, 1987); Bursa prov., İstanbul prov.: Alem Mountain, Bilecik prov., Ankara prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, Bulgaria, European Turkey), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion ortrudae Braun, 1980

Type loc.: Turkey: Kahramanmaraş prov..

This species is endemic to CSE Turkey.

Records in Turkey: (KA-TUR)
Kahramanmaraş prov.: Göksun (Adlbauer, 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.

Chorotype: Anatolian.

Dorcadion paracinerarium Breuning, 1974

Type loc.: Turkey: İçel prov.: Mut.

This species is endemic to SCW Turkey (Cilician Taurus). According to Braun (1979), *D. paracinerarium* Breuning, 1974 is a morpha of *D. cinerarium* (Fabricius, 1787).

Records in Turkey: (IC-KM)
İçel prov.: Mut (Sertavul pass) (Breuning, 1974); İçel prov.: Mut (Sertavul pass), Karaman prov. (Braun, 1978 and 1979); İçel prov. (Demelt ex Braun, 1979).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion parallelum Küster, 1847

Dorcadion (*Pedestredorcadion*) *parallelum* m. *rufimembre* Breuning, 1946

Type loc.: Turkey (mistaken information).

This species is distributed mostly in central parts of Turkey from S to N. Breuning (1962) stated that the type locality, Turkey is mistaken information ("irrige Angabe"). Danilevsky in Löbl & Smetana (2010) gave it under the subgenus *Megalodorcadion*.

Records in Turkey: (AM-AN-CO-TO-YO-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); Tokat prov. (Ganglbauer, 1884); Anatolia (Winkler, 1924-1932); Çorum prov.: Alaca (Braun, 1978); Amasya prov., Ankara prov.: Central / Hüseyin Gazi Mountain / Lalabel (Önalp, 1990); Çorum prov.: Alaca (Adlbauer, 1992); Turkey (Lodos, 1998); Yozgat prov.: Yozgat National Park (Özdikmen & Hasbenli, 2004a); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey, Palestine, Syria.
Chorotype: SW-Asiatic (Syro-Anatolian) or E-Mediterranean (Plaestino-Taurian).

Dorcadion pararufipenne Braun, 1976

Type loc.: Turkey: Bolu prov..

ssp.
***D. pararufipenne pararufipenne* Braun, 1976**
***D. pararufipenne rassei* Braun, 1976**

It has two subspecies. *D. pararufipenne rassei* Braun, 1976 occurs probably eastward from the distribution patterns of the nominotypical subspecies. This species is endemic to NCW Turkey and probably distributes in a local area.

Records in Turkey: (AN-BO)
Bolu prov.: Abant Mts. (Braun, 1978); Bolu prov.: Gerede / Central as *D. pararufipenne rassei* (Braun, 1978); Bolu prov. as *D. pararufipenne rassei* (Adlbauer, 1992); Bolu prov.: Abant (Özdikmen & Demir, 2006); Ankara prov.: Bayındır dam, Ayaş road (Başayaş village env., Ayaş Beli) and Çubuk (Özdikmen, 2006); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion parescherichi Breuning, 1966

Type loc.: Turkey: Çorum prov.: Boğazkale.

This species is endemic to central parts of N Turkey. Recently, Danilevsky in Löbl & Smetana (2010) accepted it as a synonym of *D. iconiense*.

Records in Turkey: (CO-TUR)
Turkey: Çorum prov.: Boğazkale as the type loc. of *Dorcadion parescherichi* Breuning, 1966; Çorum prov.: Boğazkale (Perissinotto & Luchini, 1966); Turkey (Lodos, 1998).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pavesii Pesarini & Sabbadini, 1998

Type loc.: Turkey: Hakkari prov.: Yüksekova.

This species is endemic to SE Turkey. It has been known only from the type locality.

Records in Turkey: (HA-TUR)
Hakkari prov.: Yüksekova (Pesarini & Sabbadini, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pedestre (Poda, 1761)

Cerambyx suturalis Voet, 1778
Lamia rufipes Fabricius, 1792
Dorcadion molitor Redtenbacher, 1849 (nec Fabricius)
Dorcadion gogium Thomson, 1867
Dorcadion pedestre v. *austriacum* Ganglbauer, 1888
Dorcadion pedestre v. *ruficorne* Pic, 1931
Dorcadion (*Pedestredorcadion*) *pedestre* m. *fuscipenne* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *pedestre* m. *apicebivittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *pedestre* m. *absolutum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *pedestre* ssp. *zoufali* Tippmann, 1958
Dorcadion (*Autodorcadion*) *pedestre* ab. *incopiosum* Breuning, 1946

Original combination: *Lamia pedestris* Poda, 1761

Type loc.: Italy: Triest.

ssp.
***D. pedestre pedestre* (Poda, 1761)**
***D. pedestre kaszabi* Breuning, 1956**

It has two subspecies as the nominotypical subspecies and *D. pedestre kaszabi* Breuning, 1956 that occurs only in Hungary. According to Sama (2002), however, *D. pedestre kaszabi* Breuning, 1956 is only a synonym of *D. pedestre*. Breuning (1962) stated that the type locality, Triest is very dubious.

This species probably is distributed only in European Turkey for Turkey.

Records in Turkey: (IS-TUR)
İstanbul prov. (Önalp, 1990); Turkey (Lodos, 1998).

Distribution: Europe (Croatia and Bosnia-Herzegovina, Serbia, Macedonia, Albania, Bulgaria, Romania, Hungary, Austria, Czechia, Slovakia, Poland, Ukraine, Crimea, Moldovia).
Chorotype: Turano-European (Turano-Sarmato-Pannonian).

Dorcadion petrovitzi Heyrovsky, 1964

Type loc.: Turkey: İçel prov..

This species is endemic to SCW Turkey (Cilician Taurus). It has been known only from the type locality.

Records in Turkey: (IC-TUR)
İçel prov. (Heyrovsky, 1964); İçel prov.: Namrun (Demelt, 1967); Turkey (Lodos, 1998).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion piochardi Kraatz, 1873

Dorcadion piochardi v. *elongatum* Pic, 1898
Dorcadion pelops Jakovlev, 1901
Dorcadion piochardi v. *theophilei* Pic, 1901
Dorcadion piochardi v. *roberti* Pic, 1905
Dorcadion piochardi ab. *mauricei* Plavilstshikov, 1926
Dorcadion varievittatum Pic, 1942
Dorcadion (*Pedestredorcadion*) *piochardi* m. *apicedisparatum* Breuning, 1946

Type loc.: Turkey: Samsun prov., Amasya prov., Akdağ.

ssp.
***D. piochardi piochardi* Kraatz, 1873**
***D. piochardi ladikense* Breuning & Villiers, 1967**

This species has two subspecies. Both are endemic to Turkey and they distribute in Central parts of North Turkey. *D. piochardi ladikense* was described from Samsun province (Ladik). According to Braun (1979), the subspecies *D. pochardi ladikense* Breuning & Villiers, 1967 that described from Ladik in Samsun province (North Turkey) is a synonym of *D. piochardi piochardi* as a form.

Records in Turkey: (AM-CO-SM-SN-YO-TUR)
Samsun prov., Amasya prov.: Akdağ (Ganglbauer, 1884); Turkey as *D. pelops* (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Taurus as *D. piochardi* ab. *elongatum* (Aurivillius, 1921); Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Samsun prov., Amasya prov.: Akdağ (Breuning, 1962); Holotype and paratype: Samsun prov.: Ladik as *D. piochardi ladikense* Breuning et Villiers, 1967 (Breuning et Villiers, 1967); Samsun prov. as *D. piochardi apicedisparatum* Breuning (Breuning et Villiers, 1967); Turkey (Winkler, 1924-1932; Lodos, 1998); Samsun prov.: Havza / Central (Breuning et Villiers, 1967); Çorum prov.: Mecitözü / Central / Alaca / Yazılıkaya, Samsun: Ladik (Aslantaş / Ak Mountain) / Karadağ / Vezirköprü, Sinop prov.: Boyabat (Bektaş), Yozgat prov.: Central (Braun, 1978 and 1979); Sinop prov.: Boyabat, Samsun prov.: Vezirköprü / Ladik, Amasya prov.: Ak Mountain, Çorum prov.: Central / Mecitözü / Alaca / Yazılıkaya, Yozgat prov. (as Dorcadion bangi heinzorum) (from map in Braun, 1979); Samsun prov.: Ladik as *D. piochardi ladikense* Breuning et Villiers, 1967 (Braun, 1979); Amasya prov. (Önalp, 1990); Amasya prov.: Borabay lake (Taşova) / Merzifon, Samsun prov.: Çayırkent (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pittinorum Pesarini & Sabbadini, 1998

Type loc.: Turkey: Çorum prov..

This species is endemic to NC Turkey. It has been known only from the type locality.

Records in Turkey: (CO-TUR)
Çorum prov. (Pesarini & Sabbadini, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pluto Thomson, 1867

Type loc.: Siberia (mistaken information). Turkey.

This species is endemic to Turkey. It is distributes mostly in N Anatolia.

Records in Turkey: (AM-ES-EZ-SA-SM-TUR)
Turkey: Amasya prov. (Ganglbauer, 1884; Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Amasya prov. (Breuning et Villiers, 1967); Amasya prov. (Gfeller, 1972); Samsun prov.: Ladik (Akdağ) (Braun, 1978); Amasya prov., Erzurum prov., Eskişehir prov., Sakarya prov.: Geyve (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion poleti Breuning, 1948

Type loc.: Turkey: Caria: Denizli prov.: Babadağ.

This species is endemic to SW Turkey. It has been known only from type locality until now.

Records in Turkey: (DE-TUR)
Anatolia: Caria: Denizli prov.: Babadağ (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion praetermissum Pesarini & Sabbadini, 1998

Type loc.: Turkey: Bursa prov.: Uludağ.

ssp.
***D. praetermissum praetermissum* Pesarini & Sabbadini, 1998**
***D. praetermissum mikhaili* ssp. n.**

This species has two subspecies with the ssp. n..

D. praetermissum mikhaili ssp. n.

As nominotypical form, but it has distinct longitudinal and transversal reticulation among the elytral punctae on the entire surface.

Holotype: 1 male from Anatolia: Bolu prov.: Abant, 30.IV.2010, paratype: 1 male from the same locality.

Remarks: *D. praetermissum* is endemic to NW Anatolia. It has been known only from the type locality, Bursa province, until the present work. *D. praetermissum mikhaili* ssp. n. is an eastern subspecies of this species.

Etimology: The name is dedicated to well known cerambydologist Mikhail L. Danilevsky (Russia).

Records in Turkey: (BO-BS-TUR)
Bursa prov.: Uludağ (Pesarini & Sabbadini, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010) .
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion preissi Heyden, 1894

Dorcadion (*Pedestredorcadion*) *preissi* m. *kastamoniense* Breuning, 1962

Type loc.: Turkey: Paphlagonia: Kastamonu prov..
Endemic to Turkey and it distributes in a local area of North Turkey.

Records in Turkey: (KS-TUR)
Turkey: Kastamonu prov. as the type loc. of *D. preissi* Heyden, 1894; Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Kastamonu prov. as *D. p.* m. *kastamuniense* (Breuning, 1962); Kastamonu prov.: Devrekani (Braun, 1978); Kastamonu prov. (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudarcivagum Breuning, 1943

Dorcadion (*Pedestredorcadion*) *pseudarcivagum* m. *brevidorsale* Breuning, 1946

Type loc.: Turkey: Amasya prov..

This species is endemic to NC Turkey.

Records in Turkey: (AM-SM-TUR)
Amasya prov. (Breuning, 1943); Amasya prov., Samsun prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudinfernale Breuning, 1943

Dorcadion (*Pedestredorcadion*) *pseudinfernale* m. *pseudimmutatum* Breuning, 1948

Type loc.: Turkey: Amanos Mts. (not Syria).

This species is endemic to Amanos Mts. in SC Turkey. It has been known only from type locality until now.

Records in Turkey: (TUR)
S Turkey: Amanos Mts. (Breuning, 1943, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudobithyniense Breuning, 1962

Dorcadion (*Pedestredorcadion*) *pseudobithyniense* m. *inhumerovittipenne* Breuning, 1962

Type loc.: Turkey: Balıkesir prov..

This species is endemic to CW Anatolia. It has been known only from the type locality.

Records in Turkey: (BL-CA-TUR)
Balıkesir prov. (Breuning, 1962); Balıkesir prov.: Balya (Braun, 1978); Çanakkale prov. (Adlbauer, 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudocinctellum Breuning, 1943

Dorcadion (*Pedestredorcadion*) *pseudocinctellum* m. *fuscoplagiatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *pseudocinctellum* m. *fuscoconjunctum* Breuning, 1946

Type loc.: Turkey: Konya prov.: Akşehir.

This species is endemic to CW Anatolia.

Records in Turkey: (KN-US-TUR)
Turkey: Konya prov.: Akşehir (Breuning, 1943, Breuning, 1962); Uşak prov. (Demelt, 1963); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudoholosericeum Breuning, 1962

Dorcadion (*Pedestredorcadion*) *pseudoholosericeum* m. *pseudorossicum* Breuning, 1962

Type loc.: Turkey: Sinop prov..

This species is endemic to NC Anatolia. It has been known only from the type locality.

Records in Turkey: (SN-TUR)
Turkey: Sinop prov. as the type loc. of *D. pseudoholosericeum* Breuning, 1962; Sinop prov.: Dranaz Mt. (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pseudopreissi Breuning, 1962

Dorcadion (*Pedestredorcadion*) *pseudopreissi* m. *pseudokastamoniense* Breuning, 1962

Type loc.: Turkey: Sinop prov..

This species is endemic to NC Anatolia.

Records in Turkey: (AM-SN-TUR)
Turkey: Sinop prov. as the type loc. of *Dorcadion pseudopreissi* Breuning, 1962; Amasya prov.: Merzifon (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion punctipenne Küster, 1852

Dorcadion olympicum v. *distinguendum* Pic, 1931

Type loc.: Turkey: Anatolia.

This species is endemic to NW Turkey.
Records in Turkey: (IS-TUR)
Anatolia as *D. condensatum* v. *punctipenne* Küster, 1852 (Winkler, 1924-1932); İstanbul prov. and near (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion punctulicolle Breuning, 1944

Type loc.: Turkey: Diyarbakır prov.

This species is endemic to SE Turkey.

Records in Turkey: (DI-TUR)
Diyarbakır prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion pusillum Küster, 1847

Type loc.: Ukraine: Podolia.

ssp.
***D. pusillum pusillum* Küster, 1847**
***D. pusillum berladense* Pic, 1903**
***D. pusillum tanaiticum* Kasatkin, 2002**

It has three subspecies. *D. pusillum berladense* Pic, 1903 occurs only in Romania and *D. pusillum tanaiticum* Kasatkin, 2002 occurs only in European Russia. This species has been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However, it is distributed only in Romania to European Russia now. So, it is not confirmed and impossible for Turkey now.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Romania, Ukraine, Crimea, Moldavia, European Russia.
Chorotype: E-European.

Dorcadion pygmaeum Breuning, 1947

Dorcadion (*Pedestredorcadion*) *pygmaeum* m. *presuturesignatum* Breuning, 1947

Type loc.: Kurdistan.

It has been known only from type locality until now. It is the type locality, Kurdistan that is Anatolian Kurdistan. According to the type, it is endemic to E Anatolia.

Records in Turkey: (?TUR)
Kurdistan (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion quadripustulatum Kraatz, 1873

Dorcadion (*Pedestredorcadion*) *quadripustulatum* m. *tenuefasciatum* Breuning, 1948

Type loc.: Turkey: Çanakkale prov.: Dardaneli.

This species is endemic to NW Turkey.

Records in Turkey: (CA-TRA-TUR)
Çanakkale prov. (Aurivillius, 1921); European Turkey (Winkler, 1924-1932); Çanakkale prov.: Dardaneli and Troja (Breuning, 1962); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion regulare Pic, 1931

Dorcadion (*Pedestredorcadion*) *regulare* m. *angustesuturale* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *regulare* m. *fuscovittipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *regulare* m. *postvittipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *regulare* m. *regularoide* Breuning, 1962
Original combination: *Dorcadion hallipolitanum* v. *regulare* Pic, 1931

Type loc.: Turkey: Edirne prov.: Keşan.

This species is distributed only in European Turkey for Turkey.

Records in Turkey: (ED-KK-TRA)
Edirne prov.: Keşan (Breuning, 1962); European Turkey (Althoff & Danilevsky, 1997); Kırklareli prov.: Yenice env. (Kurzawa pers. comm.); European Turkey (Danilevsky in Löbl & Smetana, 2010).
Distribution: Greece, Bulgaria, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian) or Thracian.

Dorcadion reitteri Ganglbauer, 1884

Type loc.: Caucasus.

This species is endemic to Caucasus (W and C Georgia). It has been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However, it is distributed only in Caucasus now. So, it is not confirmed for Turkey now.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Caucasus (Georgia).
Chorotype: Caucasian or Georgian.

Dorcadion rigattii Breuning, 1966

Dorcadion (*Pedestredorcadion*) *rigattii* m. *atroampliatum* Breuning, 1966 [Sivas prov.: Zara]

Type loc.: Turkey: Sivas prov.: Zara.

This species is endemic to NC and CE Turkey.

Records in Turkey: (AM-CO-SV-TUR)
Sivas prov.: Zara (Breuning, 1966); Sivas prov.: Zara (Perissinotto & Luchini, 1966); Çorum prov. (Braun, 1978); Amasya prov.: Merzifon (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).

Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion rizeanum (Breuning & Villiers, 1967)

Dorcadion ikizderense Breuning, 1973

Type loc.: Turkey: Rize prov.: Sivrikaya.

This species is endemic to NE Turkey.

Records in Turkey: (RI-TUR)
Rize prov.: Sivrikaya as the type loc. of *D. rizeanum* (Breuning et Villiers, 1967); Rize prov.: İkizdere as *D. ikizderense* (Breuning, 1973); Rize prov.: İkizdere (Braun, 1978); Turkey (Lodos, 1998); Rize prov.: Çamlıhemşin (Elevit plateau) (Özdikmen, 2007); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion robustum Ganglbauer, 1884

Type loc.: Turkey: Amasya prov..

This species is endemic to NC Turkey.

Records in Turkey: (AM-TUR)
Amasya prov. (Ganglbauer, 1884; Aurivillius, 1921; Breuning, 1962); Turkey (Winkler, 1924-1932; Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion rolandmenradi Peks, 1992

Type loc.: Turkey: Bursa prov.: Ballısaray.

This species is endemic to NW Anatolia of Turkey. It has been known only from description localities.

Records in Turkey: (BS-KU-TUR)
Bursa prov.: Ballısaray, between Nalınlar-Erenler, Erenler, 5 km W of Harmancık, about 9 km NW of Harmancık, 13 km N of Harmancık, 5 km E of Harmancık, 17 km N of Harmancık, Kütahya prov.: 10 km SE of Harmancık (Peks, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion rosinae Daniel, 1900

Type loc.: Turkey: Konya prov.: Akşehir: Sultan Mt..

This species is endemic to CSW Anatolia of Turkey. It has been known only from the type locality.

Records in Turkey: (KN)
Konya prov.: Akşehir (Sultan Mt.) (Daniel, 1900 in Bodemeyer, 1900); Turkey (Winkler, 1924-1932; Lodos, 1998).
Distribution: Turkey.

Chorotype: Anatolian.

Dorcadion rosti Pic, 1900

Dorcadion kalinowskyi Koenig, 1901
Dorcadion (*Autodorcadion*) *rosti* ab. *goergicum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *rosti* ab. *imereticum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *rosti* ab. *zekaricum* Plavilstshikov, 1958

Type loc.: Turkey.

Breuning (1962) gave *D. rosti* Pic, 1900 as a morha of *D. sodale* Hampe, 1852. It is distributed only in NE Anatolia for Turkey. Breuning (1962) mentioned it also for Georgia: Abbastuman and Achalzich.

Records in Turkey: (ER-GU-TUR)
NE Turkey (Plavistshikov, 1958); Northern Turkey (Danilevsky & Miroshnikov, 1985); Gümüşhane prov.: Kelkit (Kömürköy), Erzincan prov.: Çayırlı (Başköy) (Özdikmen & Hasbenli, 2004a); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus (Georgia), Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion rufipenne Breuning, 1946

Dorcadion (*Pedestredorcadion*) *rufipenne cankiriense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *rufipenne cankiriense* m. *antenigrescens* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *rufipenne cankiriense* m. *subnigripenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *rufipenne* m. *multivittipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *rufipenne* m. *univittatum* Breuning, 1962

Type loc.: Turkey: Kastamonu prov.: Ilgaz Mt..

ssp.
***D. rufipenne rufipenne* Breuning, 1946 (Kastamonu prov., Çankırı prov., Ankara prov.)**
***D. rufipenne major* Breuning, 1962 (Sinop prov.)**

It is endemic to Turkey and distributes in NCW Turkey. The species is represented by two subspecies. The nominotypical subspecies *D. rufipenne rufipenne* Breuning, 1946 occurs in Kastamonu, Çankırı and Ankara provinces, and *D. rufipenne major* Breuning, 1962 occurs only in Sinop prov. (Eastern subspecies). According to Braun (1978), *D. boluense* is a subspecies of *D. rufipenne* Breuning, 1946. According to Pesarini & Sabbadini (1998), *D. boluense* is a distinct species. On the other hand, *D. rufipenne* (incl. two subspecies) was regarded as a subspecies of *D. subsericatum* Pic, 1901 by Pesarini & Sabbadini (1998).

Records in Turkey: (AN-CN-KS-SN-TUR)
Turkey: Kastamonu prov.: Ilgaz Mt. as type loc. of *D. rufipenne* Breuning, 1946; Kastamonu prov.: Ilgaz Mt. as *D. rufipenne* m. *univittatum* and *D. rufipenne* m. *multivittipenne* / S. Sinop prov. as the type loc of *D. rufipenne major* (Breuning, 1962); Kastamonu prov.: Ilgaz Mountain (Demelt, 1967); Kastamonu prov.: Ilgaz Mountain / Ilgaz (İnköy) / Yukarıyuva, Ankara prov.: Kızılcahamam (Akdoğan) (Braun, 1978); Sinop prov.: Dranaz Mountain as *D. rufipenne major* (Braun, 1978); Kastamonu prov.: Ilgaz Mountain, Sinop prov.: Dranaz Mountain (Sama, 1982); Kastamonu prov.: Devrekani (Adlbauer, 1988); Turkey (Lodos, 1998); Kastamonu prov.: Ilgaz Mt., Çankırı prov.: Çerkeş (Kurtçimeni) as *D. subsericatum rufipenne*, and Sinop prov.: Çulhalı as *D. subsericatum majus* (Pesarini & Sabbadini, 1998); Anatolia as *D. subsericatum rufipenne* (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion rufoapicale Breuning, 1943

Dorcadion (*Pedestredorcadion*) *rufoapicipenne* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *rufoapicipenne* m. *rufobrunneotomentosum* Breuning, 1946

Type loc.: Turkey: Bayburt prov..

This species is endemic to NE Turkey. Breuning (1962) stated that "I described it from Bayburt under the name "*rufoapicale*" which then I altered even in "*rufoapicipenne*". Because the name *D. rufoapicale* Breuning, 1943 is a homonym of *D. septemlineatum* v. *rufoapicale* Pic, 1942 that is a synonym of *D. apicale* Thomson, 1865. In this case, the senior name *D. rufoapicale* Breuning, 1943 must be valid. This approach firstly proposed in Özdikmen (2007).

Records in Turkey: (BY-GI-RI-SV-TUR)
Bayburt prov. (Breuning, 1943, 1962); Rize prov.: İkizdere as *D. rufoapicipenne* Breuning, 1946 (Braun, 1978); Between Sivas prov.: Köse Mountain and Rize Mountains (North Turkey) as *D. rufoapicipenne* Breuning, 1946 (Braun, 1979); Giresun prov.: Kulakkaya / Eğribel as *D. rufoapicipenne* Breuning, 1946 (Sama, 1982); Turkey as *D. rufoapicipenne* Breuning, 1946 (Lodos, 1998); Ankara prov.: Keçiören (Bağlum) (Özdikmen & Demir, 2006).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion sareptanum Kraatz, 1873

Dorcadion (*Pedestredorcadion*) *sareptanum* m. *dorsoimmaculatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sareptanum* m. *posticereductum* Breuning, 1946

Type loc.: Russia: Stalingrad.

ssp.
***D. sareptanum sareptanum* Kraatz, 1873 (European Russia, Kazakhstan, ?Caucasus)**
***D. sareptanum striatiforme* Suvorov, 1913 (Caucasus)**
***D. sareptanum kubanicum* Plavilstshikov, 1934 (European Russia, Caucasus)**

Danilevsky (2010b) stated that "according to Plavilstshikov (1958: 181) the types (males) of *D. euxinum* Suvorov, 1915 (described from Novorossijsk) are *D. sareptanum*, and only one female designated as type, but not mentioned in the original description was *D. cinerarium*. That is why a new synononym was published (Danilevsky et al., 2005): *D. sareptanum euxinum* Suv. = *D. kubanicum* Plav. Now all available (ZIN) syntypes of *D. euxinum* Suvorov, 1915 are males of *D. cinerarium*. One of them is designated by M.Lazarev (in press) as lectotype, so *D. cinerarium* (F.) = *D. euxinum* Suv., and *D. sareptanum* kubanicum Plav. is a valid name. The name *D. euxinum* Suv. was already published (Plavilstshikov, 1931: 64; 1958: 118) as a synonym of *D. cinerarium"*.

This species has been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However, it is distributed in European Russia and Kazakhstan and Caucasus now. So, it is not confirmed for Turkey now. If present, it probably occurs only in NE Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: European Russia, European Kazakhstan, Caucasus.
Chorotype: Turanian.

Dorcadion saulcyi Thomson, 1865

Dorcadion simile Kraatz, 1884
Dorcadion destinoi Fairmaire, 1884
Dorcadion fenestratum Pic, 1894
Dorcadion destinoi m. *adanense* Pic, 1904
Dorcadion destinoi v. *univestitum* Pic, 1931
Dorcadion destinoi m. *subelongatum* Pic, 1931
Dorcadion aleppense v. *tabense* Pic, 1931
Dorcadion (*Pedestredorcadion*) *javeti* ssp. *adanense* m. *mersinense* Breuning, 1946
Dorcadion saulcyi v. *haleppense* Kraatz, 1884

Type loc.: Syria (mistaken information).

ssp.
***D. saulcyi saulcyi* Thomson, 1865**
***D. saulcyi javeti* Kraatz, 1873**

This species has two subspecies. *D. saulcyi javeti* Kraatz, 1873 that described from Akbez in Turkey (not Syria), probably occurs only in Amanos Mts. for Turkey and Syria. So all old records from Amanos Mts. in Turkey should be belonging to the subspecies, *D. saulcyi javeti* Kraatz, 1873. It is represented by both subspecies in central parts of S Turkey. Besides, Breuning (1962) mentioned the type locality, Syria is mistaken information ("irrige Angabe"). I also think the type locality of this species should be Turkey. So this species is endemic to Turkey. It is distributed in SC, SCW and CSE Turkey.

Records in Turkey: (AD-GA-HT-IC-MA-OS-TUR)
Hatay prov.: Akbez as *D. destinoi* (Fairmaire, 1884); Turkey: İçel prov. as *D. saulcyi* v. *javeti* (Ganglbauer, 1884; Aurivillius, 1921); Malatya prov. as *D. simile* (Ganglbauer, 1886; Aurivillius, 1921); Hatay prov.: Akbez as *D. destinoi* (Ganglbauer, 1886; Aurivillius, 1921); Adana prov. as *D. destinoi* v. *adanense* (Aurivillius, 1921); Anatolia as *D. saulcyi* v. *javeti* (Winkler, 1924-1932); Adana prov. as *D. destinoi* v. *adanense* Pic, 1905 (Winkler, 1924-1932); Malatya prov. as *D. simile* (Kraatz, 1884); Anatolia as *D. saulcyi* v. *simile* (Winkler, 1924-1932); Cilicia: İçel prov.: Gülek, Malatya prov. (Breuning, 1962); Hatay prov.: İskenderun, Osmaniye prov.: Hasanbeyli (Demelt, 1963); Osmaniye prov.: Hasanbeyli, Amanos Mountains *D. saulcyi javeti* (Fuchs et Breuning, 1971); Osmaniye prov.: Hasanbeyli, Amanos Mountain as *D. saulcyi fenestratum* (Fuchs et Breuning, 1971); Osmaniye prov.: Toprakkale, Hatay prov.: Antakya (Yayladağı) (Braun, 1978); Anatolia (Önalp, 1990); Hatay: Akbez, Amanos Mountains *D. saulcyi javeti* (ex Önalp, 1990); Hatay prov.: Akbez, Adana prov. as *D. destinoi* (Önalp, 1990); Hatay prov.: Antakya (Harbiye) (Adlbauer, 1992); Turkey (Lodos, 1998); Turkey as *D. destinoi* (Lodos, 1998); Gaziantep prov.: Islahiye (Özdikmen et al., 2005); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion scabricolle Dalman, 1817

Dorcadion corpulentum Menetries, 1832
Dorcadion modestum Tournier, 1872
Dorcadion scabricolle v. *lutescens* Kraatz, 1873
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *aeruginosum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *latefasciatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *basalireductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *bulghardaghense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *nubilosum* Breuning, 1946
Dorcadion scabricolle v. *micheli* Pic, 1948
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *posticeparteinterruptum* Breuning, 1960
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *albithorax* Breuning, 1956 [Ankara prov.]
Dorcadion (*Pedestredorcadion*) *scabricolle* ab. *consuetum* Plavilstshikov, 1958
Dorcadion (*Pedestredorcadion*) *scabricolle* ab. *masculochromum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *scabricolle* ab. *masculochromum* Plavilstshikov, 1958

Dorcadion (*Autodorcadion*) *scabricolle* ab. *supermodestum* Plavilstshikov, 1958
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *subbasalireductum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *scabricolle* m. *humeralibivittatum* Breuning, 1962

Type loc.: Georgia (mistaken information).

ssp.
***D. scabricolle scabricolle* Dalman, 1817**
***D. scabricolle sevangense* Reitter, 1889 (Armenia: Erivan)**
***D. scabricolle caramanicum* Daniel, 1903 (Karaman prov.)**
***D. scabricolle elisabethpolicum* Suvorov, 1915 (Azerbaijan)**
***D. scabricolle paphlagonicum* Breuning, 1962 (Kastamonu prov.)**
***D. scabricolle balikesirense* Breuning, 1962 (Balıkesir prov.)**
***D. scabricolle uludaghicum* Breuning, 1970 (Bursa prov.)**
***D. scabricolle nakhiczevanum* Danilevsky, 1999**
***D. scabricolle paiz* Danilevsky, 1999**

This species has nine subspecies. The species distributes widely in Turkey. It is represented by five subspecies in Turkey. *D. scabricolle caramanicum* Daniel, 1903 (Southern subspecies) occurs in Cilician Taurus (South-East Turkey), *D. scabricolle paphlagonicum* Breuning, 1962 (Northern subspecies) occurs in Kastamonu province of North Turkey, *D. scabricolle balikesirense* Breuning, 1962 and *D. scabricolle uludaghicum* Breuning, 1970 (Western subspecies) occurs in Balıkesir and Bursa provinces of North-West Turkey and the nominative *D. scabricolle scabricolle* Dalman, 1817 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 only 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 (2010b), - *sevangense* Reitter, 1889 is a subspecies of *D. scabricolle*. The records of Van prov.: Kuzgunkıran and Özalp in Fuchs et Breuning (1971) are very likely belong to *D. scabricolle caramanicum*. Also the record of Bursa prov.: Uludağ as *D. s.* m. *corpulentum* in Breuning et Villiers, 1967 likely belongs to *D. scabricolle balikesirense*. Besides, Danilevsky (2010b) mentioned that "*Dorcadion scabricolle elisabethpolicum Suvorov, 1915 was described from near Elisavetpol (now Giandzha in Azerbajdzhan) on the base of small size of available specimens. According to my series from Khanlar (7km S Giandzha) the local population really consists of relatively small specimens. So, the name can be regarded as valid. In fact each population of D.scabricolle is more or less peculiar*". So this taxon is presented as a subspecies of this species.

Consequently, this species is the widest *Dorcadion* species in Turkey. The taxonomic status of subspecific level of the species needs to be clarified with future works.

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)
Malatya prov. (Heyden,1888); Konya prov.: Akşehir (Sultan Mt.) (Bodemeyer, 1900); Antalya prov.: Toros Mts., Niğde prov.: Çamardı as *D. s.* v. *caramanicum* (Bodemeyer, 1900); Niğde prov.: Çamardı as *D. scabricolle* v. *caramanicum* (Aurivillius, 1921); Anatolia as *D. scabricolle* v. *caramanicum* (Winkler, 1924-1932); NE Turkey (Plavilstshikov, 1958); Cilician Taurus as *D. s. caramanicum* Daniel, 1903 / Niğde prov.: Bolkar Dağları-Maden (=Çamardı) as *D. s.* m. *bulghardaghense* Breuning, 1946 / Kastamonu prov. as *D. s. paphlagonicum* Breuning, 1962, *D. s.* m. *subbasalireductum* Breuning, 1962, *D. s.* m. *humeralibivittatum* Breuning, 1962 / Balıkesir prov. *D. s. balikesirense* Breuning, 1962 (Breuning, 1962); Konya prov.: Akşehir (Demelt, 1963); Sivas prov.: Zara, Çorum prov.:

Boğazkale (Perissinotto & Luchini, 1966); Erzurum prov. (Breuning et Villiers, 1967); Bursa prov.: Uludağ as *D. s.* m. *corpulentum*(Breuning et Villiers, 1967); Bursa prov.: Uludağ as *D. scabricolle balikesirense* (Breuning et Villiers, 1967); Van prov.: Özalp *D. s.* m. *corpulentum* (Fuchs et Breuning, 1971); Yozgat prov.: Central (Fuchs et Breuning, 1971); Van prov.: Kuzgunkıran as *D. s. paphlagonicum* (Fuchs et Breuning, 1971); Malatya prov.: Arguvan (Gfeller, 1972); Konya prov.: Akşehir (Tuatay et al., 1972); Konya prov.: Akşehir (Cankurtaran), Kayseri prov.: Bakırdağı, Ankara prov.: Central / Kızılcahamam (Central / Güvem), Çorum prov.: Yazılıkaya, Yozgat prov., İçel prov.: Sertavul pass, Kahramanmaraş prov.: Göksun / Elbistan, Adana prov.: Saimbeyli / Tufanbeyli, Bilecik prov.: Söğüt (Braun, 1978); Balıkesir prov., Bursa prov., Uşak prov., Isparta prov., Ankara prov., Kastamonu prov., İçel prov., Kayseri prov., Kahramanmaraş prov., Erzurum prov., Van prov., Ağrı prov., Ardahan prov. (from map in Braun, 1978); Erzurum prov. and near (Özbek, 1978); Konya prov.: Sertavul pass, Gümüşhane prov.: Köse (Sama, 1982); Turkey (Danilevsky & Miroshnikov, 1985; Özdikmen, 2006); Erzurum prov.: İspir, Ankara prov.: Güvem (Adlbauer, 1988); Konya prov.: Akşehir / Sultandağ, Ankara prov.: Central / Gölbaşı / Çal Mt. / Hüseyin Gazi Mt., Erzurum prov., Van prov., Kars prov.: Central / Kağızman, Niğde prov.: Bulgar-Maden (Çamardı), Afyon prov.: Emirdağ (Önalp, 1990); Yozgat prov.: Yozgat pine grove, Erzincan prov.: Çayırlı (Başköy), Sivas prov.: Tahtıkement village, Gümüşhane prov.: Kelkit (Akdağ), Yozgat prov.: Yozgat National Park (Özdikmen & Hasbenli, 2004a); Konya prov.: Akşehir (Özdikmen et al., 2005); Ankara prov.: Çal Mountain (Özdikmen & Demir, 2006); Kahramanmaraş prov.: Göksun (Central / Küçüksu plateau / Korkmaz) (Özdikmen & Okutaner, 2006); Ankara prov.: Ayaş, Kızılcahamam (Işık Dağı) (Özdikmen et al., 2009); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Armenia, Azerbaijan, Transcaucasia, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion schultzei Heyden, 1894

Type loc.: Turkey: Mardin prov..

This species is endemic to SE Anatolia of Turkey.

Records in Turkey: (MR-TUR)
Turkey (Aurivillius, 1921; Winkler, 1924-1932; Lodos, 1998); Mardin prov. (Breuning, 1962); Mardin prov.: Mazıdağı (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion scopolii (Herbst, 1784)

Lamia lineata Fabricius, 1787
Cerambyx germanicus Gmelin, 1790
Cerambyx ungaricus Gmelin, 1790
Dorcadion convexicolle Küster, 1852
Dorcadion vicinum Pic, 1892 [Siberia]
Dorcadion (*Pedestredorcadion*) *scopolii* m. *fulvipenne* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scopolii* m. *rufinipes* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scopolii* m. *flavidovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *scopolii* m. *interclarepubens* Breuning, 1956

Original combination: *Lamia scopolii* Herbst, 1784

Type loc.: Hungary.

This species has been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. Also Jenis (2001) gave it for Turkey with a question mark. However, it is distributed in Europe (incl. Balkans) now. So, it is not

confirmed for Turkey now. If present, it probably occurs in European Turkey especially.

Records in Turkey: (?TRA-TUR)
Turkey (Lodos, 1998).
Distribution: ?Austria, Hungary, ?Czechia, Slowakia, Croatia, Serbia, Greece, Bulgaria, Romania, Poland, Ukraine, Moldavia.
Chorotype: E-European.

Dorcadion scrobicolle Kraatz, 1873

Dorcadion (*Pedestredorcadion*) *scrobicolle* m. *fuscosubrevestitum* Breuning, 1962

Type loc.: Turkey:Anatolia.
ssp.
***D. scrobicolle scrobicolle* Kraatz, 1873**
***D. scrobicolle morulum* Holzschuh, 1995 (Tokat prov.)**

This species is endemic to NC Turkey. It has two subspecies. *D. scrobicolle morulum* was described by Holzschuh (1995) from Tokat province. So this is eastern subspecies of the species.

Records in Turkey: (AM-TO-YO-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921; Winkler, 1924-1932); Amasya prov., Tokat prov. as *D. scrobicolle* and Tokat prov.: Niksar as the type loc. of *D. scrobicolle* m. *fuscosubrevestitum* (Breuning, 1962); Yozgat prov.: Central, Tokat prov.: Yaylacık-Orman (Fuchs et Breuning, 1971); Tokat prov.: Yaylacık-Orman as *D. scrobicolle fuscosubrevestitum* (Fuchs et Breuning, 1971); Yozgat prov. (Braun, 1978); Tokat prov.: Topçam Mountain / Yakacık (Gökdere) (Adlbauer, 1992); Tokat prov.: Gökdere and between Tokat and Niksar as *D. scrobicolle morulum* (Holzschuh, 1995); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion semibrunneum Pic, 1903

Dorcadion (*Cribridorcadion*) *mniszechi semibrunneum* m. *mediocreimpressum* Pic, 1909
Dorcadion (*Cribridorcadion*) *mniszechi* v. *medioimpressum* Pic, 1910
Dorcadion (*Cribridorcadion*) *mniszechi semibrunneum* m. *boszdaghanum* Breuning, 1948

Original combination: *Dorcadion mniszechi* v. *semibrunneum* Pic, 1903.

Type loc.: Turkey: İzmir prov.: Bozdağ

ssp.
***D. semibrunneum semibrunneum* Pic, 1903**
***D. semibrunneum anamasum* Pic, 1934**

This species has two subspecies as the nominotypical subspecies and *D. semibrunneum anamasum* Pic, 1934 which described from Pisidian Taurus: ?Isparta prov.: Anamas Mts. in the original combination as *D. mniszechi* ssp. *anamasum* Pic, 1934. Both subspecies are distributed only in Anatolia. In this status, probably *D. semibrunneum semibrunneum* Pic, 1903 is distributed in W Anatolia and *D. semibrunneum anamasum* Pic, 1934 is distributed in S Anatolia. So, the old Kahramanmaraş record of Özdikmen & Okutaner (2005) belongs to the subspecies, *D. mniszechi* ssp. *anamasum* Pic, 1934 very likely.

Records in Turkey: (AG-EZ-IP-IZ-KAR-SV-TUR)
?İzmir prov.: Bozdağ as D. mniszechi var. semibrunneum (Bodemeyer, 1906); Anatolia as *D.* (*C.*) *mniszechi* v. *semibrunneum* (Aurivillius, 1921); Anatolia as D. mniszechi v. semibrunneum (Winkler, 1924-1932);?İzmir prov.: Bozdağ to Ödemiş as *D. mniszechi* ssp. *semibrunneum*, Pisidian Taurus: ?Isparta prov.: Anamas Mts. as *D. mniszechi* ssp. *anamasum* (Breuning, 1962); Kahramanmaraş prov.: Çağlayancerit (Bozlar) as *D. semibrunneum* (Özdikmen & Okutaner, 2005); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion semilineatum Fairmaire, 1866

Dorcadion (*Pedestredorcadion*) *semilineatum* m. *medioincisum* Breuning, 1946

Type loc.: Turkey:Anatolia: ?İzmir prov.: Bozdağ.

This species is endemic to W and CW Turkey.

Records in Turkey: (IZ-KN-TUR)
İzmir prov.: Bozdağ (Ganglbauer, 1884; Aurivillius, 1921); Anatolia (Winkler, 1924-1932); ?İzmir prov.: Bozdağ (Breuning, 1962); Konya prov.: Akşehir (Tuatay et al., 1972; Özdikmen et al., 2005); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion semilucens Kraatz, 1873

Dorcadion scabricolle mesmini Pic, 1903 [Transcaucasia]
Dorcadion (*Pedestredorcadion*) *semilucens* m. *lactescens* Breuning, 1946
Dorcadion (*Autodorcadion*) *semilucens* ab. *homogeneum* Plavilstshikov, 1958

Type loc.: Mongolia (mistaken information).

This species is endemic to Caucasus. This species has been recorded only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However, it is distributed only in Caucasus now. So, it is not confirmed for Turkey.

Records in Turkey: (IZ-KN-TUR)
Anatolia (Winkler, 1924-1932); ?İzmir prov.: Bozdağ (Breuning, 1962); Konya prov.: Akşehir (Tuatay et al., 1972; Özdikmen et al., 2005); Turkey (Lodos, 1998).
Distribution: Caucasus (Armenia, Azerbaijan).
Chorotype: Caucasian.

Dorcadion seminudum Kraatz, 1873

Dorcadion nachycevanicum Breuning, 1943
Dorcadion (*Pedestredorcadion*) *seminudum* m. *apicejunctum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *seminudum impuncticolle* Breuning, 1946
Dorcadion (*Autodorcadion*) *seminudum* ab. *sagittiferum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *seminudum* ab. *semiperactum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *seminudum* m. *shelkovnikovi* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *seminudum* ab. *zangezuricum* Plavilstshikov, 1958

Type loc.: Caucasus.

Plavilstshikov (1958) mentioned that the caucasian species possibly occurs also in Iran and Turkey. However, this species has been recorded only by Lodos (1998) for Turkey after Plavilstshikov (1958). Also Danilevsky (2010b) gave it with the question marks for Turkey and Iran. So, it is doubtful for Turkey now. If present, it is distributed only in NE Turkey.

Records in Turkey: (TUR)
NE Turkey (Plavilstshikov, 1958); Turkey (Lodos, 1998).
Distribution: Caucasus (Armenia, Azerbaijan), ?Turkey, ?Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian) or Caucasian.

Dorcadion semivelutinum Kraatz, 1873

Type loc.: Turkey: Sivas prov..

This species is endemic to CE Turkey. It has been known only from type locality until now. According to Önalp (1990), *D. nobile* and *D. semivelutinum* are synonyms of *D. nodicorne* Tournier, 1872!

Records in Turkey: (SV-TUR)
Sivas prov. (Aurivillius, 1921); Anatolia as *D. nobile* v. *semivelutinum* (Winkler, 1924-1932); Sivas prov. as the type locality (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion septemlineatum Waltl, 1838

Dorcadion apicale Thomson, 1865
Dorcadion forcipiferum Kraatz, 1873
Dorcadion septemlineatum v. *rufoapicale* Pic, 1942
Dorcadion (*Pedestredorcadion*) *septemlineatum* m. *basilineatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *septemlineatum* ssp. *octolineatum* m. *pseudapiceconjunctum* Br., 1946
Dorcadion (*Pedestredorcadion*) *septemlineatum* ssp. *novemlineatum* m. *pseudapiceconjunctum* Breuning, 1946

Type loc.: Turkey.

ssp.
***D. septemlineatum septemlineatum* Waltl, 1838**
***D. septemlineatum novemlineatum* Kraatz, 1873 (Anatolia: Bilecik prov., Eskişehir prov.)**
***D. septemlineatum octolineatum* Kraatz, 1873 (Anatolia: Karaköy, Bursa prov.)**
***D. septemlineatum demirciense* Breuning, 1966 (Anatolia)**
***D. septemlineatum abanti* Braun, 1976 (Anatolia: Bolu prov.)**

It has five subspecies. All subspecies are represented in Turkey. The nominotypical subspecies occurs also in Greece and Bulgaria. This species is distributed rather widely in Turkey (especially W and N Turkey). The nominotypical subspecies, *D. septemlineatum septemlineatum* Waltl, 1838, occurs mainly in European Turkey.

Records in Turkey: (AF-AN-BI-BL-BO-BS-BU-CA-ES-GA-IP-IS-KN-KO-KR-KU-SA-TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); Constantinopel (=İstanbul prov.) as *Dorcadion 7-lineatum* v. *8-lineatum* (Heyden, 1884); Bilecik prov., Burdur prov.: Karakent as *D. septemlineatum novemlineatum* (Bodemeyer, 1900); Turkey (Winkler, 1924-1932; Lodos, 1998; Özdikmen, 2006); European Turkey as *D. septemlineatum* a. *apicale* Thomson, 1865 (Winkler, 1924-1932); European Turkey and Anatolia: Bosphorus, Karaköy, Bursa prov., Bilecik prov., Eskişehir prov. (Breuning, 1962); Sakarya prov.: Adapazarı (Sapanca lake) as *D. septemlineatum novemlineatum* (Fuchs et Breuning, 1971); Çanakkale prov.: Çan (Braun, 1978); Bolu prov.: Abant Mts. as *D. septemlineatum abanti* (Braun, 1978); Bilecik prov.: Söğüt / Bozüyük (Saraycık) / Central, Kütahya prov.: Central, Afyon prov.: Bayramgazi as *D. septemlineatum novemlineatum* (Braun, 1978); Sakarya prov.: Adapazarı (Esentepe) as *D. septemlineatum octolineatum* (Braun, 1978); Bolu prov.: Abant

(Sama, 1982); Eskişehir prov.: Boz Mountain, Bursa prov., Kocaeli prov.: İzmit (Osmaneli) (Adlbauer, 1988); İstanbul prov.: Alem Mountain / Central, Eskişehir prov., Konya prov., Ankara prov.: Central / Soğuksu / Karagöl, Isparta prov.: Eğirdir, Balıkesir prov. (Önalp, 1990); Bolu prov.: Abant lake as *D. septemlineatum abanti* (Adlbauer, 1992); European Turkey (Althoff & Danilevsky, 1997); Bolu prov.: Gerede (Yeniçağ) as *D. septemlineatum abanti* (Özdikmen & Hasbenli, 2004a); Gaziantep prov.: Islahiye (Özdikmen et al., 2005); Bolu prov.: Dörtdivan as *D. septemlineatum abanti* (Özdikmen et al., 2005); Karabük prov.: Hanköy (Aşağıbağ place) (Özdikmen, 2007); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, Bulgaria, European Turkey), Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion sericatum Sahlberg, 1823

Dorcadion velutinum Kraatz, 1873

Type loc.: Crimea.

This species is endemic to Crimea. It has been recorded by many authors from Turkey. But these records belong to *D. cinerarium* and *D. subsericatum* very likely. All Turkish records need to be clarified. Since, it is impossible for Turkey.

Records in Turkey: (AM-ANT-BS-CN-ER-ES-EZ-GU-IC-IS-NI-SV-TO-VA-YO)
All old records that were given as *D. sericatum* Krynicki, 1832 should be *D. cinerarium* and *D. subsericatum*. These are: Antalya prov.: Toros Mountains, Niğde prov.: Çamardı (Bodemeyer, 1900); Amasya prov., İstanbul prov., Bursa prov.: Uludağ, Tokat prov., Niğde prov.: Ulukışla / Bulgar Maden (Çamardı), Eskişehir prov., Van prov., Ankara prov.: Beynam / Elmadağ / Hüseyin Gazi Mountain / Baraj I, Çankırı prov.: İsmet Paşa, Erzurum prov.: İspir (Önalp, 1990); Ankara prov.: Beynam, Gümüşhane prov.: Kelkit (Kömürköy), Erzincan prov.: Çayırlı (Balıklı village), Sivas prov.: Ulaş (Kurtlukaya village), Yozgat prov.: Yozgat National Park (Özdikmen & Hasbenli, 2004a); Ankara prov.: Hüseyin Gazi Mountain, İçel prov.: Silifke (Özdikmen et al., 2005).
Distribution: Crimea.
Chorotype: Crimean.

Dorcadion sinopense Breuning, 1962

Dorcadion (*Pedestredorcadion*) *sinopense* m. *reductevittipenne* Breuning, 1962 (Sinop pr.)
Dorcadion (*Pedestredorcadion*) *sinopense* m. *drannadaghense* Breuning, 1974 (Sinop pr.: Dranaz Mt.)
Dorcadion (*Pedestredorcadion*) *sinopense* m. *nigrovittipenne* Breuning, 1974 (Sinop pr.: Dranaz Mt.)

Type loc.: Turkey: Sinop prov..

This species is endemic to NC Turkey. It has been known only from type locality until now. *D. spinense* Breuning, 1962 is an error writing of *D. sinopense* Breuning, 1962.

Records in Turkey: (SN-TUR)
Sinop prov. (Breuning, 1962); Sinop prov.: Dranaz Mt. (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion sinuatevittatum Pic, 1937

Dorcadion (*Pedestredorcadion*) *sinuatevittatum* m. *brevemediolineatum* Pic, 1942

Type loc.: Turkey: Anatolia: Carian Taurus.

This species is endemic to SW and SC Turkey.

Records in Turkey: (DE-BU-KA-TUR)
Denizli prov.: Carian Taurus, Babadağ (Breuning, 1962); Burdur prov. as *D. bangi* (Özdikmen et al., 2005); Kahramanmaraş prov.: Göksun (Mehmetbey bridge) as *D. bangi heinzorum* Braun, 1975 (Özdikmen & Okutaner, 2006); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion smyrnense (Linnaeus, 1757)

Lamia (Dorcadion) crux Billberg, 1817
Dorcadion graecum Waltl, 1838
Dorcadion cruciator Gistel, 1848
Dorcadion bifidum Chevrolat, 1882
Dorcadion crux v. *lunulatum* Pic, 1900
Dorcadion crux v. *niveopictum* Daniel, 1901
Dorcadion crux v. *integrofasciatum* Daniel, 1901
Dorcadion grandevittatum Pic, 1904
Dorcadion crux v. *biinterruptum* Pic, 1901
Dorcadion cinctellum v. *subfurcatum* Pic, 1913
Dorcadion crux v. *brevedisjunctum* Pic, 1929
Dorcadion crux v. *lateargenteum* Pic, 1929
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *dorsoabbreviatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *holodisjunctum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *quadriinterruptum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *rufulum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *semiinterruptum* Breuning, 1946
Dorcadion (Pedestredorcadion) smyrnense m. *lunulatoides* Breuning, 1948
Dorcadion (*Pedestredorcadion*) *smyrnense* m. *bodemeyerianum* Breuning, 1962

Original combination: *Cerambyx smyrnensis* Linnaeus, 1757

Type loc.: Turkey: Anatolia: Smyrna (İzmir prov.).

This species is endemic to W and SW and SC Turkey. Danilevsky in Löbl & Smetana (2010) gave it as *D. crux.*

Records in Turkey: (BI-BL-BS-ES-IS-IZ-KN-KU-OS-US-TRA-TUR)
Turkey: İzmir prov. as *D. crux* (Ganglbauer, 1884; Aurivillius, 1921); Eskişehir prov. as *D. crux* var. *integrofasciatum* (Bodemeyer, 1900); İzmir prov. (Aurivillius, 1921); Eskişehir prov. as *D. crux* (Bodemeyer, 1906); İzmir prov. as *D. divisum* ab. *smyrnense* (Aurivillius, 1921); Turkey as *D. grandevittatum* (Aurivillius, 1921); Anatolia and European Turkey as *D. crux* (Winkler, 1924-1932); İzmir prov.: Ödemiş, Bozdağ (Breuning, 1962); Konya prov.: Akşehir, Uşak prov. (Demelt, 1963); Osmaniye prov.: Bahçe as *D. crux* var. *integrofasciatum* (Fuchs et Breuning, 1971); Konya prov.: Akşehir as *D. crux* (Tuatay et al., 1972); Bilecik prov.: Söğüt, Kütahya prov. (Braun, 1978); İzmir prov.: Bergama (Adlbauer, 1988); Bursa prov., Eskişehir prov., İzmir prov.: Ödemiş (Bozdağ), Konya prov.: Akşehir, İstanbul prov.: Alem Mountain, Balıkesir prov. as *D. crux* (Önalp, 1990); Turkey as *D. crux* (Lodos, 1998).Turkey (Lodos, 1998); Turkey as *D. grandevittatum* (Winkler, 1924-1932; Lodos, 1998); Konya prov.: Akşehir (Özdikmen et al., 2005); Anatolia as *D. crux* (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion sodale Hampe, 1852

Type loc.: Unknown.

ssp.
***D. sodale sodale* Hampe, 1852**
***D. sodale trapesunticum* Breuning, 1946**

***D. sodale blumenthali* Breuning, 1966**

This species is endemic to NE Anatolia.

Records in Turkey: (BY-EZ-TB-TUR)
NE Turkey (Plavilstshikov, 1958); Zigana Mountains (?Trabzon Erzurum prov.) (Villiers, 1959); Turkey: Pontic Alps, Kolat Mt. (Breuning, 1962); Trabzon prov. as *D. sodale* m. *trapesunticum* Breuning, 1946 (Breuning, 1962); Trabzon prov.: Soğanlı pass (Breuning et Villiers, 1967); Bayburt prov.: Soğanlı pass (Demelt, 1967); Erzurum prov.: Aşkale (Gfeller, 1972); Erzurum prov.: İspir / Ovacık (Braun, 1978); Bayburt prov. (Adlbauer, 1988); Erzurum prov.: Central / İspir (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion sonjae Peks, 1993

Type loc.: Turkey: Elazığ prov..

This species is endemic to western parts of E Turkey.

Records in Turkey: (EL-TUR)
Elazığ prov.: Elmapınarı and Çaybağ (Peks, 1993); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion steineri Holzschuh, 1977

Type loc.: Turkey: Rize prov..

This species is endemic to NE Turkey.

Records in Turkey: (RI-TUR)
Rize prov.: Çamlıhemşin (Hacıvanak plateau) as the type loc. of *D. steineri* (Holzschuh, 1977); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion striolatum Kraatz, 1873

Dorcadion obesum Tournier, 1872
Dorcadion striolatum ab. *masculinum* Plavilstshikov, 1927
Dorcadion (*Pedestredorcadion*) *striolatum* m. *distinctefasciatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *striolatum* ssp. *suramense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *striolatum* m. *brunnescens* Breuning, 1948

Type loc.: Caucasus.

This species is distributed only in NE Anatolia for Turkey.

Records in Turkey: (AG-TUR)
NE Turkey (Plavilstshikov, 1958; Danilevsky & Miroshnikov, 1985); Ağrı prov.: N Bayazıt (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion sturmi Frivaldsky, 1837

Dorcadion (*Pedestredorcadion*) *sturmi* m. *albofasciatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sturmi* m. *albotomentosum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sturmi* m. *fulvofasciatum* Breuning, 1946

Type loc.: Bulgaria.

This species is distributed mostly in European Turkey for Turkey. The Diyarbakır (SE Turkey) record of Önalp (1990) needs to be confirmed.

Records in Turkey: (DI-ED-TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); European Turkey (Winkler, 1924-1932); Diyarbakır prov., Edirne prov. (Önalp, 1990); Turkey (Lodos, 1998).
Distribution: Macedonia, Bulgaria, ?Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion subatritarse Breuning, 1966

Type loc.: Turkey: Çorum prov..

This species is endemic to NC Turkey. According to Braun (1978), *D. subatritarse* Breuning, 1966 is a synonym of *D. iconiense*. Recently, Danilevsky in Löbl & Smetana (2010) also accepted it as a synonym of *D. iconiense*.

Records in Turkey: (CO)
Çorum prov.: Boğazkale (Breuning, 1966; Perissinotto & Lucini, 1966; Braun, 1978).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion subcinctellum Breuning, 1962

Type loc.: Turkey: ?Malatya prov.: Hamidiye.

This species is endemic to western parts of E Turkey. It has been known only from type locality until now. The type locality was given by Breuning (1962) as "Kappadocien, Hamidje, östlich von Kaisarié". So Hamidiye is a village of Yazıhan (Malatya prov.) very likely.

Records in Turkey: (MA-TUR)
?Malatya prov.: Yazıhan: Hamidiye village (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion subinterruptum Pic, 1900

Dorcadion divisum v. *indivisum* Pic, 1900
Dorcadion (*Pedestredorcadion*) *divisum* m. *interruptevittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *subinterruptum* m. *exiguum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *subinterruptum* m. *posticeconjunctum* Breuning, 1946

Original combination: *Dorcadion divisum* v. *subinterruptum* Pic, 1900

Type loc.: Turkey: Konya prov..

This species is endemic to Turkey. It is distributed mostly in W half of Anatolia (W, C, SW and SC Turkey).

Records in Turkey: (ES-?IC-IZ-KN-TUR)
Konya prov. as *D. divisum* v. *indivisum* and *D. divisum* ab. *subinterruptum* (Aurivillius, 1921); İzmir prov.: Bozdağ, Eskişehir prov., Konya prov., ?İçel prov.: Bolkar Mts. (Breuning, 1962); Konya prov.: Ilgın (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion subsericatum Pic, 1901

Dorcadion (*Pedestredorcadion*) *paphlagoniense* Breuning, 1944
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *disconigromaculipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *humerosubvittatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *junctum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *nigroapicale* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *nigroimmaculatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *rubroapicipenne* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *subpaphlagoniense* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *sutureimmaculatum* Breuning, 1962
Dorcadion (*Pedestredorcadion*) *subsericatum* m. *suturemaculatum* Breuning, 1962

Type loc.: Syria (mistaken information). Turkey: Kastamonu prov. undoubtedly.
ssp.
***D. subsericatum subsericatum* Pic, 1901 (Kastamonu prov.)**
***D. subsericatum vulneratum* Pesarini & Sabbadini, 1998 (Kastamonu prov.: Masruf pass)**

It has two subspecies that are known only from Kastamonu province. However, according to Pesarini & Sabbadini (1998), this species has four subspecies. *Dorcadion subsericatum subsericatum* Pic, 1901 occurs in Kastamonu prov., *Dorcadion subsericatum vulneratum* Pesarini & Sabbadini, 1998 occurs in Kastamonu prov.: Masruf pass, *Dorcadion subsericatum rufipenne* (Breuning, 1946) occurs in Kastamonu prov.: Ilgaz Mt., Araç, Yeşilova, Çankırı prov.: Çerkeş, Kurtçimeni and *Dorcadion subsericatum majus* (Breuning, 1962) occurs only in Sinop prov.: Çulhalı. So this species is endemic to NCW and C Turkey. Type locality, Syria is mistaken information undoubtedly.

Records in Turkey: (AN-CN-KN-KS)
Kastamonu prov. for all morphae (Breuning, 1962); Kastamonu prov.: Ilgaz Mountain (Demelt, 1967); Kastamonu prov.: Ilgaz Mountain (Yılancı village / Bürnük) / Devrekani (Braun, 1978); Kastamonu prov.: 35 km. to Çankırı prov. (Sama, 1982); Kastamonu prov.: Ilgaz Mountain (Yılancı village) / Yaralıgöz (Devrekani), Çankırı prov., Ankara prov. (Adlbauer, 1992); Konya prov.: Kulu (between Beşkardeş-Zincirlikuyu villages) (Özdikmen & Hasbenli, 2004a); Ankara prov.: Bayındır Dam, Ayaş road (Başayaş village env.), Çubuk (Özdikmen, 2006); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion subvestitum Daniel, 1900

Type loc.: Turkey: İzmir prov.: Bozdağ-Ödemiş.

This species is endemic to Turkey. It probably is distributed rather widely in Turkey (especially W half of Anatolia and W of E Anatolia).

Records in Turkey: (AM-AN-ES-IZ-KN-MA-NI-TUR)
Anatolia (Aurivillius, 1921; Winkler, 1924-1932); Malatya prov.: Arguvan (Gfeller, 1972); İzmir prov., Eskişehir prov., Ankara prov., Niğde prov.: Bulgar-Maden (=Çamardı), Konya prov., Amasya prov. (Önalp, 1990); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.

Chorotype: Anatolian.

Dorcadion sulcipenne Küster, 1847

Dorcadion impressicorne Tournier, 1872 (Caucasus: Georgia, Armenia and Turkey)
Dorcadion sericatum v. *atripes* Reitter, 1900 Amasya, Tokat
Dorcadion maljushenkoi Pic, 1904
Dorcadion argonauta kurda Suvorov, 1913
Dorcadion argonauta v. *pallescens* Suvorov, 1913
Dorcadion armenum Suvorov, 1915
Dorcadion goktshanum Suvorov, 1915
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *extremum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *subcinerarium* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *cinerarium* m. *apicevittatum* Breuning, 1946 Ukraine, N Turkey
Dorcadion (*Pedestredorcadion*) *impressicorne* m. *subpallescens* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *bisbifasciatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *tiflisense* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *humerofasciatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *nigroirroratum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *subflavum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *sulcipenne* m. *meskischense* Breuning, 1946
Dorcadion sulcipenne ab. *autotomentosum* Plavilstshikov, 1948
Dorcadion cinerarium m. *tokatense* Podany, 1954 Tokat
Dorcadion (*Pedestredorcadion*) *impressicorne* m. *bivittipenne* Breuning, 1956
Dorcadion (*Autodorcadion*) *argonauta* ab. *subinfensum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *maljushenkoi* ab. *affluentinum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *maljushenkoi* ab. *subopimum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *sulcipenne* ab. *suspectum* Plavilstshikov, 1958
Dorcadion cinerarium m. *rubricorne* Breuning, 1958

Type loc.: Caucasus.

ssp.
***D. sulcipenne sulcipenne* Küster, 1847 (Caucasus: Georgia)**
***D. sulcipenne caucasicum* Küster, 1847 (Caucasus: Georgia, Armenia and Turkey)**
***D. sulcipenne argonauta* Suvorov, 1913 (Caucasus: Georgia, Armenia and Turkey)**
***D. sulcipenne goektshanum* Suvorov, 1915 (Caucasus: Armenia)**

This species has four subspecies. In Turkey, it is represented by two subspecies as *D. sulcipenne caucasicum* Küster, 1847 that is distributed rather widely in Turkey, and *D. sulcipenne argonauta* Küster, 1847 that is distributed only in NE Anatolia for Turkey. According to Breuning (1962), *D. argonauta* is a synonym of *D. impressicorne*. *D. caucasicum* was regarded as a glabrous subspecies of *D. sulcipenne* by Lazarev (2009). According to Danilevsky in Löbl & Smetana (2010), this species is represented only by *D. sulcipenne argonauta* in Turkey.

Records in Turkey: (AM-AN-CO-EZ-IZ-KAR-US-VA-TUR)
Turkey: Amasya prov. (Ganglbauer, 1884); Turkey as *D. sericatum* for *D. caucasicum* (Ganglbauer, 1884); NE Turkey (Plavilstshikov, 1958); Kars prov.: Kağızman, Sarıkamış, Erzurum prov.: Oltu as *D. argonauta* (Plavilstshikov, 1958); North Turkey as *D. c.* m. *caucasicum* / *D. c.* m. *apicevittatum* (Breuning, 1962); Uşak prov. as *D. caucasicum* m. *bivittatum* (Demelt, 1963); Çorum prov.: Boğazkale, Ankara prov.: Gölbaşı as *D. cinerarium* m. *caucasicum* (Perissinotto & Luchini, 1966); Van prov.: Kuzgunkıran, Yozgat prov.: Central as *D. cinerarium caucasicum* (Fuchs et Breuning, 1971); İzmir prov.: Bornova as *D. caucasicum* m. *bivittatum* (Gül-Zümreoğlu, 1975); Turkey (Danilevsky & Miroshnikov, 1985); NE Turkey as *D. argonauta* (Danilevsky & Miroshnikov, 1985); Turkey as *D. cinerarium caucasicum* (Lodos, 1998); Anatolia as *D. sulcipenne argonauta* (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Turkey.
Chorotype: SW-Asiatic (Anatolo-Caucasian).

Dorcadion syriense Breuning, 1943

Type loc.: Turkey: Amanos Mts..

This species is endemic to SC Turkey. It has been known only fron type locality until now. The type locality was given as Syria: Amanos Mts. by Breuning. Amanos Mts. is in S Turkey, not Syria.

Records in Turkey: (TUR)
Turkey: Amanos Mts. (Breuning, 1943 and 1962).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion tauricum Waltl, 1838

Dorcadion nigritarse Kraatz, 1873
Dorcadion (*Pedestredorcadion*) *tauricum* v. *discovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *tauricum* m. *humerovittatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *tauricum* m. *preapicereductum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *tauricum* m. *presuturemaculatum* Breuning, 1946

Type loc.: Crimea (mistaken information).

This species for Turkey is distributed only in NW Turkey.

Records in Turkey: (ED-IS-SA-TE-TRA-TUR)
Thrace (Breuning, 1962); Edirne prov.: Keşan (Braun, 1978); Tekirdağ prov.: Muratlı (Adlbauer, 1988); İstanbul prov.: Alem Mountain, Sakarya prov.: Sapanca (Önalp, 1990); Turkey (Lodos, 1998); European Turkey (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Serbia, Greece, Bulgaria, European Turkey, Romania, Ukraine, Crimea).
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion theophilei Pic, 1898

Dorcadion costiferum Pic, 1898
Dorcadion theophilei v. *costiferum* Pic, 1898

Type loc.: Turkey: Trabzon prov..

This species is endemic to NE Turkey.

Records in Turkey: (GU-TB-TUR)
Trabzon prov. as *D. costiferum* (Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998); Artvin prov. (Plavilstshikov, 1958); Trabzon prov.: Kolat Mt. (Pontic Alpes) (Villiers, 1959); Trabzon prov., Gümüşhane prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion tuerki Ganglbauer, 1884

Dorcadion (*Pedestredorcadion*) *türki* m. *internestriatum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *türki* m. *stramentosoides* Breuning, 1946
Dorcadion (*Autodorcadion*) *türki* ab. *posticefibulatum* Plavilstshikov, 1958

Original combination: *Dorcadion türki* Ganglbauer, 1884

Type loc.: Iran: Mazanderan: Hadschgabad.

This species is endemic to Iran now. Since Danilevsky (2010b) gave *D. türki* v. *transcaspicum* Jakovlev, 1901 which was regarded as a subspecies of *D. türki* by Breuning (1962), as a synonym of *D. komarowi* Jakovlev, 1887. However, it has been recorded by Demelt (1963) from Amanos Mts. (S Turkey) for Turkey. This doubtful record probably belongs to another *Dorcadion* species. It needs to be confirmed. So this species is not confirmed for Turkey now.

Records in Turkey: (TUR)
S Turkey: Amanos Mts. (=Nur Mts.) (Demelt, 1963).
Distribution: Iran.
Chorotype: Iranian or SW-Asiatic (Irano-Anatolian).

Dorcadion turcicum Breuning, 1963

Type loc.: Turkey: Marmara Sea: Balıkesir prov.: Erdek: Paşalimanı Island.

This species is endemic to NW Turkey. It has been known only fron type locality until now.

Records in Turkey: (BL-TUR)
Turkey: Marmara: Balıkesir prov.: Erdek: Paşalimanı Island (Breuning, 1963); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion ullrichi Bernhauer, 1988

Type loc.: Turkey: Malatya prov..

This species is endemic to CSE Turkey. It has been known only fron type locality until now.

Records in Turkey: (MA-TUR)
Malatya prov. (Bernhauer, 1988); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion urmianum Plavilstshikov, 1937

Type loc.: Iran: Urmia.

This species is distributed only in SE Anatolia for Turkey.

Records in Turkey: (HA-TUR)
Turkey (Braun, 1975); Hakkari prov.: Oramar (Sat Mt.) (Braun, 1978); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Iran, Turkey.
Chorotype: SW-Asiatic (Irano-Anatolian).

Dorcadion variegatum Ganglbauer, 1884

Type loc.: Syria.

This species is distributed only in central parts of S Anatolia for Turkey.

Records in Turkey: (GA-KA-TUR)
Kahramanmaraş prov., Gaziantep prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Syria, Turkey.
Chorotype: SW-Asiatic (Syro-Anatolian).

Dorcadion wagneri Küster, 1846

Dorcadion solyzinosum Pic, 1942
Dorcadion (*Pedestredorcadion*) *wagneri* m. *dorsobipartitum* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *wagneri* m. *disparatum* Breuning, 1946
Dorcadion (*Autodorcadion*) *wagneri* ab. *biramosum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *wagneri* ab. *evirgatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *wagneri* ab. *grigorianum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *wagneri* ab. *pervulgatum* Plavilstshikov, 1958
Dorcadion (*Autodorcadion*) *wagneri* ab. *zoricum* Plavilstshikov, 1958

Type loc.: Turkey: Ağrı prov.: Ağrı Mt. (=Ararat).
This species is distributed only in NE Anatolia for Turkey.

Records in Turkey: (AG-EZ-KAR-TUR)
Type loc.: Turkey: Büyük Ağrı (Kuster, 1848); Turkey: Ağrı prov.: Ağrı Mt., Erzurum prov. (Ganglbauer, 1884); NE Turkey: to Erzurum prov. (Plavilstshikov, 1958); N Turkey (Danilevsky & Miroshnikov, 1985); Kars prov., Erzurum prov.: Hasankale, Ağrı prov.: Doğu Beyazıt (Ağrı Mountain) (Önalp, 1990); Turkey (Lodos, 1998); European Turkey (Danilevsky in Löbl & Smetana, 2010).
Distribution: Caucasus, Turkey, Iran.
Chorotype: SW-Asiatic (Anatolo-Caucasian + Irano-Caucasian + Irano-Anatolian).

Dorcadion walteri Holzschuh, 1991

Type loc.: Turkey: Bolu prov..

This species is endemic to NCW Turkey. It has been known only from type locality until now. Danilevsky in Löbl & Smetana (2010) gave it under the subgenus *Megalodorcadion*.

Records in Turkey: (TUR)
Bolu prov.: Alpu Bey village to Bolu (Holzschuh, 1991); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion weyersi Fairmaire, 1866

Dorcadion weyersi v. *aolense* Pic, 1942
Dorcadion (*Pedestredorcadion*) *weyersi* m. *brunneicolor* Breuning, 1946
Dorcadion (*Pedestredorcadion*) *weyersi* m. *subbrunneicolor* Breuning, 1946

Type loc.: Turkey: ?Burdur prov.: Kızılkaya (=Kisilgye-Aole).

This species is endemic to W and SW Turkey.

Records in Turkey: (BU-IZ-MN-TUR)
Type loc.: Turkey: Kızılkaya (?Burdur: Bucak) (Fairmaire, 1866); ?Burdur prov.: Kızılkaya (Ganglbauer, 1884; Aurivillius, 1921); Turkey (Winkler, 1924-1932; Lodos, 1998); İzmir prov.: Ödemiş (Breuning, 1962); Manisa prov. (Gül-Zümreoğlu, 1972); İzmir prov.: Alaşehir (Adlbauer, 1988); İzmir prov.: Ödemiş (Önalp, 1990); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.

Chorotype: Anatolian.

Subgenus *MACULATODORCADION* Breuning, 1942

Type sp.: *Dorcadion quadrimaculatum* Küster, 1848

In this subgenus, according to Breuning (1962), the first antennal segment normally pubescencent. 3rd antennal segment considerably shorter than the first, apical half of the 3rd segment to 5th or 6th strongly thickened. Penis wide basally, moderately narrowed apically, in apical quite broadly rounded, but not truncate, the lower lamella projecting at the side and very much broadly rounded.

This subgenus is represented by 4 species in Turkey. 3 species among them are endemic to Turkey.

Dorcadion janssensi Breuning, 1966

Type loc.: Turkey: Rize prov.: Tatos Mts..

This species is endemic to NE Turkey. It has been known only from type locality until now.

Records in Turkey: (RI-TUR)
Rize prov.: Tatos Mts. (Breuning, 1966); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion quadrimaculatum Küster, 1848

Dorcadion quadrimaculatum v. *bimaculatum* Pic, 1898
Dorcadion quadrimaculatum v. *innotatum* Pic, 1908
Dorcadion quadrimaculatum v. *clementinum* Pic, 1918
Dorcadion (*Maculatodorcadion*) *quadrimaculatum* m. *tristiforme* Breuning, 1946
Dorcadion (*Maculatodorcadion*) *quadrimaculatum* m. *multinigrosparsum* Breuning, 1946
Dorcadion (*Maculatodorcadion*) *quadrimaculatum* m. *subbimaculatum* Breuning, 1947
Dorcadion (*Maculatodorcadion*) *quadrimaculatum* m. *maculereductum* Breuning, 1962
Dorcadion (*Maculatodorcadion*) *quadrimaculatum* m. *subnodicorne* Breuning, 1962

Type loc.: Greece and Turkey (the latter information mistakenly ex Breuning, 1962).

ssp.
***D. quadrimaculatum quadrimaculatum* Küster, 1848**
***D. quadrimaculatum nodicorne* Tournier, 1872 (Turkey: Çanakkale, Greece: Lesbos Isl.)**

This species has two subspecies. It is represented by both subspecies in Turkey. It is distributed in W and NW Turkey. According to Breuning (1962), the type locality, Taurus for *D. quadrimaculatum nodicorne* is mistaken information.

Records in Turkey: (CA-IZ-TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); Taurus as *D. nodicorne* (Aurivillius, 1921); European Turkey (Winkler, 1924-1932); Toros Mountains as *D. nodicorne* (Winkler, 1924-1932; Önalp, 1990); European Turkey, Toros Mts, Çanakkale prov. (Breuning, 1962); Thrace and west Anatolia (Kratschmer, 1985); İzmir prov. (Önalp, 1990); European Turkey (Althoff & Danilevsky, 1997); European Turkey as *D. nodicorne* (Althoff & Danilevsky, 1997); Turkey as *D. nodicorne* (Lodos, 1998); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Europe (Greece, European Turkey), Turkey.

Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Dorcadion triste Frivaldsky, 1845

Dorcadion (*Maculatodorcadion*) *triste* m. *postmedioreductum* Breuning, 1946
Dorcadion (*Maculatodorcadion*) *triste* m. *vittipenne* Breuning, 1946

Type loc.: Turkey: İzmir prov. (=Smyrna).

ssp.
***D. triste triste* Frivaldsky, 1845**
***D. triste phrygicum* Peks, 1993 (S Turkey: Antalya prov.)**

This species is endemic to W and SW Turkey. It has two subspecies as *D. triste triste* (western subspecies) and *D. triste phrygicum* (eastern subspecies). The later was collected by Chris Bruggeman (Belgium) from Antalya prov.: Aspendos in April 2010 (pers. comm.. 2010).

Records in Turkey: (ANT-BL-BS-IZ-TUR)
Turkey: Bursa prov. (Ganglbauer, 1884); İzmir prov., Bursa prov. (Aurivillius, 1921); Anatolia (Winkler, 1924-1932); Bursa prov., Balıkesir prov., İzmir prov. (Breuning, 1962); İzmir prov.: Dikili (Makaron) (Demelt, 1963); İzmir prov.: Dikili (Gül-Zümreoğlu, 1972); Balıkesir prov.: Balya (Braun, 1978); İzmir prov.: Dikili (Kratschmer, 1985); İzmir prov., Balıkesir prov.: Susurluk, Bursa prov.: Mustafa Kemal Paşa, Karacabey (Önalp, 1990); Type loc.: Holotype: Antalya prov.: Ova SE Korkuteli, Bakacak beli N Saklıkent as *D. triste phrygicum* Peks, 1889 (Peks, 1993); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Dorcadion wolfi Kraetschmer, 1985

Type loc.: Turkey: Balıkesir prov.: Ören.

This species is endemic to NW Anatolia.

Records in Turkey: (BL-TUR)
Balıkesir prov.: Ören near Burhaniye (10 km. South of Edremit) (Kratschmer, 1985); Balıkesir prov.: Burhaniye (Adlbauer, 1992); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Subgenus *DORCADION* Dalman, 1817

Compsodorcadion Ganglbauer, 1884

Type sp.: *Cerambyx glycyrrhizae* Pallas, 1771

In this subgenus, according to Breuning (1962), the first antennal segment completely without pubescence or at most with very much sparsely pubescence, only in females of some species a little less sparse. Penis very wide, more narrow from the base, noticeably upward crooked, apically narrow, but dull, the lower lamella not projecting forwardly.

The subgenus *Compsodorcadion* Ganglbauer, 1884 (type sp.: *Dorcadion gebleri* Kraatz, 1873) was regarded as a synonym of the subgenus *Dorcadion* s.str. by

Breuning (1962). It was revalidated by Danilevsky (1996) as a subgenus of *Dorcadion*. The separation of *Compsodorcadion* and *Dorcadion* s. str. was published by Danilevsky (1996). Later Danilevsky et al. (2004) *Compsodorcadion* sensu Danilevsky, 1996 (with 4 species: *D. gebleri, D. cephalotes, D. crassipes* and *D. ganglbaueri*) was enlarged with at least three more species on the base of endophallic characters: *D. glicyrrhizae, D. alakoliense* and *D. abakumovi*. Finally, Danilevsky (2010b) returned the position of Breuning (1962) and gave *Compsodorcadion* as a synonym of *Dorcadion* s.str..

Only 2 species have been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. So, these records are not confirmed for Turkey. Finally, this subgenus is not represented in Turkey.

Dorcadion gebleri Kraatz, 1873

Dorcadion glycyrrhizae Fischer-Waldheim, 1823 (nec Pallas, 1773)
Dorcadion pallasi Gebler, 1833 (nec Fischer-Waldheim)
Compsodorcadion gebleri jakovlevianum Suvorov, 1911
Compsodorcadion gebleri jakovlevianum ab. *tryphthis* Suvorov, 1911
Compsodorcadion gebleri jakovlevianum ab. *zaisanense* Suvorov, 1911
Compsodorcadion alexii Suvorov, 1915
Dorcadion gebleri m. *occidentale* Breuning, 1947
Dorcadion gebleri m. *androcoloratum* Plavilstshikov, 1958
Dorcadion gebleri m. *autovestitum* Plavilstshikov, 1958
Dorcadion gebleri m. *demimetrum* Plavilstshikov, 1958

Type loc.: Kazakhstan: Zaisan.

ssp.
***D. gebleri gebleri* Kraatz, 1873 (Kazakhstan, E Siberia, China)**
***D. gebleri demimetrum* Plavilstshikov, 1958 (Kazakhstan)**
***D. gebleri lukhtanovi* Danilevsky, 1996 (Kazakhstan)**
***D. gebleri takyr* Danilevsky, 1996 (Kazakhstan)**

The subspecies structure of *D. gebleri* was revised by Danilevsky (1996). Thus, it has four subspecies. This species has been recorded only by Lodos (1998) from Turkey in his unrealistic list without any exact locality. However, it is distributed only in Kazakhstan, E Siberia and China now. So, this record is not confirmed and is impossible for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Kazakhstan, Siberia, China.
Chorotype: Asiatic.

Dorcadion glicyrrhizae (Pallas, 1773)

Lamia glycyrrhizae Fabricius, 1781
Dorcadion rufifrons Motschulsky, 1860
Dorcadion politum Fischer-Waldheim, 1823 (nec Dalman)
Dorcadion olivieri Kraatz, 1878
Compsodorcadion androsovi v. *barsukorum* Suvorov, 1909
Compsodorcadion androsovi v. *rufiscapus* Suvorov, 1909
Compsodorcadion inderiense Suvorov, 1911
Compsodorcadion inderiense v. *penichrus* Suvorov, 1911
Compsodorcadion akmolicum Suvorov, 1915
Dorcadion (*Compsodorcadion*) *rufifrons* ab. *indorsale* Plavilstshikov, 1924
Dorcadion (*Compsodorcadion*) *rufifrons* ab. *lividesuturatum* Plavilstshikov, 1924
Dorcadion (*Compsodorcadion*) *rufifrons* ab. *zhuravlei* Plavilstshikov, 1924
Dorcadion androsovi m. *discoalbopunctatum* Breuning, 1947
Dorcadion androsovi m. *dorsointactum* Breuning, 1947

Dorcadion androsovi m. *fuscopubescens* Breuning, 1947
Dorcadion glycyrrhizae m. *claretomentosum* Breuning, 1947
Dorcadion obtusipenne m. *dorsoobscurum* Breuning, 1947
Dorcadion glycyrrhizae m. *humeropunctatum* Breuning, 1947
Dorcadion glycyrrhizae m. *intravittatum* Breuning, 1947
Dorcadion glycyrrhizae m. *nigrotomentosum* Breuning, 1947
Dorcadion striatum m. *dorsolatevittatum* Breuning, 1947
Dorcadion dubianskii m. *nigrofemorale* Breuning, 1948
Dorcadion androsovi ab. *praedivinatum* Plavilstshikov, 1958
Dorcadion dubianskii ab. *suffusum* Plavilstshikov, 1958
Dorcadion obtusipenne m. *perpullum* Plavilstshikov, 1958
Dorcadion obtusipenne m. *perpullum* Plavilstshikov, 1958
Dorcadion obtusipenne ab. *ponderosum* Plavilstshikov, 1958
Dorcadion uvarovi ab. *indelibatum* Plavilstshikov, 1958
Dorcadion uvarovi m. *pseuduvarovi* Breuning, 1962

Original combination: *Cerambyx glycyrrhizae* Pallas, 1773

Type loc.: Irtim.

ssp.
***D. glicyrrhizae glicyrrhizae* (Pallas, 1773) (Kazakhstan)**
***D. glicyrrhizae striatum* (Goeze, 1777) (European Russia, Kazakhstan, W Siberia)**
***D. glicyrrhizae obtusipenne* Motschulsky, 1860 (Kazakhstan)**
***D. glicyrrhizae dostojewskii* Semenov, 1899 (Kazakhstan)**
***D. glicyrrhizae dubianskii* Jakovlev, 1906 (Kazakhstan, W Siberia)**
***D. glicyrrhizae androsovi* Suvorov, 1909 (Kazakhstan)**
***D. glicyrrhizae uvarovi* Suvorov, 1911 (Kazakhstan)**
***D. glicyrrhizae turgaicum* (Suvorov, 1915) (Kazakhstan)**
***D. glicyrrhizae fedorenkoi* Danilevsky, 2001 (Kazakhstan)**
***D. glicyrrhizae galinae* Danilevsky, 2001 (Kazakhstan)**
***D. glicyrrhizae nikireevi* Danilevsky, 2001 (Kazakhstan)**
***D. glicyrrhizae tobolense* Danilevsky, 2001 (Kazakhstan)**
***D. glicyrrhizae dalilae* Kadyrbekov, 2004 (Kazakhstan)**
***D. glicyrrhizae guberlense* Danilevsky, 2006 (European Russia, Kazakhstan)**
***D. glicyrrhizae inderiense* Danilevsky, 2006 (Kazakhstan)**
***D. glicyrrhizae korshikovi* Danilevsky, 2006 (Kazakhstan, W Siberia)**
***D. glicyrrhizae nemkovi* Danilevsky, 2006 (European Russia, Kazakhstan)**
***D. glicyrrhizae ishkarganum* Danilevsky, 2009 (Kazakhstan)**

The species has eighteen subspecies from Kazakhstan, European Russia and W Siberia. This species has been recorded only by Lodos (1998) from Turkey in his unrealistic list without any exact locality. However, it is distributed only in European Russia, Kazakhstan and W Siberia now. So, this record is not confirmed and is impossible for Turkey.

Records in Turkey: (TUR)
Turkey as *D. glicyrrhizae* and *Dorcadion rufifrons* Motschulsky, 1860 (Lodos, 1998).
Distribution: Kazakhstan, European Russia, W Siberia.
Chorotype: Centralasiatic or Asiatic.

Genus *NEODORCADION* Ganglbauer, 1884

Type sp.: *Lamia bilineata* Germar, 1824

The genus can be easily distinguished from *Dorcadion* Dalman, 1817 by presence of sclerite between clypeus and labrum.

The genus has W Palaearctic chorotype (Italy to Turkey, Ukraine and Moldavia). It was described by Ganglbauer (1884) by separating from

Dorcadion Dalman, 1817. It includes nine species in the world fauna as *Neodorcadion bilineatum* (Germar, 1824), *Neodorcadion calabricum* Reitter, 1889, *Neodorcadion exornatoides* Breuning, 1962, *Neodorcadion exornatum* (Frivaldsky, 1835), *Neodorcadion fallax* (Kraatz, 1873), *Neodorcadion laqueatum* (Waltl, 1838), *Neodorcadion orientale* Ganglbauer, 1884, *Neodorcadion pelleti* (Mulsant et Rey, 1863) and *Neodorcadion virleti* (Brullé, 1832).

8 species of this genus have been recorded from Turkey. However, 2 species have been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. So, these records are not confirmed for Turkey. Finally, this subgenus is represented by 6 species as *Neodorcadion bilineatum* (Germar, 1824), *Neodorcadion exornatoides* Breuning, 1962, *Neodorcadion exornatum* (Frivaldsky, 1835), *Neodorcadion laqueatum* (Waltl, 1838), *Neodorcadion orientale* Ganglbauer, 1884 and *Neodorcadion pelleti* (Mulsant et Rey, 1863) in Turkey.

Neodorcadion bilineatum (Germar, 1824)

Neodorcadion bilineatum ab. *unicolor* Csiki, 1904
Neodorcadion bilineatum v. *macedonicum* Pic, 1917
Neodorcadion bilineatum ab. *backovense* Jurecek, 1940
Neodorcadion bilineatum m. *flavotomentosum* Breuning, 1947
Neodorcadion bilineatum m. *humerovittatum* Breuning, 1947
Neodorcadion bilineatum v. *apicenudum* Podany, 1953
Neodorcadion bilineatum m. *plurilineatum* Breuning, 1962
Neodorcadion bilineatum m. *rubripes* Breuning, 1962

Original combination: *Lamia bilineata* Germar, 1824

Type loc.: Austria.

The species is distributed only in European Turkey for Turkey.

Records in Turkey: (ED-IS-TE-TRA-TUR)
İstanbul prov. (Heyden, 1884); Turkey (Ganglbauer, 1884); European Turkey (Plavilstshikov, 1958; Althoff & Danilevsky, 1997); Tekirdağ prov.: Malkara (Breuning et Villiers, 1967); Edirne prov.: Keşan (Braun, 1978); Turkey (Lodos, 1998).
Distribution: Europe (Croatia, Bosnia-Herzegovina, Serbia, Macedonia, Albania, Greece, Bulgaria, European Turkey, Hungary, Romania, Ukraine, Moldavia).
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Neodorcadion exornatoides Breuning, 1962

Neodorcadion exornatoides m. *claresuturale* Breuning, 1962
Neodorcadion exornatoides m. *rufimembre* Breuning, 1962

Type loc.: Turkey: Balıkesir prov..

The species is endemic to NW Anatolia. It has been known only from type locality until now.

Records in Turkey: (BL-TUR)
Balıkesir prov. (Breuning, 1962); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.

Chorotype: Anatolian.

Neodorcadion exornatum (Frivaldsky, 1835)

Dorcadion labyrinthicum Thomson, 1865 [Crimea]
Dorcadion balcanicum Tournier, 1872
Neodorcadion balcanicum v. *anticejunctum* Pic, 1917
Neodorcadion balcanicum v. *subdiversum* Pic, 1917
Neodorcadion exornatum m. *basiseparatum* Breuning, 1947
Neodorcadion exornatum m. *fuscovariegatum* Breuning, 1947
Neodorcadion exornatum m. *latefasciatum* Breuning, 1948
Neodorcadion exornatum m. *discoseparatum* Breuning, 1962
Neodorcadion exornatum m. *flavescens* Breuning, 1962
Neodorcadion exornatum m. *xanthicum* Breuning, 1962

Original combination: *Dorcadion exornatum* Frivaldsky, 1835

Type loc.: Bulgaria.

The species for Turkey is distributed in NW Turkey.

Records in Turkey: (TRA-TUR)
Turkey (Ganglbauer, 1884; Aurivillius, 1921); Turkey as *D. balcanicum* (Ganglbauer, 1884; Aurivillius, 1921); European Turkey (Winkler, 1924-1932; Breuning, 1962; Althoff & Danilevsky, 1997); Turkey (Winkler, 1924-1932; Breuning, 1962; Lodos, 1998); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Greece, Bulgaria, European Turkey, Romania.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Neodorcadion fallax (Kraatz, 1873)

Neodorcadion fallax m. *fallaciosum* Breuning, 1947

Original combination: *Dorcadion fallax* Kraatz, 1873

Type loc.: Greece: Saloniki.

This species is endemic to Balkan sor Greece. It has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from Greece, ?Macedonia, Thrace now. So, this record is not confirmed for Turkey now.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Greece, ?Macedonia, Thrace.
Chorotype: Balkanian or Greek.

Neodorcadion laqueatum (Waltl, 1838)

Dorcadion interruptum Mulsant & Rey, 1863
Dorcadion sparsum Mulsant & Rey, 1863
Dorcadion abeillei Tournier, 1872
Neodorcadion laqueatum v. *anceyi* Pic, 1913
Neodorcadion laqueatum v. *bulgaricum* Pic, 1913
Neodorcadion laqueatum v. *diversesparsum* Pic, 1914
Neodorcadion laqueatum v. *sparsenotatum* Pic, 1914
Neodorcadion laqueatum v. *lemoulti* Pic, 1914
Neodorcadion laqueatum v. *insparsum* Pic, 1914
Neodorcadion balcanicum v. *subinterruptum* Pic, 1917
Neodorcadion balcanicum v. *kadiense* Pic, 1917
Neodorcadion laqueatum v. *servilorum* Pic, 1917
Neodorcadion laqueatum m. *nigrimembre* Breuning, 1947
Neodorcadion laqueatum m. *rufobrunneum* Breuning, 1947

Neodorcadion laqueatum m. *albescens* Breuning, 1962

Original combination: *Dorcadion laquetum* Waltl, 1838

Type loc.: Turkey.

The species is distributed in NW Turkey for Turkey.

Records in Turkey: (AM-BS-IS-KO-TRA-TUR)
Bursa prov., Amasya prov. (Ganglbauer, 1884); İstanbul prov.: Alem Mt. (Bodemeyer, 1906; Demelt & Alkan, 1962; Demelt, 1963); Bursa prov. as *D. laquetum* v. *abeillei* (Aurivillius, 1921); Anatolia as *D. balcanicum* ab. *kadiense* (Aurivillius, 1921); Anatolia and European Turkey (Winkler, 1924-1932); Bursa prov., İstanbul prov.: Alem Mt. (Breuning, 1962); Kocaeli prov.: Gebze (Braun, 1978); European Turkey (Althoff & Danilevsky, 1997); Turkey (Lodos, 1998); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: ?Greece, Bulgaria, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Neodorcadion orientale Ganglbauer, 1884

Neodorcadion flaschneri Pic, 1889
Neodorcadion orientale v. *merkli* Pic, 1892
Neodorcadion orientale v. *dispar* Pic, 1892
Neodorcadion flaschneri v. *eduardi* Pic, 1900

Original combination: *Neodorcadion balcanicum* v. *orientale* Ganglbauer, 1884

Type loc.: Turkey.

The species is endemic to NW and W Turkey.

Records in Turkey: (IS-IZ-KO-TRA-TUR)
İstanbul prov.: Alem Mt. as *N. flashneri* Pic (Bodemeyer, 1906); İstanbul prov.: Bosphorus as *D. flaschneri* (Aurivillius, 1921); İstanbul prov.: Alem Mt. (Demelt & Alkan, 1962; Demelt, 1963); European Turkey as *N. flashneri* Pic and *N. flashneri* v. *merkli* Pic (Winkler, 1924-1932); İstanbul prov.: Alem Mt., İzmir prov. (Breuning, 1962); Kocaeli prov.: Gebze (Braun, 1978); Turkey as *N. flashneri* Pic (Lodos, 1998); Turkey (Lodos, 1998); Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: Turkey.
Chorotype: Anatolian.

Neodorcadion pelleti (Mulsant & Rey, 1863)

Dorcadion segne Mulsant & Rey, 1863
Neodorcadion segne v. *credulum* Pic, 1917
Neodorcadion segne v. *disjunctum* Pic, 1907
Neodorcadion pelleti m. *reductevittatum* Breuning, 1962

Original combination: *Dorcadionpelleti* Mulsant & Rey, 1863

Type loc.: Turkey: İzmir prov. (=Smyrna).

The species is distributed in NW and W Turkey for Turkey.

Records in Turkey: (IS-IZ-TRA-TUR)
İzmir prov. (Ganglbauer, 1884; Aurivillius, 1921); İstanbul prov. as *D. segne* (Ganglbauer, 1884; Aurivillius, 1921); İstanbul prov.: Alem Mt. as *D. segne* (Bodemeyer, 1906); Anatolia (Winkler, 1924-1932); European Turkey as *D. segne* (Winkler, 1924-1932); İstanbul prov.: Belgrad forest as *N. pelleti disjunctum* (Villiers, 1959); İzmir prov., European Turkey

(Breuning, 1962); Turkey as *D. segne* (Lodos, 1998); Turkey (Lodos, 1998); European Turkey and Anatolia (Danilevsky in Löbl & Smetana, 2010).
Distribution: ?Serbia, Greece, Turkey.
Chorotype: Turano-Mediterranean (Balkano-Anatolian).

Neodorcadion virleti (Brullé, 1832)

Neodorcadion ionicum Pic, 1901
Neodorcadion virleti v. *acarnanicum* Pic, 1914
Neodorcadion virleti v. *subbinotatum* Pic, 1914

Original combination: *Dorcadion virleti* Brullé, 1832

Type loc.: Greece: Corfu Island.

The species is endemic to Balkans or Greece. It has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. However the species has been recorded only from Greece and ?Bulgaria now. So, this record is not confirmed for Turkey.

Records in Turkey: (TUR)
Turkey (Lodos, 1998).
Distribution: Greece, ?Bulgaria.
Chorotype: Balkanian or Greek.

Genus *IBERODORCADION* Breuning, 1943

Type sp.: *Cerambyx fuliginator* Linnaeus, 1758

Danilevsky et al. (2004) accepted *Iberodorcadion* as a separate genus on the base of endophallic characters. This genus is not represented in Turkey normally. However, some species of this genus has been reported only by Lodos (1998) for Turkey in his unrealistic list without any exact locality. The species have been recorded only from W Europe chiefly now. So, these records are not confirmed and are impossible for Turkey. They listed as follows:

Subgenus *IBERODORCADION* Breuning, 1943

Type sp.: *Cerambyx fuliginator* Linnaeus, 1758

Iberodorcadion fuliginator (Linnaeus, 1758)

Chorotype: SW and C European (Spain to Poland and Latvia).

Subgenus *BAETICODORCADION* Vives, 1976

Type sp.: *Dorcadion mus* Rosenhauer, 1856

Iberodorcadion mucidum (Dalman, 1817)

Chorotype: Iberian (Spain and Portugal).

Subgenus *HISPANODORCADION* Vives, 1976

Type sp.: *Dorcadion hispanicum* Mulsant, 1851

Iberodorcadion heydeni (Kraatz, 1870)

Chorotype: Spanish (Spain).

Iberodorcadion molitor (Fabricius, 1775)

Chorotype: SW-European (Portugal, Spain and France).

The following list includes only 134 endemic species for Turkey:

Genus *DORCADION* Dalman, 1817
Subgenus *CARINATODORCADION* Breuning, 1943
***Dorcadion ingeae* Peks, 1993**
Subgenus *CRIBRIDORCADION* Pic, 1903
***Dorcadion abstersum* Holzschuh, 1982**
***Dorcadion accola* Heyden, 1894**
***Dorcadion afflictum* Pesarini & Sabbadini, 1998**
***Dorcadion albicolle* Breuning, 1943**
***Dorcadion albolineatum* Küster, 1847**
***Dorcadion albonotatum* Pic, 1895**
***Dorcadion amanense* Breuning, 1943**
***Dorcadion anatolicum* Pic, 1900**
***Dorcadion angorense* Ganglbauer, 1897**
***Dorcadion arcivagum* Thomson, 1867**
***Dorcadion ardahense* Breuning, 1975**
***Dorcadion bangi* Heyden, 1894**
***Dorcadion banjkovskyi* Plavilstshikov, 1958**
***Dorcadion bisignatum* Jakovlev, 1899**
***Dorcadion bithyniense* Chevrolat, 1856**
***Dorcadion blandulus* Holzschuh, 1977**
***Dorcadion bodemeyeri* Daniel, 1900**
***Dorcadion boluense* Breuning, 1962**
***Dorcadion boszdaghense* Fairmaire, 1866**
***Dorcadion bouilloni* Breuning & Ruspoli, 1975**
***Dorcadion brauni* Breuning, 1979**
***Dorcadion bremeri* Breuning, 1981**
***Dorcadion bulgharmaadense* Breuning, 1946**
***Dorcadion cachinno* Thomson, 1868**
***Dorcadion carinipenne* Pic, 1900**
***Dorcadion carolisturanii* Breuning & Ruspoli, 1971**
***Dorcadion cinctellum* Fairmaire, 1866**
***Dorcadion coiffaiti* Breuning, 1962**
***Dorcadion confluens* Fairmaire, 1866**
***Dorcadion culminicola* Thomson, 1868**
***Dorcadion delagrangei* Pic, 1894**
***Dorcadion deyrollei* Ganglbauer, 1884**
***Dorcadion dobrovljanskii* Suvorov, 1915**
***Dorcadion drusoides* Breuning, 1962**

******Dorcadion elazigi* **Breuning, 1971**
******Dorcadion enricisturanii* **Breuning & Ruspoli, 1971**
******Dorcadion escherichi* **Ganglbauer, 1897**
******Dorcadion gebzeense* **Breuning, 1974**
******Dorcadion glabricolle* **Breuning, 1943**
******Dorcadion glabrofasciatum* **Daniel, 1901**
******Dorcadion hampii* **Mulsant & Rey, 1863**
******Dorcadion heinzi* **(Breuning, 1964)**
******Dorcadion holtzi* **(Pic, 1905)**
******Dorcadion holzschuhi* **Breuning, 1974**
******Dorcadion iconiense* **Daniel, 1901**
******Dorcadion infernale* **Mulsant & Rey, 1863**
******Dorcadion inspersum* **Holzschuh, 1982**
******Dorcadion investitum* **Breuning, 1970**
******Dorcadion ispartense* **Breuning, 1962**
******Dorcadion jakovleviellum* **Plavilstshikov, 1951**
******Dorcadion janatai* **Kadlec, 2006**
******Dorcadion kagyzmanicum* **Suvorov, 1915**
******Dorcadion karsense* **Suvorov, 1915**
******Dorcadion kindermanni* **Waltl, 1838**
******Dorcadion kraetschmeri* **Bernhauer, 1988**
******Dorcadion kurdistanum* **Breuning, 1944**
******Dorcadion kurucanum* **Holzschuh, 2007**
******Dorcadion ladikanum* **Braun, 1976**
******Dorcadion lameeri* **Théry, 1896**
******Dorcadion ledereri* **Thomson, 1865**
******Dorcadion ledouxi* **Breuning, 1974**
******Dorcadion linderi* **Tournier, 1872**
******Dorcadion lodosi* **Sabbadini & Pesarini, 1992**
******Dorcadion lohsei* **Braun, 1976**
******Dorcadion longulum* **Breuning, 1943**
******Dorcadion maceki* **Holzschuh, 1995**
******Dorcadion martini* **Bernhauer, 1988**
******Dorcadion menradi* **Holzschuh, 1989**
******Dorcadion merkli* **Ganglbauer, 1884**
******Dorcadion mesopotamicum* **Breuning, 1944**
******Dorcadion micans* **Thomson, 1867**
******Dorcadion miminfernale* **Breuning, 1970**
******Dorcadion muchei* **Breuning, 1962**
******Dorcadion multimaculatum* **Pic, 1932**
******Dorcadion nigrostriatum* **Adlbauer, 1982**
******Dorcadion obtusum* **Breuning, 1944**
******Dorcadion oezdurali* **Önalp, 1988**
******Dorcadion ortrudae* **Braun, 1980**
******Dorcadion paracinerarium* **Breuning, 1974**
******Dorcadion pararufipenne* **Braun, 1976**
******Dorcadion parescherichi* **Breuning, 1966**
******Dorcadion pavesii* **Pesarini & Sabbadini, 1998**
******Dorcadion petrovitzi* **Heyrovsky, 1964**
******Dorcadion piochardi* **Kraatz, 1873**
******Dorcadion pittinorum* **Pesarini & Sabbadini, 1998**
******Dorcadion pluto* **Thomson, 1867**

******Dorcadion poleti* **Breuning, 1948**
******Dorcadion praetermissum* **Pesarini & Sabbadini, 1998**
******Dorcadion preissi* **Heyden, 1894**
******Dorcadion pseudarcivagum* **Breuning, 1943**
******Dorcadion pseudobithyniense* **Breuning, 1962**
******Dorcadion pseudinfernale* **Breuning, 1943**
******Dorcadion pseudocinctellum* **Breuning, 1943**
******Dorcadion pseudoholosericeum* **Breuning, 1962**
******Dorcadion pseudopreissi* **Breuning, 1962**
******Dorcadion punctipenne* **Küster, 1852**
******Dorcadion punctulicolle* **Breuning, 1944**
******Dorcadion quadripustulatum* **Kraatz, 1873**
******Dorcadion rigattii* **Breuning, 1966**
******Dorcadion rizeanum* **(Breuning & Villiers, 1967)**
******Dorcadion robustum* **Ganglbauer, 1884**
******Dorcadion rolandmenradi* **Peks, 1992**
******Dorcadion rosinae* **Daniel, 1900**
******Dorcadion rufipenne* **Breuning, 1946**
******Dorcadion rufoapicale* **Breuning, 1943**
******Dorcadion saulcyi* **Thomson, 1865**
******Dorcadion schultzei* **Heyden, 1894**
******Dorcadion scrobicolle* **Kraatz, 1873**
******Dorcadion semibrunneum* **Pic, 1903**
******Dorcadion semilineatum* **Fairmaire, 1866**
******Dorcadion semivelutinum* **Kraatz, 1873**
******Dorcadion sinopense* **Breuning, 1962**
******Dorcadion sinuatevittatum* **Pic, 1937**
******Dorcadion smyrnense* **(Linnaeus, 1757)**
******Dorcadion sodale* **Hampe, 1852**
******Dorcadion sonjae* **Peks, 1993**
******Dorcadion steineri* **Holzschuh, 1977**
******Dorcadion subatritarse* **Breuning, 1966**
******Dorcadion subcinctellum* **Breuning, 1962**
******Dorcadion subinterruptum* **Pic, 1900**
******Dorcadion subsericatum* **Pic, 1901**
******Dorcadion subvestitum* **Daniel, 1900**
******Dorcadion syriense* **Breuning, 1943**
******Dorcadion theophilei* **Pic, 1898**
******Dorcadion turcicum* **Breuning, 1963**
******Dorcadion ullrichi* **Bernhauer, 1988**
******Dorcadion walteri* **Holzschuh, 1991**
******Dorcadion weyersi* **Fairmaire, 1866**
Subgenus *MACULATODORCADION* Breuning, 1942
******Dorcadion janssensi* **Breuning, 1966**
******Dorcadion triste* **Frivaldsky, 1845**
******Dorcadion wolfi* **Kraetschmer, 1985**
Genus *NEODORCADION* Ganglbauer, 1884
******Neodorcadion exornatoides* **Breuning, 1962**
******Neodorcadion orientale* **Ganglbauer, 1884**

The following list includes 58 none endemic species for Turkey:

Genus *DORCADION* Dalman, 1817
Subgenus *CARINATODORCADION* Breuning, 1943
***Dorcadion aethiops* (Scopoli, 1763)**
***Dorcadion carinatum* (Pallas, 1771)**
***Dorcadion fulvum* (Scopoli, 1763)**
***Dorcadion hybridum* Ganglbauer, 1884**
Subgenus *CRIBRIDORCADION* Pic, 1903
***Dorcadion apicerufum* Breuning, 1943**
***Dorcadion arenarium* (Scopoli, 1763)**
***Dorcadion atritarse* Pic, 1931**
***Dorcadion auratum* Tournier, 1872**
***Dorcadion beckeri* Kraatz, 1873**
***Dorcadion bistriatum* Pic, 1898**
***Dorcadion blanchardi* Mulsant & Rey, 1863**
***Dorcadion breuningi* Heyrovsky, 1943**
***Dorcadion cinerarium* (Fabricius, 1787)**
***Dorcadion cingulatum* Ganglbauer, 1884**
***Dorcadion complanatum* Ganglbauer, 1884**
***Dorcadion condensatum* Küster, 1852**
***Dorcadion decipiens* (Germar, 1824)**
***Dorcadion dimidiatum* Motschulsky, 1838**
***Dorcadion divisum* Germar, 1839**
***Dorcadion equestre* (Laxmann, 1770)**
***Dorcadion ferruginipes* Ménétriés, 1836**
***Dorcadion formosum* Kraatz, 1870**
***Dorcadion gallipolitanum* Thomson, 1867**
***Dorcadion haemorrhoidale* Hampe, 1852**
***Dorcadion halepense* (Kraatz, 1873)**
***Dorcadion hellmanni* Ganglbauer, 1884**
***Dorcadion johannisfranci* Pesarini & Sabbadini, 2007**
***Dorcadion kasikoporanum* Pic, 1902**
***Dorcadion laeve* Faldermann, 1837**
***Dorcadion lineatocolle* Kraatz, 1873**
***Dorcadion lugubre* Kraatz, 1873**
***Dorcadion margheritae* Breuning, 1964**
***Dorcadion mniszechi* Kraatz, 1873**
***Dorcadion nitidum* Motschulsky, 1838**
***Dorcadion niveisparsum* Thomson, 1865**
***Dorcadion nobile* Hampe, 1852**
***Dorcadion obsoletum* Kraatz, 1873**
***Dorcadion olympicum* Ganglbauer, 1882**
***Dorcadion parallelum* Küster, 1847**
***Dorcadion pedestre* (Poda, 1761)**
***Dorcadion regulare* Pic, 1931**
***Dorcadion rosti* Pic, 1900**
***Dorcadion scabricolle* Dalman, 1817**
***Dorcadion seminudum* Kraatz, 1873**
***Dorcadion septemlineatum* Waltl, 1838**
***Dorcadion striolatum* Kraatz, 1873**
***Dorcadion sturmi* Frivaldsky, 1837**

***Dorcadion sulcipenne* Küster, 1847**
***Dorcadion tauricum* Waltl, 1838**
***?Dorcadion tuerki* Ganglbauer, 1884**
***Dorcadion urmianum* Plavilstshikov, 1937**
***Dorcadion variegatum* Ganglbauer, 1884**
***Dorcadion wagneri* Küster, 1846**
Subgenus *MACULATODORCADION* Breuning, 1942
***Dorcadion quadrimaculatum* Küster, 1848**
Genus *NEODORCADION* Ganglbauer, 1884
***Neodorcadion bilineatum* (Germar, 1824)**
***Neodorcadion exornatum* (Frivaldsky, 1835)**
***Neodorcadion laqueatum* (Waltl, 1838)**
***Neodorcadion pelleti* (Mulsant & Rey, 1863)**

The following list includes 26 unconfirmed or impossible species which have only been recorded mostly by Lodos (1998) for Turkey in his unrealistic list without any exact locality:

Genus *DORCADION* Dalman, 1817
Subgenus *CRIBRIDORCADION* Pic, 1903
***!Dorcadion atticum* Kraatz, 1873**
***!Dorcadion elegans* Kraatz, 1873**
***!Dorcadion etruscum* (Rossi, 1790)**
***!Dorcadion glaucum* Faldermann, 1837**
***!Dorcadion holosericeum* Krynicki, 1832**
***!Dorcadion impressicolle* Kraatz, 1873**
***!Dorcadion indutum* Faldermann, 1837**
***!Dorcadion litigiosum* Ganglbauer, 1884**
***!Dorcadion mediterraneum* Breuning, 1942**
***!Dorcadion minutum* Kraatz, 1873**
***!Dorcadion murrayi* Küster, 1847**
***!Dorcadion pusillum* Küster, 1847**
***!Dorcadion pygmaeum* Breuning, 1947**
***!Dorcadion reitteri* Ganglbauer, 1884**
***!Dorcadion sareptanum* Kraatz, 1873**
***!Dorcadion scopolii* (Herbst, 1784)**
***!Dorcadion semilucens* Kraatz, 1873**
***!!Dorcadion sericatum* Sahlberg, 1823**
Subgenus *DORCADION* Dalman, 1817
***!Dorcadion gebleri* Kraatz, 1873**
***!Dorcadion glicyrrhizae* (Pallas, 1773)**
Genus *NEODORCADION* Ganglbauer, 1884
***!Neodorcadion fallax* (Kraatz, 1873)**
***!Neodorcadion virleti* (Brullé, 1832)**
Genus *IBERODORCADION* Breuning, 1943
Subgenus *IBERODORCADION* Breuning, 1943
***!Iberodorcadion fuliginator* (Linnaeus, 1758)**
Subgenus *BAETICODORCADION* Vives, 1976
***!Iberodorcadion mucidum* (Dalman, 1817)**
Subgenus *HISPANODORCADION* Vives, 1976
***!Iberodorcadion heydeni* (Kraatz, 1870)**
***!Iberodorcadion molitor* (Fabricius, 1775)**

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SOME HOVERFLIES OF SUBFAMILY SYRPHINAE OF QURIGOL FAUNA IN EAST AZERBAYJAN PROVINCE, IRAN (DIPTERA: SYRPHIDAE)

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[Ehteshamnia, N., Khaghaninia, S. & Pour Abad, R. F. 2010. Some hoverflies of subfamily Syrphinae of Qurigol fauna in East Azerbayjan province, Iran (Diptera: Syrphidae). Munis Entomology & Zoology, 5 (2): 499-505**]**

ABSTRACT: In this study, specimens belonged to subfamily of Syrphinae collected thoght environment of Qurigol lake during 2009.The specimens were collected using malaise trap as well as entomological handy net from seventeen localities in studying area. Totally 27 species related to 11 genera were identified which all of them are as new records for studied region and three of them, *Chrysotoxum octomaculatum* Curtis 1837, *Platycheirus manicatus* (Meigen, 1822) and *Melanostoma dubium* (Zetterstedt, 1837), are reported for the first time for Iran insect fauna.

KEY WORDS: Syrphidae, Syrphinae, Fauna, New records, Qurigol, Iran.

Qurigol is a small, about 200 hectares expanse, fresh to brackish lake with associated marshes in the steppe uplands of northwestern Iran. There are extensive areas of reed beds. It is situated about 40 Km east- southeast of Tabriz city. The surrounding area is semi-arid, and there is wheat cultivation on the west and damp grasslands on the southwest. Geographical coordinates is 37° 55' N; 46° 42' to 46° 44' E.

Syrphidae is one of the largest families of the order Diptera, which comprises the popularly called hover flies or flower flies. One of the significant characters of these flies is the ability of them to keep the body motionless in the air for quite a period of time during flight. The adults mainly feed on nectar and pollen for energy and/or pollen for proteins, lipids and vitamins (Faegri & van der Pijl, 1979 and Saribiyik, 2003). Many species, being regular visitors of flowers, are important pollinators of various plants including vegetables, fruit trees (e.g. Asteraceae, Brassicaceae, and Rosaceae) and flowering plants (Kevan & Baker, 1983). The larva of numerous species of hover flies, particularly subfamily of Syrphinae, are one of the most important predators of aphids and other pests which play important roles in their biological control (Gilbert, 1981). Recently, the fauna of Syrphids has been studied by the related taxonomists as well in Iran (Modarres Awal, 1997; Khiaban et al. 1998; Dousti, 1999; Gharali et al. 2000; Alichi et al., 2002; Gharali et al., 2002; Goldasteh et al., 2002; Sadeghi et al., 2002; Moetamedinia et al., 2002; Pourrabi et al., 2003; Golmohammadi & Khiaban, 2004; Gilasian, 2005). Checklists of Iranian hover flies were listed by Peck (1988) and Dousti & Hayat (2006). Unfortunately, so far the Syrphid fauna of this region has not been well known thus it subjected for present study.

MATERIAL AND METHODS

Studied specimens were collected once a week during 2009. Adult of Syrphids were sampled by a variety of methods, including visually scanning crops while

walking, aerial netting, and Malaise traps in seventeen localities situated around of Qurigol lake (Fig. 1).

The collected specimens were placed in ordinary paper envelopes after killing them in cyanid bottle in order to bring them in laboratory. The collection thus brought was placed in a desiccator (having water at its bottom) for about 24 h in order to soak and soften them. Thereafter, they were pinned using 000, 00, 0, 1 and 2 mounted pins and their wings and legs set on appropriate setting boards to facilitate morphological studies and the others were put into tubes filled with 70% alcohol. For identification, the materials were examined under a Nikon (SMZ 1000) binocular microscope manufactured by Japan. The identification was done up to the specific level with the help of relevant literature such as Bezzi (1966), Vockeroth & Tompson (1987), Bei- Bienko (1988), Stubbs & Falk (2002) and Lyneborg & Barkemeyer (2005).

RESULTS

The present investigation has yielded 27 species, which are arranged in 11 genera. All of the verified species are as new records for studied region and three species which marked by an asterisk newly introduced to Iran fauna that totally listed as follows:

Chrysotoxum bicinctum (Linnaeus, 1758)

Syst. Nat., Ed. 10, 1: 592 (*Musca*). Type locality: "Europa".
Material examined: 2 specimens (1♂, 1♀).
Distribution: Fennoscandia south to Iberia and the Mediterranean, including North Africa; through central and southern Europe (Italy, the former Yugoslavia, Bulgaria) into Turkey and European parts of Russia, Iran.

Chrysotoxum cautum (Harris, 1776)

Expos. Eng. Ins.: 60, tab. XV, fig. 15 (*Musca*). Type locality: not given (England).
Material examined: 1 specimen (1♂).
Distribution: Finland south to the Pyrenees and Spain; Ireland (extinct?) and Britain (southern England) eastwards through central and southern Europe (Italy, the former Yugoslavia, Bulgaria, Greece) into Turkey and Russia as far as the Altai mountains (Mongolia), Iran.

Chrysotoxum elegans Loew, 1841

Stettin. ent. Ztg, 2: 140 (*Chrysotoxum*). Type locality: "Wien" (Austria).
Material examined: 8 specimens (4♂♂, 4♀♀).
Distribution: Fennoscandia south to Iberia and the Mediterranean; through central and southern Europe into European parts of Russia as far as the Caucasus Mountains and into Turkey, Iran.

Chrysotoxum festivum (Linnaeus, 1758)

Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type locality: "Europa".
Material examined: 4 specimens (3♂♂, 1♀).
Distribution: Ireland, Great Britain, Norway, Sweden, Finland, Spain, Italy, Yugoslavia, Bulgaria, USSR from Kola to Transcaucasus, Kazakh SSR, Siberia, Far East, Asia: Mongolia, Japan, Oriental region.

**Chrysotoxum octomaculatm* Curtis, 1837

Brit. Ent.,: 653 (Chrysotoxum).Type "Bourne Mouth, near Lulworth and Portland, Stourrton Caundle"(Great Britain).
Material examined: 20 specimens (9♂♂, 11♀♀).

Distribution: Sweden, Great Britain, Netherlands, Belgium, German, Poland, Czechoslovakia, France, Switzerland, Hungry, Spain, Italy, Yugoslavia, Romania, Bulgaria, USSR from Kola to Transcaucasus, Kazakh SSR, North European territory, Central European territory, South European territory, West Siberia.

Chrysotoxum vernale Loew, 1841

Stettin. ent. Ztg, 2: 138 (*Chrysotoxum*).Type locality: not given ("hier gefangen") [= environs of Poznan] (Poland).
Material examined: 2 specimens (1♂, 1♀).
Distribution: Fennoscandia south to the Pyrenees; from Britain (southern England) eastwards through most of Europe into Asia almost to the Pacific; Iran.

Episyrphus balteatus (De Geer, 1776)

Mém. Ins., 6: 116 (*Musca*). Type locality: not given (Sweden).
Material examined: 20 specimens (12♂♂, 8♀♀).
Distribution: Fennoscandia to the Mediterranean; Canary Isles, Azores and N Africa; Ireland through Eurasia to the Pacific coast; south through the Oriental region to Sri Lanka; Australia. This is an extremely migratory species with records from offshore islands of northern Europe. Iran.

Epistrophe euchroma (Kowarz, 1885)

Wien. Ent. Ztg, 4: 135 and 167 (*Syrphus*). Type locality: "Bohmen; Asch" [=Czechoslovakia: As].
Material examined: 4 specimens (2♂♂, 2♀♀).
Distribution: Northern Fennoscandia south to the Pyrenees and central Spain; from Britain (southern England) eastwards through central Europe into Russia, reaching the Caucasus in the south and eastern Siberia (Yakut) in Asia. Iran.

Eupeodes corollae (Fabricius, 1794)

Entom. Syst., 4: 306 (*Syrphus*). Type locality: Kilia [=Kiel] [Germany].
Material examined: 10 specimens (4♂♂, 6♀♀).
Distribution: From Iceland, Fennoscandia and the Faroes south to Iberia, the Mediterranean, Madeira, the Canary Isles and N Africa; coastal States of Africa down to and including S Africa; Mauritius; from Ireland eastwards through most of Europe into European parts of Russia; through Siberia from the Urals to the Pacific coast; Japan; China; Formosa. Iran.

Eupeodes luniger (Meigen, 1822)

Syst. Beschr., 3: 300 (*Syrphus*). Type locality: not given (aus der Baumhauerischen Sammlung) (Europe).
Material examined: 6 specimens (3♂♂, 3♀♀).
Distribution: From Fennoscandia south to Iberia, the Mediterranean, Madeira and N Africa; from Ireland eastwards through most of Europe into European parts of Russia and Asia Minor (including Turkey), in Siberia from the Urals to the Pacific coast (Kuril Isles), Japan, India, Iran.

Eupeodes nuba (Wiedemann, 1830)

Aussereurop. Zweifl. Insekt., 2: 136 (*Syrphus*). Type locality: "Nubien" (Sudan).
Material examined: 14 specimens (8♂♂, 6♀♀).
Distribution: Canary Isles, Mediterranean basin, from southern France to Italy (Sicily) and parts of the former Yugoslavia, Crete, Cyprus, Lebanon, Israel, Egypt and Morocco; Switzerland in central Europe, Roumania; Transcausasus and south-western parts of Asia (Uzbekistan, Kirghizistan, Tajikistan) to Afghanistan and Mongolia. In eastern parts of the Afrotropical region from Ethiopia south to South Africa (inclusive), Iran.

**Melanostoma dubium* (Zetterstedt, 1837)

Isis(Okens) 1837, 1:37 and Insecta Lapp., 1838: 609 (Scaeva). Type-locality: in Lapponia passium, ... ad Kengis et Juckasjervi, Lapponiae Tornensis,... ad Lycksele, Asele et Frederica,

Lapponiae Umensis..., ad aquas Lyckselense et ad Alten Finmarkiae...(Lappon-Scan:...) (Sweden, Finland)("Juckasjarvi",Lectotype des. Anderson, 1970. Ent. Scand., 1:239.
Material examined: 1 specimen (1♂).
Distribution: Sweden, Finland, Belgium, German, Poland, France, Switzerland,Italy, Hungary, Great Britain, USSR from Kola to Transcaucasus, Kazakh SSR, North European territory, Central European territory, South European territory, West Siberia, Nearctic region.

Melanostoma mellinum (Linnaeus, 1758)
Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type-locality: Svecia (Sweden).
Material examined: 6 specimens (4♂♂, 2♀♀).
Distribution: From Iceland and Fennoscandia south to Iberia, the Mediterranean and North Africa; from Ireland eastwards through most of Europe into European parts of Russia; Siberia from the Urals to the Pacific coast; North America from Alaska to Quebec and south to Washington, Iran.

Paragus albifrons (Fallén, 1817)
Syrphici Sveciae: 60 (*Pipiza*). Type locality: “prope Stenshufvud Scaniae” (Sweden).
Material examined: 12 specimens (7♂♂, 5♀♀).
Distribution: From southern Norway and Denmark south to the Mediterranean; from Britain (southern England) eastwards through central and southern Europe (Italy, the former Yugoslavia, Bulgaria) into European parts of Russia and the Caucasus and on to the Pacific; Iran, Afghanistan and Mongolia (Speight, 2005) and Turkey (Düzgüneþ *et al*., 1982), Iran.

Paragus bicolor (Fabricius, 1794)
Entom. Syst., 4: 297 (*Syrphus*). Type locality: “Barbariae” [= NW Africa].
Material examined: 3 specimens (2♂♂, 1♀).
Distribution: From Belgium (extinct) south to the Mediterranean and North Africa; from France eastwards through central and southern Europe to Mongolia; Iran and Afghanistan; North America, Iran.

Paragus finitimus Goeldlin De Tiefenau, 1971
Mitt. schweiz. Ent. Ges., 43(3-4): 277 (*Paragus*). Type locality: “Devens (Vaud)” (Switzerland).
Material examined: 2 specimens (1♂, 1♀).
Distribution: So far recorded from southern Norway, Denmark, The Netherlands, Belgium, France (Paris basin, Rhine valley), southern Germany, Switzerland and Spain; extensions of range in central Europe can be expected as revisions of National lists are published, but given the habitat preferences of this species recent records will probably be few. Very probably endangered in western Europe, at least (Speight, 2005).Finland, Denmark, The Netherlands, Switzerland, USSR-Central and South European territories, Kazakhstan, Soviet Middle Asia, West and East Siberia, Mongolia and Iran (Peck, 1988).

Paragus haemorrhous (Meigen, 1822)
Syst. Beschr., 3: 182 (*Paragus*). Type locality: osterreich (Austria); sudliches Frankreich (France).
Material examined: 3 specimens (2♂♂, 1♀).
Distribution: From northern Norway south to Iberia and the Mediterranean (including Sicily and Malta); North Africa, Israel and Turkey; also in the Afrotropical region; from Ireland eastwards through central and southern Europe (Italy, the former Yugoslavia) into European parts of Russia; in North America from the Yukon south to Costa Rica.

Paragus tibialis (Fallén, 1817)
Syrphici Sveciae: 60 (*Pipiza*). Type locality: in Vestrogothia; in arvis montosis Scaniae [=prov. Vastergotland and prov. Skane] (Sweden).
Material examined: 4 specimens (3♂♂, 1♀).

Distribution: Uncertain at present, due to confusion with other species until recently; apparently occurs from southern Norway, Sweden and Denmark south to the Mediterranean coast of Europe, North Africa and the Canary Isles; from Britain (southern England) eastwards through central and southern Europe to the former Yugoslavia, Turkey, Israel, Nearctic and Oriental Regions, Iran.

**Platycheirus manicatus* (Meigen, 1822)

Syst. Beschr., 3: 336 (Syrphus). Type locality: not given (Europe).
Material examined: 1 specimen (1♂).
Distribution: Europe from Scandinavia to Spain, Italy, Yugoslavia, Bulgaria, USSR: North European territory, Transcaucasus, Soviet Middle Asia, West Siberia, Asia: Mongolia.

Scaeva albomaculata (Macquart, 1842)

Mém. Soc. Sci. Agric. Lille, 1841(1): 146 and Dipt. exot., 2(2): 86 (*Syrphus*). Type localities:"Mont-sinai" (Egypt)."Alger" (Algeria).
Material examined: 4 specimens (2♂♂, 2♀♀).
Distribution: Iberian peninsula and round the Mediterranean basin to Morocco; Canary Islands; eastward through southern Russia, the Caucasus and southern Siberia to the far east and northern China; Afghanistan, Mongolia; highly migratory and occasionally reaches as far north as Britain. Iran.

Scaeva pyrastri (Linnaeus, 1758)

Syst. Nat., Ed. 10, 1: 594 (*Musca*). Type locality: Svecia (Sweden).
Material examined: 6 specimens (3♂♂, 3♀♀).
Distribution: Fennoscandia south to Iberia, the Mediterranean, Canary Isles and North Africa; from Ireland east through much of Europe and Asia Minor into European Russia; through Siberia from the Urals to the Pacific coast (Kuril Isles); India; China; North America from Alaska to California and New Mexico. Iran.

Sphaerophoria rueppelli (Wiedemann, 1830)

Aussereurop. zweifl. Insekt., 2: 141 (*Syrphus*). Type locality: Nubien; Abyssinia (lectotype des. Vockeroth, 1971:1633).
Material examined: 31 specimens (18♂♂, 13♀♀).
Distribution: From southern Norway and Sweden south to North Africa and the Canary Isles; from Ireland east through central and southern Europe, including Greece, Turkey and Mediterranean islands into Asia Minor, Russia and Afghanistan and on to the Pacific coast , China and Korea; in eastern parts of the Afrotropical region south to Kenya, Iran.

Sphaerophoria scripta (Linnaeus, 1758)

Syst. Nat., Ed. 10, 1: 594 (*Musca*).Type locality: "Svecia" (Sweden); "Uppsala, Sweden" (lectoype des. Vockeroth, 1971: 1633).
Material examined: 22 specimens (14♂♂, 8♀♀).
Distribution: A highly migratory species; southwest Greenland, Iceland and Fennoscandia south to the Mediterranean, the Canary Isles and N Africa; from Ireland eastwards through much of the Palaearctic to the Pacific coast of Asia; Kashmir and Nepal, Iran.

Sphaerophoria turkmenica Bankowska, 1964

Annls zool., Warsz., 22(15): 345 (*Sphaerophoria*). Type locality: "Turkmenische SSR, West Kopet Dag, Berg Siunt".
Material examined: 23 specimens (11♂♂, 12♀♀).
Distribution: Romania, USSR-South European territory, Transcaucasus, Soviet Middle Asia, Afghanistan (Peck, 1988) and Turkey (Hayat & Alaoglu, 1990), Iran.

Syrphus ribesii (Linnaeus, 1758)

Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type locality: Svecia. (Sweden).
Material examined: 3 specimens (1♂♂, 2♀♀).
Distribution: From Iceland and Fennoscandia south to Iberia and the Mediterranean; Canary Isles; from Ireland eastwards through most of Europe into Turkey, European parts

of Russia and Afghanistan; from the Urals to the Pacific coast (Kuril Isles); Japan; North America from Alaska south to central parts of the USA, Iran.

Syrphus vitripennis Meigen, 1822

Syst. Beschr., 3: 308 (*Syrphus*). Type locality: not given (Europe).
Material examined: 2 specimens (1♂, 1♀).
Distribution: Throughout most of the Palaearctic region, including N Africa; in North America from Alaska to California; Formosa, Iran.

Xanthogramma pedissequum (Harris, 1776)

Expos. Eng. Ins.: 61, tab. XV, fig. 19 (*Musca*). Type locality: not given (England).
Material examined: 8 specimens (4♂♂, 4♀♀).
Distribution: Uncertain, due to confusion with related species, but from from Britain and Atlantic seabord countries south to the Paris basin and into central Europe to the Alps (France, Switzerland), Iran.

CONCLUSION

Sphaerophoria was the most conspicuous genus at the studying area based on present study. The genera of *Chrysotoxum* and *Paragus* were very specious having 6 and 5 species respectively. The specimens belonged to *Paragus* and *Melanostoma* mostly collected from reed beds area and the others found in surrounding grasslands. The specimens caught by malaise traps were female biased that were in agree with the findings of Hagvar and Nilson (2007) indicating that female flight behavior makes females more vulnerable to Malaise traps than males.

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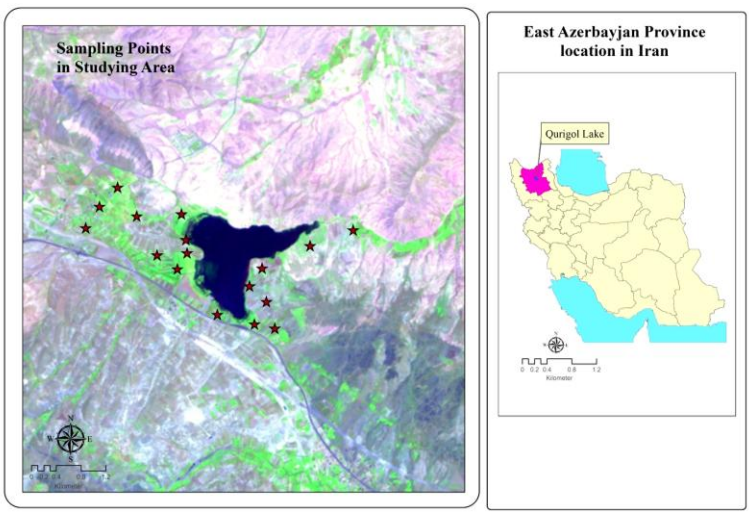

Figure 1. Location of sampling points on satellite image (SPOT) of Qurigol lake environment.

FAUNISTICAL NOTES ON LIGHT TRAP COLLECTED AUCHENORRHYNCHA (HOMOPTERA) SPECIES OCCURRING IN INTEGRATED CHERRY ORCHARDS IN İZMİR PROVINCE OF WESTERN TURKEY

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ABSTRACT: In this study, information is given on 20 species of Auchenorrhyncha collected by light traps from western Turkey. Of these species, six (*Setapius apiculatus*, *Tshurtshurnella campestre*, *Agallia ribauti*, *Aguriahana germari*, *Fieberiella flori* and *Platymetopius rostratus*) were recorded for the first time from Izmir province and Aegean Region of Turkey.

KEY WORDS: Homoptera, Auchenorrhyncha, Fauna, Western Turkey, Light Trap

Some data on the Auchenorrhyncha fauna of Western Turkey has been given by Lodos & Kalkandelen (1980a, b; 1981a, b, c, d; 1984a, b; 1985a, b; 1986a, b, c; 1987a, b); Tezcan & Zeybekoğlu (2001); Tezcan et al. (2003, 2005, 2006); Demir (2006a, b); Yılmaz et al. (2007, 2009). But there is not any detailed study on the fauna of integrated cherry orchards collected by light traps.

In this paper, monitoring of Auchenorrhyncha species occurring in integrated cherry (*Prunus avium*) (Rosaceae) orchards by using light traps were given.

MATERIAL AND METHODS

Auchenorrhyncha species were collected in integrated cherry orchards in Izmir (Kemalpaşa) by using light traps in 2006-2007. Studies were conducted in four orchards in size of about 0,5 hectare for each. One light trap on the ground was used for each area from the mid June to the mid September. A 20 watt Philips energy saver white day light bulb was used at each trap and traps were cleared at two weeks' intervals. Material were identified by the third author.

RESULTS

Cixiidae

Setapius apiculatus (Fieber, 1876)

Material examined: 28.vi.2006, 3 exs., 14.vii.2006, 2 exs., 27.vii.2006, 5 exs., 11.viii.2006, 8 exs., 24.viii.2006, 6 exs., 28.vii.2007, 1 ex., 14.viii.2007, 3 exs. Totally 28 specimens.

Distribution in Turkey: Adıyaman, Mardin (Kalkandelen, 1990).

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

Delphacidae

Laodelphax striatellus (Fallén, 1826)

Material examined: 11.viii.2006, 1 ex., 08.ix.2006, 1 ex., 14.viii.2007, 1 ex. Totally 3 specimens.

Distribution in Turkey: Adana (Kozan), Ankara (Hasanoğlan, Mogan Lake) and on the route of Bitlis-Baykan, Baykan-Silvan, Fevzipaşa-Mersin, Antalya (Aspendos-Perge), Eskişehir-Bilecik (Dlabola, 1957, 1971); Adıyaman (Besni), Diyarbakır, İzmir (Narlıdere, Yalakdere), Malatya (Hasırcılar), Muğla (Milas), Niğde (Ulukışla), Siirt (Şırnak) (Lodos & Kalkandelen, 1980a); Aydın, İzmir, Manisa (Yılmaz et al., 2009); Diyarbakır (Özgen et al., 2009); Bursa (Yenişehir) (Karsavuran et al., 2009).

Remarks: It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1980a).

Dictyopharidae

Dictyophara europaea (Linnaeus, 1767)

Material examined: 27.vii.2006, 1 ex., 11.viii.2006, 2 exs., 24.viii.2006, 3 exs., 14.viii.2007, 1 ex., 31.viii.2007, 1 ex. Totally 8 specimens.

Distribution in Turkey: Ankara (Çubuk, Karagöl, Lalahan), Denizli (Çardak), Diyarbakır (Central province, Çermik), Eskişehir (Laçin), Isparta (Eğirdir), İstanbul (Silivri), İzmir (Narlıdere, Tire, Torbalı-Ayrancılar), Iğdır, Kastamonu (Tosya), Manisa (Salihli), Muğla (Central province, Fethiye, Yatağan), Muş, Ordu (Kumru), Samsun, Siirt (Kozluk), Şırnak, Van (Muradiye) (Lodos & Kalkandelen, 1980b); Elazığ, Mardin (Özgen et al., 2009).

Remarks: It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1980b).

Issidae

Tshurtshurnella campestre (Lindberg, 1948)

Material examined: 28.vi.2006, 1 ex., 24.viii.2006, 1 ex., 31.viii.2007, 1 ex. Totally 3 specimens.

Distribution in Turkey: Adana, Niğde (Lodos & Kalkandelen, 1981d).

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

Cicadidae

Cicadatra atra (Oliver, 1790)

Material examined: 28.vi.2006, 4 exs., 14.vii.2006, 20 exs., 27.vii.2006, 1 ex., 11.viii.2006, 1 ex., 14.viii.2007, 1 ex. Totally 27 specimens.

Distribution in Turkey: Adana, Kahramanmaraş (Göksun), Kayseri (Fahringer, 1922); Kayseri (Bodenheimer, 1958); Ankara, Gaziantep (Tuatay et al., 1972); Adana, Amasya, Ankara (Central province, Elmadağ), Antalya, Bitlis, Edirne, Erzincan, Gaziantep, İstanbul (Erenköy), İzmir (Bornova, Gaziemir, Karaburun, Torbalı-Ayrancılar), Muğla (Bodrum, Köyceğiz), Siirt (Sason), Sivas (Suşehri), Şanlıurfa (Central province, Akziyaret) (Lodos & Kalkandelen, 1981a).

Cicada mordoganensis Boulard, 1979

Material examined: 14.vii.2006, 1 ex., 27.vii.2006, 1 ex., 28.vii.2007, 1 ex., 14.viii.2007, 1 ex. Totally 4 specimens.

Distribution in Turkey: Antalya (Alanya, Side, Ulupınar, Yenice), İzmir (Balıklıova, Gaziemir, Karaburun, Mordoğan, Torbalı, Urla), Muğla (Bodrum) (Lodos & Kalkandelen, 1981a).

Lyristes plebejus (Scopoli, 1763)

Material examined: 14.vii.2006, 3 exs., 27.vii.2006, 1 ex., 28.vii.2007, 2 exs., 14.viii.2007, 1 ex. Totally 7 specimens.

Distribution in Turkey: Bursa (Mudanya), İzmir, Kahramanmaraş (Yarbaşı) (Fahringer, 1922); Adana-Toros (Bürücek), Ankara (Baraj) (Dlabola, 1957); Adana (Gülek) (Linnavuori, 1965); İzmir (Bayındır), Manisa (Tuatay et al., 1972); Adana, Ankara (Central province, Çubuk Baraj I), Antalya, Artvin, Aydın (Nazilli, Söke-Samsun Dağı), Balıkesir (Edremit), Denizli (Acıpayam), Erzincan, Gaziantep (Nizip), İzmir (Bayındır, Menemen), İstanbul, Kırklareli (Türkgeldi-Lüleburgaz), Manisa (Akhisar), Mardin, Muğla (Köyceğiz), Kütahya (Gediz) (Lodos & Kalkandelen, 1981a); Kahramanmaraş (Engizek Mountain) (Kanat & Akbulut, 2005).

Membracidae

Gargara genistae (Fabricius, 1775)

Material examined: 27.vii.2006, 13 exs., 11.viii.2006, 7 exs., 24.viii.2006, 4 exs., 08.ix.2006, 10 exs., 14.viii.2007, 3 exs., 31.viii.2007, 14 exs. Totally 51 specimens.

Distribution in Turkey: Ankara (Mogan Lake, Eymir Lake, Lalahan), Aydın (Kuşadası), Balıkesir (Dursunbey), Çorum (Bayat), Erzurum (Central province, Hasankale, Horasan, İspir-Serçeme Stream), İzmir (Bozdağ, Pamucak), Muğla (Bodrum, Köyceğiz) (Lodos & Kalkandelen, 1981b).

Cicadellidae

Agallia ribauti Ossiannilson, 1938

Anaceratagallia ribauti (Ossiannilson, 1938)

Material examined: 28.vi.2006, 3 exs., 14.vii.2006, 4 exs., 27.vii.2006, 24 exs., 11.viii.2006, 20 exs., 24.viii.2006, 15 exs., 08.ix.2006, 15 exs., 14.viii.2007, 10 exs., 31.viii.2007, 18 exs. Totally 109 specimens.

Distribution in Turkey: Adana (Central province, Karataş) (Dlabola, 1957); Ankara (Cenral province, Çubuk, Eymir Lake, Lalahan), Balıkesir (Susurluk), Çankırı (Festikhan), Malatya (Hasırcılar), Mardin (Kapılı-Silopi), Samsun (Bafra) (Lodos & Kalkandelen, 1981c).

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

Aguriahana germari (Zetterstedt, 1840)

Material examined: 27.vii.2006, 2 exs., 11.viii.2006, 20 exs., 24.viii.2006, 9 exs., 08.ix.2006, 10 exs., 14.viii.2007, 10 exs., 31.viii.2007, 1 ex. Totally 52 specimens.

Distribution in Turkey: Amasya (Borabay), Artvin (Murgul), Kars (Sarıkamış), Çorum (İskilip), Çankırı (Lodos & Kalkandelen, 1984a).

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

Zyginidia pullula (Boheman, 1845)

Material examined: 14.vii.2006, 1 ex., 27.vii.2006, 1 ex., 11.viii.2006, 1 ex., 08.ix.2006, 3 exs., 14.viii.2007, 1 ex., 31.viii.2007, 1 ex. Totally 8 specimens.

Distribution in Turkey: İzmir (Linnavuori, 1965; Dlabola, 1981); Amasya (Central province), Ankara (Çubuk, Elmadağ, Hasanoğlan, Kayaş), Bolu (Düzce, Kıbrıscık, Seben), Çankırı (Ilgaz, İnandık, Konak), Çorum (Osmancık), Kayseri (Yeşilhisar), Nevşehir (Avanos, Çat, Nar, Ürgüp), Sinop (Boyabat, Durağan) (Lodos & Kalkandelen, 1984b); Aydın, İzmir, Manisa (Yılmaz et al., 2007).

Opsius stactogalus Fieber, 1866

Material examined: 27.vii.2006, 1 ex., 11.viii.2006, 1 ex., 14.viii.2007, 1 ex. Totally 3 specimens.

Distribution in Turkey: Ankara (Central province) (Lodos & Kalkandelen, 1985a); Bursa (Karacabey) (Karsavuran et al., 2009); Antalya (Demir, 2006b).

Neoaliturus fenestratus (Herrich-Schaffer, 1834)

Material examined: 14.vii.2006, 2 exs., 11.viii.2006, 2 exs., 24.viii.2006, 2 exs., 14.viii.2007, 2 exs., 31.viii.2007, 1 ex. Totally 9 specimens.

Distribution in Turkey: It distributes largely in Turkey (Lodos & Kalkandelen, 1985a).

Remarks: It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1985a).

Macrosteles quadripunctulatus (Kirschbaum, 1868)

Material examined: 28.vi.2006, 28 exs., 14.vii.2006, 84 exs., 27.vii.2006, 18 exs., 11.viii.2006, 180 exs., 24.viii.2006, 122 exs., 08.ix.2006, 71 exs., 28.vii.2007, 10 exs., 14.viii.2007, 66 exs., 31.viii.2007, 43 exs., 08.ix.2007, 2 exs. Totally 624 specimens.

Distribution in Turkey: It distributes largely in Turkey (Lodos & Kalkandelen, 1985b).

Remarks: It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1985b).

Fieberiella florii (Stal, 1864)

Material examined: 27.vii.2006, 6 exs., 11.viii.2006, 27 exs., 24.viii.2006, 17 exs., 08.ix.2006, 2 exs., 28.vii.2007, 1 ex., 14.viii.2007, 1 ex., 31.viii.2007, 3 exs. Totally 57 specimens.

Distribution in Turkey: Amasya, Ankara, Kocaeli, Samsun, Sinop, Tokat (Lodos & Kalkandelen, 1986a).

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

Exitianus capicola (Stal, 1855)

Material examined: 27.vii.2006, 7 exs., 11.viii.2006, 2 exs., 24.viii.2006, 7 exs., 14.viii.2007, 4 exs., 31.viii.2007, 5 exs., 08.ix.2007, 4 exs. Totally 29 specimens.

Distribution in Turkey: Adana (Central province, Ceyhan, Misis, Pozantı), Antalya (Aksu, Güloluk), İçel (Tarsus), İzmir (Narlıdere, Ödemiş-Bozdağ), Muğla (Dalaman) (Lodos & Kalkandelen, 1986a); Antalya (Demir, 2006b); Aydın (Yılmaz et al., 2007).

Platymetopius rostratus (Herrich-Schaffer, 1834)

Material examined: 27.vii.2006, 3 exs., 11.viii.2006, 7 exs., 24.viii.2006, 6 exs., 08.ix.2006, 2 exs., 28.vii.2007, 1 ex., 14.viii.2007, 1 ex., 31.viii.2007, 1 ex. Totally 21 specimens.

Distribution in Turkey: Ankara (Çubuk Baraj I), Nevşehir (Ürgüp) (Kalkandelen, 1974); Erzurum (Kandilli) (Dlabola, 1981); Ankara (Çubuk, Kızılcahamam), Diyarbakır, Elazığ, Erzincan (Değirmencik, Central province, Yalınca), Erzurum, Gümüşhane (Kelkit), Kars (Aralık, Iğdır, Tuzluca), Muş, Sinop (Ahmetyeri) (Lodos & Kalkandelen, 1986b); Diyarbakır, Elazığ, Mardin (Özgen & Karsavuran, 2009).

Remarks: First record for İzmir province and Aegean Region of Turkey. It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1986b).

Selenocephalus pallidus Kirschbaum, 1868

Material examined: 28.vi.2006, 4 exs., 14.vii.2006, 22 exs., 27.vii.2006, 116 exs., 11.viii.2006, 78 exs., 24.viii.2006, 75 exs., 08.ix.2006, 7 exs., 28.vi.2007, 1 ex., 28.vii.2007, 31 exs., 14.viii.2007, 27 exs., 31.viii.2007, 5 exs. Totally 366 specimens.

Distribution in Turkey: Adana (Hasanbeyli), Ankara (Çubuk, Eymir, Lalahan, Kalecik, Kurtboğazı, Nallıhan), Antalya (Alanya, Manavgat), Aydın (Kuşadası, Samsun Dağı), Bolu, Burdur (Gülhisar), Bursa (Central province-Doğanköy), Çanakkale, Çankırı (Kurşunlu), Çorum (Central province, Bayat), Denizli (Tavas), Isparta (Eğirdir), İzmir (Karaburun, Ödemiş, Menemen), Kayseri (Hacılar), Kırşehir (Yılandağı), Konya (Ermenek, Seydişehir), Manisa (Gördes), Sinop (Gerze), Tokat (Erbaa), Yozgat (Çekerek) (Lodos & Kalkandelen, 1986c).

Euscelidius mundus (Haupt, 1927)

Material examined: 28.vi.2006, 1 ex., 27.vii.2006, 1 ex., 11.viii.2006, 1 ex., 24.viii.2006, 1 ex., 08.ix.2006, 2 exs., 14.viii.2007, 1 ex., 31.viii.2007, 2 exs. Totally 9 specimens.

Distribution in Turkey: Adana, Ankara, Diyarbakır, Erzurum, Gaziantep, Hatay, Isparta, İçel, İzmir, Mardin, Şanlıurfa, Van (Lodos & Kalkandelen, 1987a); Antalya (Demir, 2006b).

Remarks: It was reported that some material of this species was collected by light traps (Lodos & Kalkandelen, 1987a).

Psammotettix alienus (Dahlbom, 1850)

Material examined: 28.vi.2006, 1 ex., 14.vii.2006, 2 exs., 27.vii.2006, 15 exs., 11.viii.2006, 6 exs., 24.viii.2006, 5 exs., 08.ix.2006, 9 exs., 28.vii.2007, 1 ex., 14.viii.2007, 5 exs., 31.viii.2007, 12 exs., 08.ix.2007, 1 ex. Totally 57 specimens.

Distribution in Turkey: Adana (Pozantı), Amasya (Central province, Taşova), Ankara (Central province, Çubuk, Elmadağ, Eymir, Karagöl, Lalahan, Kızılcahamam, Polatlı), Balıkesir (Balya), Bursa (Gemlik), Diyarbakır (Central province), Erzincan (Central province, Çağlayan, Dumanlı Dağları, Refahiye), Hakkari (Central province), Iğdır, Kastamonu (Tosya), Konya (Akşehir), Mardin (İdil), Muş (Solhan), Sakarya (Adapazarı, Hendek), Siirt (Kurtalan), Sinop (Boyabat, Duragan), Uşak (Bölme), Van (Başkale, Güzeldere, Edremit, Erciş), Yozgat (Boğazlıyan, Sorgun) (Lodos & Kalkandelen, 1987b); Antalya (Demir, 2006b).

DISCUSSION

In this study a total of 20 species belonging to seven families of Homoptera were recorded by light traps. Of these species, six (*Setapius apiculatus*, *Tshurtshurnella campestre*, *Agallia ribauti*, *Aguriahana germari*, *Fieberiella flori* and *Platymetopius rostratus*) were recorded for the first time from Izmir province and Aegean Region of Turkey.

Eight species, namely *Laodelphax striatellus*, *Dictyophara europaea*, *Aguriahana germari*, *Neoaliturus fenestratus*, *Macrosteles quadripunctulatus*, *Platymetopius rostratus*, *Euscelidius mundus* and *Psammotettix alienus* were collected by light traps in previous studies (Lodos & Kalkandelen, 1980a, b; 1984a; 1985a, b; 1986b; 1987a, b). Collecting by light traps is also an effective method for other 12 species. It is hoped that current data will be contributed other studies that will be carried out both in other cultures and other locations in Turkey.

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SOME ADDITIONAL NOTES ABOUT HETEROPTERA FAUNA OF QARADAG FORESTS-IRAN

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[Khaghaninia, S., Askari, O., Pour Abad, R. F. & Shahim, K. 2010. Some additional notes about Heteroptera fauna of Qaradag forests-Iran. Munis Entomology & Zoology, 5 (2): 513-518]

ABSTRACT: A survey was conducted on Heteroptera fauna of Qaradag forests, in east Azarbaijan province during 2008-2009. As many as 1560 specimens were collected from trees, weeds, overwintering places, soil and water. In this study 47 species belonging to 17 families were collected and identified. Among them, the species *Anthocoris nemorum* (Linnaeus, 1761), *Nabis pseudoferus* (Romane, 1949), *Notonecta viridis* (Delcourt, 1909), *Velia affinis* (Kolenati, 1857), *Gerris maculates* (Tamanini, 1946) and *Hydrometra stagnorum* (Linnaeus, 1758) are predators. Species belonging to Pentatomidae had the most frequency. Out of verified materials, 32 species are as new records for studied area. The species, *Stinctopleurus crassicornis* and *Stinctopleurus punctatonervosus*, are newly introduced for Iran insect fauna which are described at present study.

KEY WORDS: Fauna, Qaradag forests, Heteroptera.

Qaradag is a registered biosphere in East Azarbaijan province, Iran. This biosphere reserve situated in the northern Iran with a common border to Armenia and Azerbaijan belongs to the Caucasus Iranian Highlands. In between the Caspian, Caucasus and Mediterranean region located in 38°40' to 39°08'N; 46°39' to 47°02'E. This area has Semi-arid steppes, rangelands and forests, rivers and springs with a varying altitude from 256 m in the vicinity of Araz river to 2896 m and covers an area of 78560 hectares. It is registered in world heritages by UNESCO since 1976. 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 sylvicultural 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 and 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). Unfortunately, the fauna of this important insects has poorly been studied in this area so the additional studies are necessary in this purpose.

MATERIAL AND METHODS

This study was performed during 2008 and 2009. Samples collected from 35 localities in Qaradag forests (Fig. 1). Heteroptera insects of Qaradag forests

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 used for identification fixed by 00, 0, 1 and 2 mounted pins and the others were put into tubes filled with 70% alcohol.

RESULTS

In this study 47 species belonging to 17 families were collected and identified. New species for Qaradag forests and Iran are marked by one and two asterisks respectively and listed as follows:

Family Miridae

***Adelphocoris lineolatus* (Geoze, 1778)**
Material examined: 46 specimens (26♂♂, 20♀♀), June 2008, on grasses.
Note: The species is commonly distributed in Iran on sugar-beet, cotton, tamarisk, sainfoin (Modarres Awal , 2002).

****Deraeocoris pallens* Reuter, 1904**
Material examined: 34 specimens (14♂♂, 20♀♀), June 2008, on peppermint and alfalfa.

****Stenodema turanica* Reuter, 1904**
Material examined: 36 specimens (20♂♂, 16♀♀), June 2008, on peppermint and alfalfa.

****Polymerus brevirostris* (Knight, 1925)**
Material examined: 14 specimens (9♂♂, 5♀♀), June 2008, on rape.

****Lygus rugulipennis* Poppius, 1911**
Material examined: 120 specimens (65♂♂, 55♀♀), June 2008, on alfalfa.

****Lygus pratensis* (Linnaeus, 1758)**
Material examined: 130 specimens (64♂♂, 66♀♀), June 2008, on alfalfa.

Family Anthocoridae

****Anthocoris nemorum* (Linnaeus, 1761)**
Material examined: 27 specimens (15♂♂, 12♀♀), July 2008, on rape.
Note: Predator of *Psylla pyricola, Anthonomus pomorum, Euzophera bigella, Hyponomeuta malinellus* and aphids (Modarres Awal, 2002).

Family Lygaeidae

****Aphanus rolandri* (Linnaeus, 1758)**
Material examined: 9 specimens (5♂♂, 4♀♀), June 2008, on weeds.

****Nysius senecionis* (Shilling, 1829)**
Material examined: 24 specimens (13♂♂, 11♀♀), June 2008, on weeds.

****Lygaeus equestris* (Linnaeus, 1758)**
Material examined: 13 specimens (7♂♂, 6♀♀), June 2008, on weeds.

***Rhyparochromus phoeniceus* (Rossi, 1794)**
Material examined: 4 specimens (2♂♂, 2♀♀), June 2008, on weeds.

Family Nabidae

***Nabis pseudoferrus* Remane, 1949**
Material examined: 123 specimens (78♂♂, 45♀♀), April 2008, on borage, alfalfa and licorice.
Note: The species is predator and collected on sainfoin and Lucerne (Modarres Awal, 2002).

Family Coreidae

***Coreus marginatus* (Linnaeus, 1758)**
Material examined: 66 specimens (32♂♂, 34♀♀), May 2008, 20 specimens, June 2009, on *Cirsium* and poison hemlock.

***Ceraleptus gracilicornis* (Herrich-Schäffer, 1835)**
Material examined: 54 specimens (31♂♂, 23♀♀), May 2008, 29 specimens, June 2009, on *Cirsium*.

Family Pyrrhocoridae

***Pyrrhocoris apterus* (Linnaeus, 1758)**
Material examined: 33 specimens (18♂♂, 15♀♀), June 2008, 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

***Rhopalus parumpunctatus* Schilling 1829**
Material examined: 7 specimens (3♂♂, 4♀♀), May 2008; 12 specimens, June 2009, on weeds.

***Stictopleurus* sp.**
Description: Antennal tubercles projecting outward, usually in form of a pointed denticle. Fourth antennal segment usually longer than 3ed antennal segment. Corium and clavus more or less hyaline and transparent. Eyes markedly projecting and widely separated from anterior margin of pronotum by a well developed inflation of the posterior part of the head behind the eyes. Metaplleura uniformly punctuate, with rounded outer posterior corners which are not visible in dorsal view. Proboscis usually reaching hind coxae (Fig. 2).

****Stictopleurus crassicornis* (Linnaeus, 1758)**
Material examined: 4 specimens (2♂♂, 2♀♀), May 2008; 12 specimens, June 2009, on weeds.
Description: Transverse groove of pronotum anteriorly limited by a smooth, not punctuate, ridge or fold, forming a closed loop on each side. Hairs on head and pronotum longer than thickness of 2nd antennal segment. Posterior corners of anterior genital plate of female situated at level of middle of 2nd pair of valves of ovipositor. Paramers with conical apex, tapering not flattened (Fig. 3).

****Stictopleurus punctatonervosus* (Goeze, 1778)**
Material examined: 2 specimens (1♂, 1♀), May 2008; 2 ecimens, June 2009, on weeds.
Description: A transverse groove in anterior part of pronotum, not anteriorly limited by a smooth ridge or fold, forming an open loop on each side. Paramers almost straight, slender, uniformly tapering apically, conical (Fig. 4).

***Corizus hyoscyami* (Linnaeus, 1758)**
Material examined: 39 specimens (24♂♂, 15♀♀), May 2008; 12 specimens, June 2009, on weeds.

Family Cydnidae

***Cydnus aterrimus* (Forster, 1771)**
Material examined: 4 specimens (2♂♂, 2♀♀), May 2008, on yarrow and other weeds.

Family Scutelleridae

***Eurygaster integriceps* Puton, 1881**
Material examined: 34 specimens (24♂♂, 10♀♀), June 2008, on wheat.
Note: This species has generally distribution in Iran (Modarrese Awal, 2002).

***Eurygaster maura* (Linnaeus, 1758)**
Material examined: 25 specimens (15♂♂, 10♀♀), May 2008, on wheat.

***Odontotarsus robustus* Jakovlev, 1883**
Material examined: 6 specimens (5♂♂, 1♀), May 2008, on weeds.

Family Pentatomidae

***Aelia rostrata* Boheman, 1852**
Material examined: 34 specimens (23♂♂, 11♀♀), June 2009, on wild graminae

***Apodiphus amygdali* (Germar, 1817)**
Material examined: 14 specimens (8♂♂, 6♀♀), July 2009, 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: 27 specimens (17♂♂, 10♀♀), June 2009, on poplar.

***Carpocoris fuscispinus* (Boheman, 1851)**
Material examined: 42 specimens (18♂♂, 24♀♀), July 2009, on dill and licorice.
Note: The species has distribution in East Azarbaijan, Mazandaran, Zanjan, Tehran ,

***Carpocoris coreanus* Distant, 1899**
Material examined: 15 specimensm (10♂♂, 5♀♀), June 2008, on weeds.

***Carpocoris lunulatus* (Goeze, 1778)**
Material examined: 22 specimens (12♂♂, 10♀♀), May 2009, on cereals.

***Carpocoris purpureipennis* (DeGeer, 1773)**
Material examined: 14 specimens (7♂♂, 7♀♀), August 2009, on weeds.

***Dolycoris baccarum* (Linnaeus, 1758)**
Material examined: 15 specimens (8♂♂, 7♀♀), June 2009, on Lucerne

***Dolycoris penicillatus* Horvath, 1904**
Material examined: 21 specimens (12♂♂, 9♀♀), August 2009, on weeds.

***Eurydema ornata* (Linnaeus, 1758)**
Material examined: 35 specimens (20♂♂, 15♀♀), April 2009, on rape.
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 fieberi* Schummel, 1837**
Material examined: 14 specimens (13♂♂, 1♀), June 2008, on weeds.

***Eurydema ventralis* Kolenati, 1846**
Material examined: 4 specimens (3♂♂, 1♀), June 2008, on weeds.

***Graphosoma lineatum* (Linnaeus, 1758)**
Material examined: 88 specimens (48♂♂, 40♀♀), June 2009, on wild crucifereae.

***Neottiglossa irana* Wagner, 1963**
Material examined: 65 specimens (26♂♂, 39♀♀), April 2009, on weeds.

***Ancyrosoma leucogrammes* (Gmelin, 1790)**
Material examined: 29 specimens (18♂♂, 11♀♀), April 2009, on weeds.

Family Hydrometridae

***Hydrometra stagnorum* (Linnaeus, 1758)**
Material examined: 6 specimens (4♂♂, 2♀♀), April 2009, in water surface.

Family Gerridae

***Gerris maculatus* Tamanini, 1946**
Material examined: 66 specimens (30♂♂, 36♀♀), April 2009, in water surface.

Family Veliidae

***Velia affinis* Kolenati, 1857**
Material examined: 123 specimens (101♂♂, 22♀♀), April 2009, in water surface.

Family Notonectidae

***Notonecta viridis* Delcourt, 1909**
Material examined: 26 specimens (16♂♂, 10♀♀), May 2009, from springs.

Family Pleidae

***Plea minutissima* Leach, 1817**
Material examined: 5 specimens (3♂♂, 2♀♀), June 2004, from water

Family Stenocephalidae

***Dicranocephalus setulosus* (Ferrari, 1874)**
Material examined 1 specimen, (1♂), May 2006, on weeds.

***Coriomeris scabricornis* (Panzer, 1809)**
Material examined: 4 specimens (2♂♂, 2♀♀), June 2008, on weeds.

***Maccevethus caucasicus* (Kolenati, 1845)**
Material examined: 1 specimen (1♂), March 2007, on ground.

Family Alydidae

***Camptopus lateralis* (Germar, 1817)**
Material examined: 3 specimens (2♂♂, 1♀), June 2008, on weeds.

Among the species found in this study, Species belonging to Pentatomidae had the most frequency and convertibly family of *Cydnidae* had the minimum one.

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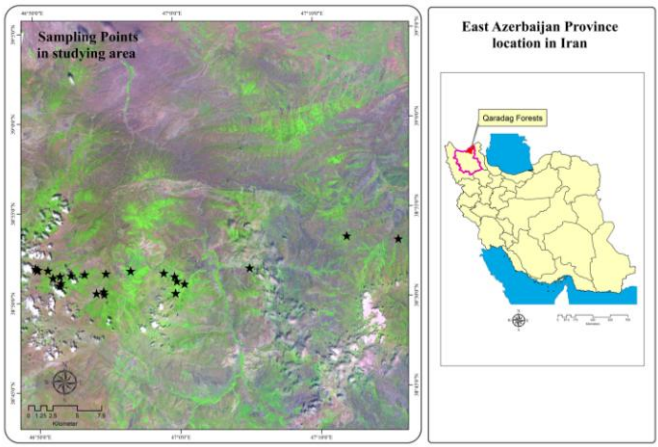

Figure 1. Location of sampling points on satellite image (SPOT) of Qaradag forests.

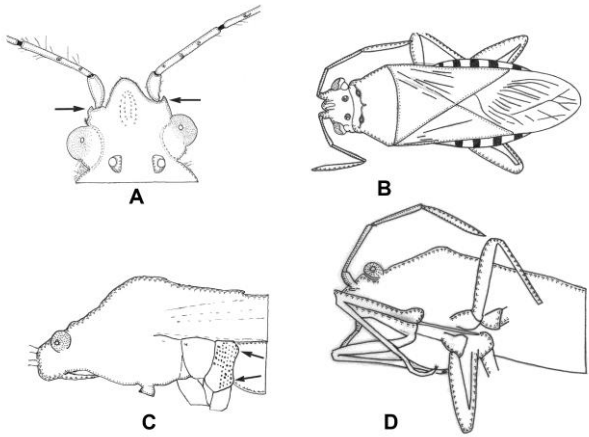

Figure 2. *Stinctopleurus* sp.: A. head, dorsal view; B. body, dorsal view; C. thorax, lateral view; D. anterior part of body, latero-ventral view.

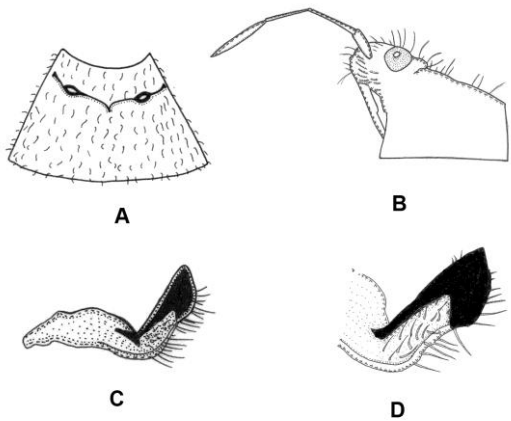

Figure 3. *Stinctopleurus crassicornis*: A. pronotum, dorsal view; B. head, lateral view; C. and D. Paramer, lateral view.

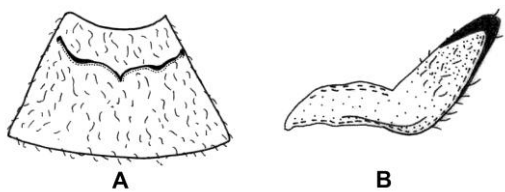

Figure 4. *Stinctopleurus punctatonervosus*: A. pronotum, dorsal view; B. paramer, lateral view.

NEW NAMES FOR THE PREOCCUPIED SPECIFIC AND SUBSPECIFIC EPITHETS IN THE GENUS *CAMPONOTUS* MAYR, 1861 (HYMENOPTERA: FORMICIDAE)

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ABSTRACT. According to the International Code of Zoological Nomenclature (ICZN, 1999), *Camponotus alii concolor* Dalla Torre, 1893; *Camponotus* (*Myrmobrachys*) *brasiliensis antennatus* Santschi, 1925; *Camponotus compressus nitens* Bernard, 1953; *Camponotus dentatus humeralis* Wheeler, 1934; *Camponotus foleyi hoggarensis* Bernard, 1953; *Camponotus fuscipennis* Carpenter, 1930; *Camponotus grandidieri mendax* Emery, 1895; *Camponotus hova luteolus* Emery, 1925; *Camponotus irritans puberulus* Emery, 1920; *Camponotus melanoticus nigrescens* Santschi, 1939; *Camponotus mutilatus luteiventris* Stitz, 1938; *Camponotus olivieri nitidior* Santschi, 1926; *Camponotus saussurei* Theobald, 1937 and *Camponotus transvaalensis arnoldi* Prins, 1965 are not correct because the specific or subspecific epithets are illegitimate. The author request the replacement names of the specific and subspecific epithets *concolor* Dalla Torre, 1893; *antennatus* Santschi, 1925; *nitens* Bernard, 1953; *humeralis* Wheeler, 1934; *hoggarensis* Bernard, 1953; *fuscipennis* Carpenter, 1930; *mendax* Emery, 1895; *luteolus* Emery, 1925; *puberulus* Emery, 1920; *nigrescens* Santschi, 1939; *luteiventris* Stitz, 1938; *nitidior* Santschi, 1926; *saussurei* Theobald, 1937 and *arnoldi* Prins, 1965 and he suggest *dallatorrei* nom. nov., *costaricanus* nom. nov., *bernardi* nom. nov., *fijianus* nom. nov., *pseudocompressus* nom. nov., *carpenteri* nom. nov., *eumendax* nom. nov., *cemeryi* nom. nov., *sumatranus* nom. nov., *kempfi* nom. nov., *stitzi* nom. nov., *zaireicus* nom. nov., *theobaldi* nom. nov. and *prinsi* nom. nov. resppectively. Accordingly, new combinations are herein proposed for the species and subspecies: *Camponotus alii dallatorrei* nom. nov. pro *Camponotus alii concolor* Dalla Torre, 1893 syn. n., *Camponotus brasiliensis costaricanus* nom. nov. pro *Camponotus brasiliensis antennatus* Santschi, 1925 syn. n., *Camponotus compressus bernardi* nom. nov. pro *Camponotus compressus nitens* Bernard, 1953 syn. n., *Camponotus dentatus fijianus* nom. nov. pro *Camponotus dentatus humeralis* Wheeler, 1934 syn. n., *Camponotus foleyi pseudocompressus* nom. nov. pro *Camponotus foleyi hoggarensis* Bernard, 1953 syn. n., *Camponotus carpenteri* nom. nov. pro *Camponotus fuscipennis* Carpenter, 1930 syn. n., *Camponotus grandidieri eumendax* nom. nov. pro *Camponotus grandidieri mendax* Emery, 1895 syn. n., *Camponotus hova cemeryi* nom. nov. pro *Camponotus hova luteolus* Emery, 1925 syn. n., *Camponotus irritans sumatranus* nom. nov. pro *Camponotus irritans puberulus* Emery, 1920 syn. n., *Camponotus melanoticus kempfi* nom. nov. pro *Camponotus melanoticus nigrescens* Santschi, 1939 syn. n., *Camponotus mutilatus stitzi* nom. nov. *Camponotus mutilates luteiventris* Stitz, 1938 syn. n., *Camponotus olivieri zaireicus* nom. nov. pro *Camponotus olivieri nitidior* Santschi, 1926 syn. n., *Camponotus theobaldi* nom. nov. pro *Camponotus saussurei* Théobald, 1937 syn. n., *Camponotus transvaalensis prinsi* nom. nov. pro *Camponotus transvaalensis arnoldi* Prins, 1965 syn. n..

KEY WORDS. Nomenclatural change, homonymy, replacement name, Hymenoptera, Formicidae, *Camponotus*.

Family FORMICIDAE
Genus *CAMPONOTUS* Mayr, 1861

Sp. *CAMPONOTUS ALII* Forel, 1890
Ssp. *CAMPONOTUS ALII DALLATORREI* nom. nov.

Camponotus alii concolor Dalla Torre, 1893. Catalogus hymenopterorum huiusque descriptorum systematicus et synonymicus. Vol. 7 Formicidae (Heterogyna). Lipsiae, 221. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus concolor* Forel, 1891. *In:* Grandidier, A. *Histoire Physique, Naturelle et Politique de Madagascar* 20. Histoire naturelle des Hyménopteres. 2 (fascicule 28). Les Formicides, 214. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus alii concolor* Dalla Torre, 1893 and *Camponotus concolor* Forel, 1891 were included in the family Formicidae.

The specific epithet *concolor* was initially introduced by Forel (1891) with the original combination *Camponotus concolor* Forel, 1891 from Madagascar. It is still used as a valid species name. According to Bolton (1995), it is a senior synonym of *Camponotus gallienii* Forel, 1916 that is an unnecessary replacement name.

Subsequently, Dalla Torre (1893) described a new variety of the species *Camponotus alii* from Algeria with the same subspecific epithet as *Camponotus alii* var. *concolor* Dalla Torre, 1893 by original combination. The name was firstly used by Forel (1890) as *Camponotus rubripes* r. *alii* var. *concolor*. However, it is an unavailable name. *Camponotus alii concolor* Dalla Torre, 1893 is also still used as a valid subspecies name.

Camponotus concolor Forel, 1891 has priority over *Camponotus alii concolor* Dalla Torre, 1893. Thus, *Camponotus alii concolor* Dalla Torre, 1893 is illegitimate and consequently can not be correct. The name *Camponotus alii concolor* Dalla Torre, 1893 is a primary junior homonym of the name *Camponotus concolor* Forel, 1891. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *concolor* Dalla Torre, 1893 the replacement name *dallatorrei* nom. nov..

Etimology: The name is dedicated to C. G. de Dalla Torre who is the current author of the preexisting subspecies *C. alii concolor*.

Summary of nomenclatural changes:

Species *Camponotus alii* Forel, 1890
[orig. comb.: *Camponotus rubripes* r. *alii* Forel, 1890 from Algeria; raised to species by Dalla Torre (1893)]

Subspecies *Camponotus alii alii* Forel, 1890

Subspecies *Camponotus alii auresi* Emery, 1920
[orig. comb.: *Camponotus* (*Myrmoturba*) *alii* var. *auresi* Emery, 1920 from Algeria. It was firstly used by Forel (1909) as *Camponotus maculatus alii* var. *auresi* Forel, 1909 that is an unavailable name]

Subspecies *Camponotus alii dallatorrei* **nom. nov.**
pro *Camponotus alii concolor* Dalla Torre, 1893 **syn. n.**, [nec *Camponotus concolor* Forel, 1891]

[orig. comb.: *Camponotus alii* var. *concolor* Dalla Torre, 1893 from Algeria. It was firstly used by Forel (1890) as *Camponotus rubripes* r. *alii* var. *concolor* Forel, 1890 that is an unavailable name]

Subspecies *Camponotus alii hoggarensis* Santschi, 1929
[orig. comb. *Camponotus* (*Myrmoturba*) *seurati* var. *hoggarensis* Santschi, 1929 from Algeria. It was ranked by Bernard (1953) as a subspecies of *alii*]

Sp. *CAMPONOTUS BRASILIENSIS* Mayr, 1862
Ssp. *CAMPONOTUS BRASILIENSIS COSTARICANUS* nom. nov.

Camponotus brasiliensis antennatus Santschi, 1925. Bull. An. Soc. Ent. Belg., 65, 246. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus canescens antennatus* Santschi, 1920. An. Soc. Cient. Argent., 89, 126. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus brasiliensis antennatus* Santschi, 1925 and *Camponotus canescens antennatus* Santschi, 1920 were included in the family Formicidae.

The subspecific epithet *antennatus* was initially introduced by Santschi (1920a) with the original combination *Camponotus* (*Myrmobrachys*) *canescens* var. *antennata* Santschi, 1920 from Bolivia. It is still used as a valid subspecies name of *C. canescens* Mayr, 1870.

Subsequently, Santschi (1925) also described a new variety of the species *Camponotus brasiliensis* from Costa Rica with the same subspecific epithet as *Camponotus* (*Myrmobrachys*) *brasiliensis* var. *antennatus* Santschi, 1925 by original combination. It is also still used as a valid subspecies name of the species *C. brasiliensis* Mayr, 1862.

Camponotus canescens antennatus Santschi, 1920 has priority over *Camponotus brasiliensis antennatus* Santschi, 1925. Thus, *Camponotus brasiliensis antennatus* Santschi, 1925 is illegitimate and consequently can not be correct. The name *Camponotus brasiliensis antennatus* Santschi, 1925 is a primary junior homonym of the name *Camponotus canescens antennatus* Santschi, 1920. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *antennatus* Santschi, 1925 the replacement name *costaricanus* nom. nov..

Etimology: from the country Costa Rica which is the distribution area of the subspecies.

Summary of nomenclatural changes:

Species *Camponotus brasiliensis* Mayr, 1862
[orig. comb.: *Camponotus brasiliensis* Mayr, 1862 from Brasil]

Subspecies *Camponotus brasiliensis brasiliensis* Mayr, 1862

Subspecies *Camponotus brasiliensis chacoensis* Mayr, 1862
[orig. comb.: *Camponotus* (*Myrmobrachys*) *brasiliensis* var. *chacoensis* Santschi, 1919 from Argentina]

Subspecies *Camponotus brasiliensis clivius* Mayr, 1862
[orig. comb.: *Camponotus* (*Myrmobrachys*) *crassus* var. *clivia* Emery, 1925 from Brasil. It was ranked by Kempf (1972) as a subspecies of *C. brasiliensis*. The name was

firstly used as *Camponotus crassus* r. *brasiliensis* var. *clivia* Forel, 1912 that is an unavailable name.]

Subspecies *Camponotus brasiliensis costaricanus* **nom. nov.**
pro *Camponotus brasiliensis antennatus* Santschi, 1925 **syn. n.**, [nec *Camponotus canescens antennatus* Santschi, 1920]
[orig. comb.: *Camponotus* (*Myrmobrachys*) *brasiliensis* var. *antennatus* Santschi, 1925 from Costa Rica]

Sp. *CAMPONOTUS COMPRESSUS* (Fabricius, 1787)
Ssp. *CAMPONOTUS COMPRESSUS BERNARDI* nom. nov.

Camponotus compressus nitens Bernard, 1953. Memoires de l'Institut Français d'Afrique Noire, 19, 194. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus nitens* Mayr, 1870. Sitzungsber. Kais. Akad. Wiss. Wien Math.-Naturwiss. Cl. Abt. I, 61, 378. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus compressus nitens* Bernard, 1953 and *Camponotus nitens* Mayr, 1870 were included in the family Formicidae.

The specific epithet *nitens* was initially introduced by Mayr (1870) with the original combination *Camponotus nitens* Mayr, 1870 from Colombia. It is still used as a valid species name.

Subsequently, Bernard (1953) described a new subspecies of the species *Camponotus compressus* (Fabricius, 1787) from Algeria with the same subspecific epithet as *Camponotus compressus nitens* Bernard, 1953 by original combination. It is also still used as a valid subspecies name.

Camponotus nitens Mayr, 1870 has priority over *Camponotus compressus nitens* Bernard, 1953. Thus, *Camponotus compressus nitens* Bernard, 1953 is illegitimate and consequently can not be correct. The name *Camponotus compressus nitens* Bernard, 1953 is a primary junior homonym of the name *Camponotus nitens* Mayr, 1870. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *nitens* Bernard, 1953 the replacement name *bernardi* nom. nov..

Etimology: The name is dedicated to F. Bernard who is the current author of the preexisting subspecies *C. compressus nitens*.

Summary of nomenclatural changes:

Species *Camponotus compressus* (Fabricius, 1787)
[orig. comb.: *Formica compressa* Fabricius, 1787 from India]

Subspecies *Camponotus compressus bernardi* **nom. nov.**
pro *Camponotus compressus nitens* Bernard, 1953 **syn. n.**, [nec *Camponotus nitens* Mayr, 1870]
[orig. comb.: *Camponotus compressus nitens* Bernard, 1953 from Algeria]

Subspecies *Camponotus compressus brullei* (Smith, 1858)
[orig. comb.: *Formica brullei* Smith, 1858 from Canary Islands. Replacement name for *Formica carinata* Brullé, 1840 that is a primary junior homonym of *Formica carinata* Fabricius, 1804]

Subspecies *Camponotus compressus compressus* (Fabricius, 1787)

Subspecies *Camponotus compressus cosensis* Finzi, 1939

[orig. comb.: *Camponotus* (*Tanaemyrmex*) *compressus* var. *cosensis* Finzi, 1939 from Greece. It was firstly used as *Camponotus maculatus* r. *sanctus* var. *cosensis* Forel, 1904 that is an unavailable name]

Subspecies *Camponotus compressus irakensis* Menozzi, 1927
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *compressus* var. *irakensis* Menozzi, 1927 from Iraq]

Subspecies *Camponotus compressus martensi* Forel, 1907
[orig. comb.: *Camponotus maculates martensi* Forel, 1907 from Algeria]

Subspecies *Camponotus compressus occipitalis* Stitz, 1917
[orig. comb.: *Camponotus* (*Myrmoturba*) *maculatus* r. *occipitalis* Stitz, 1917 from Algeria]

Subspecies *Camponotus compressus probativus* Santschi, 1921
[orig. comb.: *Camponotus* (*Myrmoturba*) *compressus* st. *probativus* Santschi, 1921 from Mozambique]

Subspecies *Camponotus compressus rectinotus* Santschi, 1921
[orig. comb.: *Camponotus compressus* st. *rectinota* Santschi, 1921 from Libya. It was firstly used as *Camponotus* (*Myrmoturba*) *maculatus* r. *samius* var. *rectinotus* Stitz, 1917 that is an unavailable name]

Subspecies *Camponotus compressus symiensis* Forel, 1910
[orig. comb.: *Camponotus maculates symiensis* Forel, 1910 from Greece]

Sp. *CAMPONOTUS DENTATUS* (Mayr, 1866)
Ssp. *CAMPONOTUS DENTATUS FIJIANUS* nom. nov.

Camponotus dentatus humeralis Wheeler, 1934. Ann. Entomol. Soc. Am., 27, 416. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus humeralis* Emery, 1920. Bull. Soc. Entomol. Ital., 52, 47. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus dentatus humeralis* Wheler, 1934 and *Camponotus humeralis* Emery, 1920 were included in the family Formicidae.

The specific epithet *humeralis* was initially introduced by Emery (1920a) with the original combination *Camponotus* (*Myrmeurynota*) *humeralis* Emery, 1920 from Peru. It is still used as a valid species name.

Subsequently, Wheeler (1934) described a new subspecies of the species *Camponotus dentatus* (Mayr, 1866) from Fiji Island with the same subspecific epithet as *Camponotus* (*Colobopsis*) *dentatus humeralis* Wheeler, 1934 by original combination. It is also still used as a valid subspecies name.

Camponotus humeralis Emery, 1920 has priority over *Camponotus dentatus humeralis* Wheler, 1934. Thus, *Camponotus dentatus humeralis* Wheler, 1934 is illegitimate and consequently can not be correct. The name *Camponotus dentatus humeralis* Wheler, 1934 is a primary junior homonym of the name *Camponotus humeralis* Emery, 1920. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *humeralis* Wheler, 1934 the replacement name *fijianus* nom. nov..

Etimology: from the country Fiji which is the distribution area of the subspecies.

Summary of nomenclatural changes:

Species *Camponotus dentatus* (Mayr, 1866)
[orig. comb.: *Colobopsis dentata* Mayr, 1866 from Fiji Island]

Subspecies *Camponotus dentatus dentatus* (Mayr, 1866)

Subspecies *Camponotus dentatus fijianus* **nom. nov.**
pro *Camponotus dentatus humeralis* Wheeler, 1934 **syn. n.**, [nec *Camponotus humeralis* Emery, 1920]
[orig. comb.: *Camponotus* (*Colobopsis*) *dentatus humeralis* Wheeler, 1934 from Fiji Island]

Sp. *CAMPONOTUS FOLEYI* SANTSCHI, 1939
Ssp. *CAMPONOTUS FOLEYI PSEUDOCOMPRESSUS* nom. nov.

Camponotus foleyi hoggarensis Bernard, 1953. Memoires de l'Institut Français d'Afrique Noire, 19, 191. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus alii hoggarensis* Santschi, 1929. Bull. Soc. Hist. Nat. Afr. Nord, 20, 104. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus foleyi hoggarensis* Bernard, 1953 and *Camponotus alii hoggarensis* Santschi, 1929 were included in the family Formicidae.

The subspecific epithet *hoggarensis* was initially introduced by Santschi (1929) with the original combination *Camponotus* (*Myrmoturba*) *seurati* var. *hoggarensis* Santschi, 1929 from Algeria. It was transferred by Bernard (1953) to the species *Camponotus alii* as a subspecies. It is still used as a valid subspecies name.

Subsequently, Bernard (1953) described a new subspecies of the species *Camponotus foleyi* Santschi, 1939 from Algeria with the same subspecific epithet as *Camponotus* (*Tanaemyrmex*) *foleyi hoggarensis* Bernard, 1953 by original combination. It was firstly used as *Camponotus* (*Tanaemyrmex*) *compressus foleyi* var. *hoggarensis* Bernard, 1948 that is an unavailable name. *Camponotus foleyi hoggarensis* Bernard, 1953 is also still used as a valid subspecies name.

Camponotus alii hoggarensis Santschi, 1929 has priority over *Camponotus foleyi hoggarensis* Bernard, 1953. Thus, *Camponotus foleyi hoggarensis* Bernard, 1953 is illegitimate and consequently can not be correct. The name *Camponotus foleyi hoggarensis* Bernard, 1953 is a primary junior homonym of the name *Camponotus alii hoggarensis* Santschi, 1929. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *hoggarensis* Bernard, 1953 the replacement name *pseudocompressus* nom. nov..

Summary of nomenclatural changes:

Species *Camponotus foleyi* Santschi, 1939
[orig. comb.: *Camponotus compressus* st. *foleyi* Santschi, 1939 from Algeria; raised to species by Bernard (1953)]

Subspecies *Camponotus foleyi ajjer* Bernard, 1953
[orig. comb.: *Camponotus foleyi ajjer* Bernard, 1953 from Algeria]

Subspecies *Camponotus foleyi fezzanensis* Bernard, 1953
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *foleyi fezzanensis* Bernard, 1953 from Algeria. It was firstly used as *Camponotus* (*Tanaemyrmex*) *compressus foleyi* var. *fezzanensis* Bernard, 1948 that is an unavailable name]

Subspecies *Camponotus foleyi foleyi* Santschi, 1939

Subspecies *Camponotus foleyi grasi* Bernard, 1953
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *foleyi grasi* Bernard, 1953 from Algeria. It was firstly used as *Camponotus* (*Tanaemyrmex*) *compressus foleyi* var. *grasi* Bernard, 1948 that is an unavailable name]

Subspecies *Camponotus foleyi lelubrei* Bernard, 1953
[orig. comb.: *Camponotus foleyi lelubrei* Bernard, 1953 from Algeria]

Subspecies *Camponotus foleyi pseudocompressus* **nom. nov.**
pro *Camponotus foleyi hoggarensis* Bernard, 1953 **syn. n.**, [nec *Camponotus alii hoggarensis* Santschi, 1929]
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *foleyi hoggarensis* Bernard, 1953 from Algeria]

Subspecies *Camponotus foleyi rufescens* Bernard, 1953
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *foleyi rufescens* Bernard, 1953 from Algeria. It was firstly used as *Camponotus* (*Tanaemyrmex*) *compressus foleyi* var. *rufescens* Bernard, 1948 that is an unavailable name]

Sp. *CAMPONOTUS CARPENTERI* nom. nov.

Camponotus fuscipennis Carpenter, 1930. Bull. Mus. Comp. Zool. Harv., 70, 59. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus fuscipennis* (Wheeler, 1915). Schr. Phys.-Ökon. Ges. Königsb. 55, 136. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus fuscipennis* Carpenter, 1930 and *Camponotus fuscipennis* Wheeler, 1915 were included in the family Formicidae.

The specific epithet *fuscipennis* was initially introduced by Wheeler (1915) with the original combination *Drymomyrmex fuscipennis* Wheeler, 1915 from Baltic Amber. Dlussky (1997) transferred it in the genus *Camponotus*. It is still used as a valid species name.

However, the species *Camponotus fuscipennis* was described by Carpenter (1930) from U.S.A. with the same specific epithet. It is also still used as a valid species name.

Camponotus fuscipennis Wheeler, 1915 has priority over *Camponotus fuscipennis* Carpenter, 1930. Thus, *Camponotus fuscipennis* Carpenter, 1930 is illegitimate and consequently can not be correct. The name *Camponotus fuscipennis* Carpenter, 1930 is a secondary junior homonym of the name *Camponotus fuscipennis* Wheeler, 1915. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *fuscipennis* Carpenter, 1930 the replacement name *carpenteri* nom. nov..

Etimology: The name is dedicated to F. M. Carpenter who is the current author of the preexisting species *C. fuscipennis*.

Summary of nomenclatural changes:

Species *Camponotus carpenteri* **nom. nov.**
pro *Camponotus fuscipennis* Carpenter, 1930 **syn. n.**, [nec *Camponotus fuscipennis* Wheeler, 1915]
[orig. comb.: *Camponotus fuscipennis* Carpenter, 1930 from U.S.A]

Sp. *CAMPONOTUS GRANDIDIERI* Forel, 1886
Ssp. *CAMPONOTUS GRANDIDIERI EUMENDAX* nom. nov.

Camponotus grandidieri mendax Emery, 1895. Ann. Soc. Ent. Fr., 64, 54. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus mendax* Forel, 1895. Journal of the Bombay Natural History Society, 9, 454. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus grandidieri mendax* Emery, 1895 and *Camponotus mendax* Forel, 1895 were included in the family Formicidae.

The specific epithet *mendax* was initially introduced by Forel (1895) in *Journal of the Bombay Natural History Society*, 9: 454 [Date of publication 20.06.1895] with the original combination *Camponotus sericeus* var. *mendax* Forel, 1895 from India. It was raised to the species by Bingham (1903). It is still used as a valid species name.

In the same year, Emery in *Annales de la Société Entomologique de France*, 64: 54 [Date of publication 16.07/08.1895] described a new subspecies of the species *Camponotus foraminosus* Forel, 1879 from South Africa with the same subspecific epithet as *Camponotus foraminosus mendax* Emery, 1895 by original combination. It was transferred to the species *C. grandidieri* by Santschi (1915). It is also still used as a valid subspecies name.

Camponotus mendax Forel, 1895 has priority over *Camponotus grandidieri mendax* Emery, 1895. Thus, *Camponotus grandidieri mendax* Emery, 1895 is illegitimate and consequently can not be correct. The name *Camponotus grandidieri mendax* Emery, 1895 is a primary junior homonym of the name *Camponotus mendax* Forel, 1895. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *mendax* Emery, 1895 the replacement name *eumendax* nom. nov..

Summary of nomenclatural changes:

Species *Camponotus grandidieri* Forel, 1886
[orig. comb.: *Camponotus grandidieri* Forel, 1886 from Madagascar]
= *Camponotus grandidieri* Forel, 1879 [*nomen nudum*]

Subspecies *Camponotus grandidieri atrabilis* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *grandidieri* var. *atrabilis* Santschi, 1915 from Madagascar]

Subspecies *Camponotus grandidieri comorensis* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *grandidieri* var. *comorensis* Santschi, 1915 from Comoro Island]

Subspecies *Camponotus grandidieri eumendax* **nom. nov.**
pro *Camponotus grandidieri mendax* Emery, 1895 **syn. n.**, [nec *Camponotus mendax* Forel, 1895]
[orig. comb.: *Camponotus foraminosus mendax* Emery, 1895 from South Africa]

Subspecies *Camponotus grandidieri grandidieri* Forel, 1886

Subspecies *Camponotus grandidieri ruspolii* Forel, 1892
[orig. comb.: *Camponotus foraminosus* r. *ruspolii* Forel, 1892 from Somalia. It was ranked by Santschi (1915) as a subspecies of *Camponotus foraminosus*]

Sp. *CAMPONOTUS HOVA* Forel, 1891
Ssp. *CAMPONOTUS HOVA CEMERYI* nom. nov.

Camponotus hova luteolus Emery, 1925. *In* Wytsman, P., Genera Insectorum. Fasc. 183, 85. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus bonariensis luteolus* Emery, 1906. Bull. Soc. Entomol. Ital., 37, 188. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus hova luteolus* Emery, 1925 and *Camponotus bonariensis luteolus* Emery, 1906 were included in the family Formicidae.

The subspecific epithet *luteolus* was initially introduced by Emery (1906) with the original combination *Camponotus maculatus luteolus* Emery, 1906 from Argentina. It was transferred by Emery (1920b) to the species *C. bonariensis* Mayr, 1868. It is still used as a valid subspecies name.

Subsequently, Emery (1925) described a new variety of the species *Camponotus hova* Forel, 1891 from Madagascar with the same subspecific epithet as *Camponotus* (*Tanaemyrmex*) *hova* var. *luteolus* Emery, 1925 by original combination. It was firstly used as *Camponotus maculatus* r. *hova* var. *luteolus* Forel, 1897 that is an unavailable name. It is also still used as a valid subspecies name.

Camponotus bonariensis luteolus Emery, 1906 has priority over *Camponotus hova luteolus* Emery, 1925. Thus, *Camponotus hova luteolus* Emery, 1925 is illegitimate and consequently can not be correct. The name *Camponotus hova luteolus* Emery, 1925 is a primary junior homonym of the name *Camponotus bonariensis luteolus* Emery, 1906. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *luteolus* Emery, 1925 the replacement name *cemeryi* nom. nov..

Etimology: The name is dedicated to C. Emery who is the current author of the preexisting subspecies *C. hova luteolus*.

Summary of nomenclatural changes:

Species *Camponotus hova* Forel, 1891
[orig. comb.: *Camponotus maculatus* r. *hova* Forel, 1891 from Madagascar. It was firstly used as *Camponotus rubripes* r. *maculatus* var. *hova* Forel, 1886 that is an unavailable name]

Subspecies *Camponotus hova becki* Santschi, 1923
[orig. comb.: *Camponotus* (*Myrmoturba*) *radamae* st. *becki* Santschi, 1923 from Madagascar. It was firstly used as *Camponotus* (*Myrmoturba*) *maculatus* r. *radamae* var. *becki* Forel, 1914 that is an unavailable name. It was transferred to the species *C. hova* by Bolton (1995) as a subspecies]

Subspecies *Camponotus hova boivini* Forel, 1891
[orig. comb.: *Camponotus maculatus* r. *boivini* Forel, 1891 from Madagascar]

Subspecies *Camponotus hova cemeryi* **nom. nov.**
pro *Camponotus hova luteolus* Emery, 1925 **syn. n.**, [nec *Camponotus bonariensis luteolus* Emery, 1906]
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *hova* var. *luteolus* Emery, 1925 from Madagascar. It was firstly used as *Camponotus maculatus* r. *hova* var. *luteolus* Forel, 1897 that is an unavailable name]

Subspecies *Camponotus hova fairmairei* Santschi, 1911
[orig. comb.: *Camponotus maculatus* st. *fairmairei* Santschi, 1911 from Madagascar]

Subspecies *Camponotus hova fulvus* Emery, 1894
[orig. comb.: *Camponotus maculatus fulvus* Emery, 1894 from Seychelle Island. It was transfered by Emery (1920) to the species *C. hova*]

Subspecies *Camponotus hova hova* Forel, 1891

Subspecies *Camponotus hova hovahoides* Forel, 1892
[orig. comb.: *Camponotus hovahovoides* Forel, 1892 from Madagascar. It was regarded as a variety of *C. hova* by Dalla Torre (1893)]

Subspecies *Camponotus hova hovoides* Dalla Torre, 1893
[orig. comb.: *Camponotus radamae* var. *hovoides* Dalla Torre, 1893 from Madagascar. It was firstly used as *Camponotus maculatus* r. *radamae* var. *hovoides* Forel, 1891 that is an unavailable name. It was regarded as a variety of *C. hova* by Santschi (1911) and Emery (1925)]

Subspecies *Camponotus hova mixtellus* Dalla Torre, 1893
[orig. comb.: *Camponotus radamae* var. *mixtellus* Dalla Torre, 1893 from Madagascar. It was firstly used as *Camponotus maculatus* r. *radamae* var. *mixtellus* Forel, 1891 that is an unavailable name. It was regarded as a variety of *C. hova* by Emery (1925)]

Subspecies *Camponotus hova obscuratus* Emery, 1925
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *hova* var. *obscurata* Emery, 1925 from Madagascar. It was firstly used as *Camponotus maculatus* subsp. *radamae* var. *obscurata* Forel, 1907 that is an unavailable name]

Subspecies *Camponotus hova pictiventris* Mayr, 1901
[orig. comb.: *Camponotus maculatus pictiventris* Mayr, 1901 from South Africa. It was regarded as a subspecies of *C. hova* by Emery (1920, 1925)]

Subspecies *Camponotus hova radamae* Forel, 1891
[orig. comb.: *Camponotus maculatus* r. *radamae* Forel, 1891 from Madagascar. It was regarded as a subspecies of *C. hova* by Emery (1920, 1925)]

Sp. *CAMPONOTUS IRRITANS* (Smith, 1857)
Ssp. *CAMPONOTUS IRRITANS SUMATRANUS* nom. nov.

Camponotus irritans puberulus Emery, 1920. Bull. Soc. Entomol. Ital., 52, 7. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus puberulus* Emery, 1897. Annali del Museo Civico di Storia Naturale di Genova, (2) 18, 604. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus irritans puberulus* Emery, 1920 and *Camponotus puberulus* Emery, 1897 were included in the family Formicidae.

The specific epithet *puberulus* was initially introduced by Emery (1897a) with the original combination *Camponotus carbo puberulus* Emery, 1897 from Somalia. It was raised to species by Santschi (1915) and Emery (1925). It is still used as a valid species name.

Subsequently, Emery (1920a) described a new subspecies of the species *Camponotus irritans* (Smith, 1857) from Sumatra with the same subspecific epithet as *Camponotus irritans puberula* Emery, 1920 by original combination. It was firstly used as *Camponotus maculatus subnudus* var. *puberula* Emery, 1900 that is an unavailable name. It is also still used as a valid subspecies name.

Camponotus puberulus Emery, 1897 has priority over *Camponotus irritans puberulus* Emery, 1920. Thus, *Camponotus irritans puberulus* Emery, 1920 is illegitimate and consequently can not be correct. The name *Camponotus irritans puberulus* Emery, 1920 is a primary junior homonym of the name *Camponotus puberulus* Emery, 1897. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *puberulus* Emery, 1920 the replacement name *sumatranus* nom. nov..

Etimology: from the country Sumatra which is the distribution area of the subspecies.

Summary of nomenclatural changes:

Species *Camponotus irritans* (Smith, 1857)
[orig. comb.: *Formica irritans* Smith, 1857 from W Malaysia. The combination in *Camponotus* was carried out by Roger (1863)]

Subspecies *Camponotus irritans carensis* Emery, 1920
[orig. comb.: *Camponotus* (*Myrmoturba*) *irritans carensis* Emery, 1920 from Nicobar Island]

Subspecies *Camponotus irritans carinifer* Viehmeyer, 1916
[orig. comb.: *Camponotus* (*Myrmoturba*) *tinctus* var. *carinifer* Viehmeyer, 1916 from Singapore. It was ranked as a subspecies of *C. irritans* by Bolton (1995)]

Subspecies *Camponotus irritans cliens* Forel, 1911
[orig. comb.: *Camponotus maculatus cliens* Forel, 1911 from Java. It was transferred to the species *C. irritans* by Emery (1920a)]

Subspecies *Camponotus irritans croceomaculatus* Emery, 1914
[orig. comb.: *Camponotus* (*Myrmoturba*) *croceomaculatus* Emery, 1914 from New Caledonia. It was ranked to the species *C. irritans* by Emery (1920a) as a subspecies]

Subspecies *Camponotus irritans curtus* Emery, 1900
[orig. comb.: *Camponotus maculatus curtus* Emery, 1900 from Indonesia. It was transferred to the species *C. irritans* by Emery (1920a)]

Subspecies *Camponotus irritans fatuus* Forel, 1886
[orig. comb.: *Camponotus kubaryi* r. *fatuus* Forel, 1886 from Sumatra. It was transferred to the species *C. irritans* by Emery (1920a) as a subspecies]

Subspecies *Camponotus irritans hongkongensis* Forel, 1912
[orig. comb.: *Camponotus maculatus hongkongensis* Forel, 1912 from Hong Kong. It was transferred to the species *C. irritans* by Emery (1920a)]

Subspecies *Camponotus irritans inferior* Emery, 1925
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *irritans* var. *inferior* Emery, 1925 from Borneo. It was firstly used as *Camponotus maculatus irritans* var. *inferior* Forel, 1911 that is an unavailable name]

Subspecies *Camponotus irritans irritans* (Smith, 1857)

Subspecies *Camponotus irritans kubaryi* Mayr, 1876
[orig. comb.: *Camponotus kubaryi* Mayr, 1876 from Palau Island. It was regarded as a subspecies of *C. irritans* by Emery (1920a)]

Subspecies *Camponotus irritans melanogaster* Stitz, 1938
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *irritans* var. *melanogaster* Stitz, 1938 from Caroline Island]

Subspecies *Camponotus irritans pallidus* (Smith, 1857)
[orig. comb.: *Formica pallida* Smith, 1857 from Borneo. It is a primary junior homonym of *Formica pallida* Latreille, 1798 (now in *Lasius*). The combination in *Camponotus* was carried out by Mayr (1862). It was regarded as a subspecies of *C. irritans* by Emery (1920a)]

Subspecies *Camponotus irritans procax* Santschi, 1919
[orig. comb.: *Camponotus* (*Myrmoturba*) *maculatus* st. *procax* Santschi, 1919 from Vietnam. It was regarded as a subspecies of *C. irritans* by Santschi (1920b) and Emery (1920a)]

Subspecies *Camponotus irritans sumatranus* **nom. nov.**
pro *Camponotus irritans puberulus* Emery, 1920 **syn. n.**, [nec *Camponotus puberulus* Emery, 1897]
[orig. comb.: *Camponotus irritans puberula* Emery, 1920 from Sumatra. It was firstly used as *Camponotus maculatus subnudus* var. *puberula* Emery, 1900 that is an unavailable name]

Subspecies *Camponotus irritans tinctus* (smith, 1858)
[orig. comb.: *Formica tincta* Smith, 1858 from Burma. The combination in *Camponotus* was carried out by Mayr (1862). It was regarded as a subspecies of *C. irritans* by Emery (1920a)]

Sp. *CAMPONOTUS MELANOTICUS* Emery, 1894
Ssp. *CAMPONOTUS MELANOTICUS KEMPFI* nom. nov.

Camponotus melanoticus nigrescens Santschi, 1939. Rev. Entomol. (Rio J.), 10, 324. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus ligniperdus nigrescens* Gösswald, 1932. Zeitschr. f. wiss. Zool., 142, 147. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus melanoticus nigrescens* Santschi, 1939 and *Camponotus ligniperdus nigrescens* Gösswald, 1932 were included in the family Formicidae.

The subspecific epithet *nigrescens* was initially introduced by Gösswald (1932) with the original combination *Camponotus ligniperdus* var. *nigrescens* Gösswald, 1932 from Germany. It is still used as a valid subspecies name.

Subsequently, Santschi (1939) described a new variety of the species *Camponotus melanoticus* Emery, 1894 from Brasil with the same subspecific epithet as *Camponotus melanoticus* var. *nigrescens* Santschi, 1939 by original combination. The combination in *Camponotus* (*Tanaemyrmex*) was carried out by Kempf (1972).

Camponotus ligniperdus nigrescens Gösswald, 1932 has priority over *Camponotus melanoticus nigrescens* Santschi, 1939. Thus, *Camponotus melanoticus nigrescens* Santschi, 1939 is illegitimate and consequently can not be correct. The name *Camponotus melanoticus nigrescens* Santschi, 1939 is a primary junior homonym of the name *Camponotus ligniperdus nigrescens*

Gösswald, 1932. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *nigrescens* Santschi, 1939 the replacement name *kempfi* nom. nov..

Etimology: This name is dedicated to the memory of well known scientist Walter Wolfgang Kempf (Germany, 1920-1976).

Summary of nomenclatural changes:

Species *Camponotus melanoticus* Emery, 1894
[orig. comb.: *Camponotus sexguttatus* var. *melanoticus* Emery, 1894 from Bolivia; raised to species by Forel (1899)]

Subspecies *Camponotus melanoticus catharinae* Santschi, 1939
[orig. comb.: *Camponotus melanoticus* var. *catharinae* Santschi, 1939 from Brasil. The combination in *Camponotus* (*Tanaemyrmex*) was carried out by Kempf (1972)]

Subspecies *Camponotus melanoticus flavopubens* Emery, 1925
[orig. comb.: *Camponotus* (*Tanaemyrmex*) *melanoticus flavopubens* Emery, 1925 from Mexico. It was firstly used as *Camponotus maculatus* r. *simillimus* var. *flavopubens* Forel, 1901 that is an unavailable name]

Subspecies *Camponotus melanoticus kempfi* **nom. nov.**
pro *Camponotus melanoticus nigrescens* Santschi, 1939 **syn. n.**, [nec *Camponotus ligniperdus nigrescens* Gösswald, 1932]
[orig. comb.: *Camponotus melanoticus* var. *nigrescens* Santschi, 1939 from Brasil. The combination in *Camponotus* (*Tanaemyrmex*) was carried out by Kempf (1972)]

Subspecies *Camponotus melanoticus melanoticus* Emery, 1894

Subspecies *Camponotus melanoticus paranaensis* Santschi, 1939
[orig. comb.: *Camponotus* (*Myrmoturba*) *melanoticus* var. *paranaensis* Santschi, 1939 from Brasil]

Subspecies *Camponotus melanoticus publicola* Forel, 1912
[orig. comb.: *Camponotus maculatus* r. *publicola* Forel, 1912 from Brasil. It was regarded as a subspecies of *C. melanoticus* by Santschi (1922), Emery (1925) and Kempf (1972)]

Subspecies *Camponotus melanoticus valerius* Santschi, 1922
[orig. comb.: *Camponotus* (*Myrmoturba*) *melanoticus* st. *valerius* Santschi, 1922 from Brasil. It was regarded as a subspecies of *C. melanoticus* by Emery (1925)]

Sp. *CAMPONOTUS MUTILATUS* (Smith, 1859)
Ssp. *CAMPONOTUS MUTILATUS STITZI* nom. nov.

Camponotus mutilatus luteiventris Stitz, 1938. Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin, 1938, 116. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus luteiventris* Emery, 1897. Advances in Ecological Research, 38, 574. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus mutilatus luteiventris* Stitz, 1938 and *Camponotus luteiventris* Emery, 1897 were included in the family Formicidae.

The specific epithet *luteiventris* was initially introduced by Emery (1897b) with the original combination *Camponotus luteiventris* Emery, 1897 from New Guinea. It is still used as a valid species name.

Subsequently, Stitz (1938) described a new variety of the species *Camponotus mutilatus* (Smith, 1859) from New Guinea with the same subspecific epithet as *Camponotus* (*Colobopsis*) *mutilatus* var. *luteiventris* Stitz, 1938 by original combination.

Camponotus luteiventris Emery, 1897 has priority over *Camponotus mutilatus luteiventris* Stitz, 1938. Thus, *Camponotus mutilatus luteiventris* Stitz, 1938 is illegitimate and consequently can not be correct. The name *Camponotus mutilatus luteiventris* Stitz, 1938 is a primary junior homonym of the name *Camponotus luteiventris* Emery, 1897. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *luteiventris* Stitz, 1938 the replacement name *stitzi* nom. nov.. A replacement name was proposed by Baroni Urbani (1971) for this taxon, but it is an unavailable.

Etimology: This name is dedicated to H. Stitz who is the current author of the preexisting subspecies *Camponotus mutilatus luteiventris*.

Summary of nomenclatural changes:

Species *Camponotus mutilatus* (Smith, 1859)
[orig. comb.: *Formica mutilata* Smith, 1859 from Indonesia. The combination in *Colobopsis* was carried out by Mayr (1862) and in *Camponotus* (*Colobopsis*) was carried out by Dalla Torre (1893)]

Subspecies *Camponotus mutilatus mutilatus* (Smith, 1859)

Subspecies *Camponotus mutilatus stitzi* **nom. nov.**
pro *Camponotus mutilates luteiventris* Stitz, 1938 **syn. n.**, [nec *Camponotus luteiventris* Emery, 1897]
[orig. comb.: *Camponotus* (*Colobopsis*) *mutilatus* var. *luteiventris* Stitz, 1938 from New Guinea. The combination in *Camponotus* (*Tanaemyrmex*) was carried out by Kempf (1972)]

Sp. *CAMPONOTUS OLIVIERI* Forel, 1886
Ssp. *CAMPONOTUS OLIVIERI ZAIREICUS* nom. nov.

Camponotus olivieri nitidior Santschi, 1926. Revue Suisse de Zoologie, 33, 617. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus nitidior* (Santschi, 1921). Bull. Soc. Vaudoise Sci. Nat., 54, 102. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus olivieri nitidior* Santschi, 1926 and *Camponotus nitidior* (Santschi, 1921) were included in the family Formicidae.

The specific epithet *nitidior* was initially introduced by Santschi (1921) with the original combination *Dendromyrmex fabricii nitidior* Santschi, 1921 from Neotropical region. It is still used as a valid species name. The subgenus *Dendromyrmex* has been revised by Fernández (2002).

Subsequently, Santschi (1926) also described a new variety of the species *Camponotus olivieri* Forel, 1886 from Zaire with the same subspecific epithet as *Camponotus* (*Myrmotrema*) *olivieri* var. *nitidior* Santschi, 1926 by original combination.

Camponotus nitidior (Santschi, 1921) has priority over *Camponotus olivieri nitidior* Santschi, 1926. Thus, *Camponotus olivieri nitidior* Santschi, 1926 is illegitimate and consequently can not be correct. The name *Camponotus olivieri nitidior* Santschi, 1926 is a secondary junior homonym of the name *Camponotus nitidior* (Santschi, 1921). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *nitidior* Santschi, 1926 the replacement name *zaireicus* nom. nov..

Etimology: from the country Zaire which is the distribution area of the subspecies.

Summary of nomenclatural changes:

Species *Camponotus olivieri* Forel, 1886
[orig. comb.: *Camponotus foraminosus* r. *olivieri* Forel, 1886 from Angola; raised to species by Santschi (1915)]

Subspecies *Camponotus olivieri concordinus* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* st. *concordia* Santschi, 1915 from Angola. *Camponotus* (*Myrmoturba*) *compressus* st. *sanctus* var. *confellah* Santschi, 1939 from Syria is an unavailable name]

Subspecies *Camponotus olivieri delagoensis* Forel, 1894
[orig. comb.: *Camponotus foraminosus* r. *delagoensis* Forel, 1894 from Mozambique. It was regarded as a subspecies of *C. olivieri* by Santschi (1915)]

Subspecies *Camponotus olivieri freyeri* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* st. *freyeri* Santschi, 1915 from Madagascar. It was firstly used as *Camponotus foraminosus* subsp. *aldabrensis* var. *fryeri* Forel, 1912 that is an unavailable name]

Subspecies *Camponotus olivieri infelix* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* st. *infelix* Santschi, 1915 from South Africa. It was firstly used as *Camponotus* (*Myrmotrema*) *foraminosus* r. *lemma* var. *infelix* Forel, 1914 that is an unavailable name]

Subspecies *Camponotus olivieri lemma* Forel, 1886
[orig. comb.: *Camponotus foraminosus* r. *lemma* Forel, 1886 from Angola. It was transfered as a subspecies of *C. olivieri* by Santschi (1915)]

Subspecies *Camponotus olivieri moshianus* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* var. *moshiana* Santschi, 1915 from Tanzania. It was firstly used as *Camponotus foraminosus lemma* var. *moshiana* Forel, 1907 that is an unavailable name]

Subspecies *Camponotus olivieri olivieri* Forel, 1886

Subspecies *Camponotus olivieri osiris* Forel, 1911
[orig. comb.: *Camponotus carbo osiris* Forel, 1911 from Zaire. It was regarded as a subspecies of *C. olivieri* by Santschi (1915)]

Subspecies *Camponotus olivieri patersoni* Arnold, 1959
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri patersoni* Arnold, 1959 from Botswana]

Subspecies *Camponotus olivieri pax* Menozzi, 1942
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* var. *pax* Menozzi, 1942 from Cameroun. It was firstly used as *Camponotus* (*Myrmotrema*) *olivieri* st. *tauricollis* var. *pax* Santschi, 1915 that is an unavailable name]

Subspecies *Camponotus olivieri sorptus* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* var. *sorpta* Santschi, 1915 from Zaire. It was firstly used as *Camponotus foraminosus delagoensis* var. *sorpta* Forel, 1909 that is an unavailable name]

Subspecies *Camponotus olivieri tenuipilis* Santschi, 1915
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* var. *tenuipilis* Santschi, 1915 from South Africa. It was firstly used as *Camponotus foraminosus olivieri* var. *tenuipilis* Emery, 1895 that is an unavailable name]

Subspecies *Camponotus olivieri zaireicus* **nom. nov.**
pro *Camponotus olivieri nitidior* Santschi, 1926 **syn. n.**, [nec *Camponotus nitidior* (Santschi, 1921)]
[orig. comb.: *Camponotus* (*Myrmotrema*) *olivieri* var. *nitidior* Santschi, 1926 from Zaire]

Sp. *CAMPONOTUS THEOBALDI* nom. nov.

Camponotus saussurei Théobald, 1937. Mém. Soc. Sei. Nancy, 7, 316. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus saussurei* Forel, 1879. Bulletin de la Société Vaudoise des Sciences Naturelles, 16, 103. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus saussurei* Théobald, 1937 and *Camponotus saussurei* Forel, 1879 were included in the family Formicidae.

The specific epithet *saussurei* was initially introduced by Forel (1879) with the original combination *Camponotus saussurei* Forel, 1879 from Antilles. It is still used as a valid species name.

Subsequently, Théobald (1937) described a new species from France with the same specific epithet as *Camponotus saussurei* Théobald, 1937 by original combination.

Camponotus saussurei Forel, 1879 has priority over *Camponotus saussurei* Théobald, 1937. Thus, *Camponotus saussurei* Théobald, 1937 is illegitimate and consequently can not be correct. The name *Camponotus saussurei* Théobald, 1937 is a primary junior homonym of the name *Camponotus saussurei* Forel, 1879. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *saussurei* Théobald, 1937 the replacement name *theobaldi* nom. nov..

Etimology: This name is dedicated to N. Théobald who is the current author of the preexisting species *Camponotus saussurei*.

Summary of nomenclatural changes:

Species *Camponotus theobaldi* **nom. nov.**
pro *Camponotus saussurei* Théobald, 1937 **syn. n.**, [nec *Camponotus saussurei* Forel, 1879]
[orig. comb.: *Camponotus saussurei* Théobald, 1937 from France]

Sp. *CAMPONOTUS TRANSVAALENSIS* Arnold, 1948
Ssp. *CAMPONOTUS TRANSVAALENSIS PRINSI* nom. nov.

Camponotus transvaalensis arnoldi Prins, 1965. Journal of the Entomological Society of Southern Africa, 27, 156. (Hymenoptera: Vespoidea: Formicidae). Preoccupied by *Camponotus truebi arnoldi* Forel, 1912. Entomologische Mitteilungen, 1, 75. (Hymenoptera: Vespoidea: Formicidae)

The names *Camponotus transvaalensis arnoldi* Prins, 1965; *Camponotus arnoldi* Pisarski, 1971 and *Camponotus truebi arnoldi* Forel, 1912 were included in the family Formicidae.

The subspecific epithet *arnoldi* was initially introduced by Forel (1912) with the original combination *Camponotus truebi* var. *arnoldi* Forel, 1912 from Taiwan. The combination was carried out by Emery (1925). It is still used as a valid subspecies name.

Then, Prins (1965) described a new subspecies of the species *Camponotus transvaalensis* Arnold, 1948 from Zimbabwe with the same subspecific epithet as *Camponotus transvaalensis arnoldi* Prins, 1965 by original combination. It is also still used as a valid subspecies name.

Later, Pisarski (1971) established a new species *Camponotus arnoldi* Pisarski, 1971 from Iraq with the same specific epithet as *Camponotus* (*Tanaemyrmex*) *arnoldi* Pisarski, 1971 by original combination. It is a senior synonym of *C. babau* Bolton, 1995.

Camponotus truebi arnoldi Forel, 1912 has priority over *Camponotus transvaalensis arnoldi* Prins, 1965 and *Camponotus arnoldi* Pisarski, 1971. Thus, *Camponotus transvaalensis arnoldi* Prins, 1965 and *Camponotus arnoldi* Pisarski, 1971 are illegitimate and consequently can not be correct. The names *Camponotus transvaalensis arnoldi* Prins, 1965 and *Camponotus arnoldi* Pisarski, 1971 are primary junior homonyms of the name *Camponotus truebi arnoldi* Forel, 1912. According to Article 60 of the International Code of Zoological Nomenclature (1999), they must be rejected and replaced. Therefore, the specific name *Camponotus arnoldi* Pisarski, 1971 was replaced by Bolton (1995) with a replacement name "*babau*". *Camponotus transvaalensis arnoldi* Prins, 1965 is still used as a valid name and has no synonym. So I propose for the subspecific epithet *arnoldi* Prins, 1965 the replacement name *prinsi* nom. nov..

Etimology: This name is dedicated to A. J. Prins who is the current author of the preexisting subspecies *Camponotus transvaalensis arnoldi*.

Summary of nomenclatural changes:

Species *Camponotus transvaalensis* Arnold, 1948
[orig. comb.: *Camponotus* (*Myrmespera*) *transvaalensis* Arnold, 1948 from South Africa]

Subspecies *Camponotus transvaalensis griqua* Arnold, 1952
[orig. comb.: *Camponotus* (*Myrmespera*) *transvaalensis griqua* Arnold, 1952 from South Africa]

Subspecies *Camponotus transvaalensis prinsi* **nom. nov.**
pro *Camponotus transvaalensis arnoldi* Prins, 1965 **syn. n.**, [nec *Camponotus truebi arnoldi* Forel, 1912 and *Camponotus arnoldi* Pisarski, 1971]
[orig. comb.: *Camponotus transvaalensis arnoldi* Prins, 1965 from Zimbabwe]

Subspecies *Camponotus transvaalensis transvaalensis* Arnold, 1948

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NEW RECORDS OF TARSONEMID MITES FROM ALFALFA FIELDS IN NORTHWEST OF EAST AZERBAIJAN PROVINCE, IRAN (ACARI)

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[Lotfollahi, P. & Irani-Nejad, K. H. 2010. New records of tarsonemid mites from alfalfa fields in northwest of east Azerbaijan province, Iran (Acari). Munis Entomology & Zoology, 5 (2): 538-542**]**

ABSTRACT: In order to study the tarsonemid soil mite fauna of alfalfa fields in Northwest of East Azarbaijan province including Soofian, Payam, Zenooz, Marand, Shabestar and Jolfa, soil samples were taken at three different times of the year 2006 (mid-May, mid-July and mid-September). Tarsonemid mites were seperated and identified. In this study 3 genera (*Tarsonemus*, *Steneotarsonemus* and *Neotarsonemoides*) and 10 species (*Steneotarsonemus acuticlavus* Wainstein, 1979*, *Steneotarsonemus arcuatus* Livshitz, Mitrofanov & Sharonov, 1979*, *Tarsonemus waitei* Banks, 1912**, *Tarsonemus mixtus* Kaliszewski, 1993*, *Tarsonemus fusarii* Cooreman, 1941, *Tarsonemus intextus* Kaliszewski, 1993*, *Tarsonemus annotatus* Livshitz, Mitrofanov & Sharonov, 1979*, *Tarsonemus bilobatus* Suski, 1965**, *Tarsonemus limitatus* Kaliszewski, 1993*, *Neotarsonemoides* lucifer* (Schaarschmidt, 1959)*) were identified, of which 1 genera and 7 species are new records for mite fauna of Iran and 1 genera and 9 species are new records for mite fauna of East Azerbaijan that indicated with * and ** respectively.

KEY WORDS: Alfalfa, East Azerbaijan, Iran, new record, Tarsonemidae.

The family Tarsonemidae belongs to the superfamily Tarsonemoidea. The family name was first proposed by Canestrini and Fanzago(1877) and also by Kramer(1877) simultaneously, but Canestrini and Fanzago gives its main profile. Tarsonemidae comprises a relatively highly derived group of mites having a greater diversity of feeding habits than any other family of acari. These mites have a variety of feeding habits, including mycophagy, phytophagy, and parasitic/symbiont associates of insects. Having such diversity of habits cause to a comparable difference in body structure, including form of mouthparts and specialization of tactile organs, particularly setae of the body and legs (Lindquist, 1986). Phytophagus species feed on leaves, flowers, fruits and soft stems (Ochoa et al., 1991) that some of them are important pests of agricultural crops. Although some species are predator (Smiley & Landwehr, 1976; Lindquist & Smiley, 1978). This family comprises more than 529 described species belonging to 40 genera worldwide (Lin & Zhang, 2002). Members of this family have been reported from parts of the world except Antarctic, large deserts and water habitats (Lindquist, 1986). Iran records for this family are scarce (Sepasgozarian, 1977; Bahreini, 1993; Sorush, 1994; Faraji & Kamali, 1993; Khanjani, 1996; Mirjamali et al., 2008; Hajiqanbar, 2009). In this paper we studied on tarsonemid soil mite fauna of alfalfa fields in northwest of East Azerbaijan province, Iran.

MATERIALS AND METHODS

Tarsonemid soil mite fauna of alfalfa fields of six regions in Northwest of East Azabaijan (Soofian, Payam, Zenooz, Marand, Shabestar and Jolfa) was studied at three different times of the year 2006 (mid-May, mid-July and mid-September),

based on Nested design (Snedecor & Cochran, 1967). In this study, three fields in each region and three samples in each field were selected and sampling of them were conducted at three different times Maximum depth for sampling was 25 cm of soil Specimens were transferred to the acarological laboratory of Plant Protection Department, Faculty of Agriculture, University of Tabriz and mites of them were extracted using the Berlese funnel. Mites were cleared by using clearing solution (Lactoglyserin and nesbit) (Krantz, 1978). Cleared mites were slide mounted in Hoyer's medium. Generic and specific identifications were made by the authors with a phase contrast microscope (Olympus, BX41). The type specimens are held in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.

RESULTS

In this study 54 soil samples were taken at three different times of year 2006, which results in collecting and identification of 3 genera and 10 species; of which 1 genus and 7 species are new records for mite fauna of Iran and 1 genus and 9 species are new records for mite fauna of East Azerbaijan province.

Genus *Steneotarsonemus* Beer, 1954

Steneotarsonemus acuticlavus Wainstein, 1979

Materials examined and associations: 2 specimens, Jolfa, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *S. acuticlavus* in Iran.

Steneotarsonemus arcuatus Livshitz, Mitrofanov & Sharonov, 1979

Materials examined and associations: 1 specimen, Soofian, mid-September 2006; 4 specimens, Zenooz, mid-September 2006; 1 specimen, Shabestar, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *S. arcuatus* in Iran.

Genus *Tarsonemus* Canestrini & Fanzago, 1876

Tarsonemus waitei Banks, 1912

Materials examined and associations: 2 specimens, Soofian, mid-September 2006.
Previous provincial records for Iran: Markazi (Sorush, 1994); Tehran (Ostovan & Kamali, 1997; Mirjamali et al. 2008).
Comments: This is the forth and first record of *T. waitei* in Iran and East Azerbaijan province, respectively.

Tarsonemus mixtus Kaliszewski, 1993

Materials examined and associations: 2 specimens, Soofian, mid-September 2006; 1 specimen, Shabestar, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *T. mixtus* in Iran.

Tarsonemus fusarii Cooreman, 1941

Materials examined and associations: 4 specimens, Shabestar, mid-July and mid-September 2006.
Previous provincial records for Iran: Hamedan (Khanjani, 1996); Mazandaran (Faraji & Kamali, 1993); Khorasan (Hagiqanbar, 2009); East Azerbaijan (Lotfollahi & Haddad, 2010).
Comments: This is the fifth and second record of *T. fusarii* in Iran and East Azerbaijan province, respectively.

***Tarsonemus intextus* Kaliszewski, 1993**
Materials examined and associations: 2 specimens, Soofian, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *T. intextus* in Iran.

***Tarsonemus annotatus* Livshitz, Mitrofanov & Sharonov, 1979**
Materials examined and associations: 2 specimens, Soofian, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *T. annotatus* in Iran.

***Tarsonemus bilobatus* Suski, 1965**
Materials examined and associations: 5 specimens, Shabestar, mid-September 2006.
Previous provincial records for Iran: Mazandaran (Barimani-Varandi, 1996; Barimani-Varandi & Kamali, 1998); Tehran (Mirjamali et al. 2008).
Comments: This is the forth and first record of *T. bilobatus* in Iran and East Azerbaijan province, respectively.

***Tarsonemus limitatus* Kaliszewski, 1993**
Materials examined and associations: 1 specimen, Soofian, mid-July 2006; 1 specimen, Marand, mid-May, 2006; 1 specimen, Zenooz, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this species in Iran.
Comments: This is the first record of *T. limitatus* in Iran.

Genus *Neotarsonemoides* Kaliszewski, 1986

***Neotarsonemoides lucifer* (Schaarschmidt, 1959)**
Materials examined and associations: 3 specimens, Soofian, mid-September 2006.
Previous provincial records for Iran: There is no provincial record of this genus in Iran.
Comments: This is the first record of *N. lucifer* in Iran.

DISCUSSION

Distribution of this family during three different sampling times showed increasing trend from mid-May to mid-September. This process may show that members of family Tarsonemidae are termophilic.

Maximum number of tarsonemid mites was obtained in Shabestar at mid-September. In general, the number of mites from high to low were in Shabestar, Soofian, Zenooz, Jolfa and Marand, respectively. Maximum species diversity of this family was obtained in Soofian at mid-September and the number of species(species diversity) from high to low were in Soofian, Shabestar, Zenooz, Jolfa and Marand, respectively. No tarsonemid mite was observed in payam.

Increasing the diversity and frequency of collected mites from mid-May to mid-September shows the dependence of species diversity and frequency to climate condition specially high temperature and low humidity, which have been shown in Bedano et al. (2005), Toros and Emekci (1989), Fathi Poor (1994) and Ardashir (2004).

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RESURRECTION OF THE ENDEMIC BIRD DUNG CRAB SPIDERS, *PHRYNARACHNE* THORELL (ARANEAE: THOMISIDAE) OF 19TH CENTURY INDIA.

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[Roy, T. K., Dhali, D. C., Saha, S. & Raychaudhuri, D. 2010. Resurrection of the endemic bird dung crab spiders, *Phrynarachne* Thorell (Araneae: Thomisidae) of 19th century India. Munis Entomology & Zoology, 5 (2): 543-550**]**

ABSTRACT: *Phrynarachne tuberosa* (Blackwall, 1864) and *P. peeliana* (Stoliczka, 1869), the only two bird dung crab spiders, known in the 19th century India, could once again be recorded in the 21st century. Both the species are resurrected and new from West Bengal, India. These are described and illustrated here.

KEY WORDS: Resurrection, Bird dung crab spiders, *Phrynarachne*, India.

Bird dung crab spiders recognized under the genus *Phrynarachne* appear to be one of the rarest group. This is well evident from the world catalogue of spiders (Platnick, 2010). Only 30 species are recognized as such spiders as against 41.253 species of spiders known globally. In India, they are known by only two endemic species namely *P. tuberosa* (Blackwall, 1864) and *P. peeliana* (Stoliczka, 1869). The former was initially described as *Thomisus tuberosus* and the latter as *T. peelianus*. Cambridge in 1884 proposed a new combination, *Ornithoscatoides* for *T. tuberosus*. Again, Simon in 1895 revised the status of both *tuberosus* and *peelianus* and placed them under the genus *Phrynarachne*.

Even though listed in the world catalogue (Platnick, 2010) and in the check lists of Indian spiders (Siliwal & Molur, 2007; Sebastian & Peter, 2009), none could record any further *Phrynarachne* since 19th century India.

We feel happy to communicate that both the species could be resurrected from the protected areas and tea ecosystem of Dooars. The outcome is the result of our effort in assessing the resource potentials of spiders, since 2006.

Both the species *Phrynarachne tuberosa* and *P. peeliana* demand contemporary taxonomic treatment and hence described and illustrated.

MATERIALS AND METHODS

Collection and preservation of the spider specimens were done following Tikader (1987). The materials were studied under Stereo Zoom Binocular Microscope, model Olympus SZX-7. The measurements indicated in the text are in millimeters, made with an eye piece graticule. Identification of the taxa was done with the help of Blackwall (1864), Stoliczka (1869), Cambridge (1884), Simon (1895). Spider specimens are in the deposition of Entomology Laboratory, Department of Zoology, University of Calcutta, Kolkata.

Abbreviations used: AME= anterior median eye, PME= posterior median eye, ALE= anterior lateral eye, PLE= posterior lateral eye, T.E. = tea estate.

TAXONOMIC ACCOUNT

Phrynarachne tuberosa (Blackwall, 1864)

(Figs. 1-6 & 14)

Thomisus tuberosus Blackwall, 1864, Ann. Mag. Nat. Hist. (3) 14 : 36-45.
Ornithoscatoides tuberosa (Blackwall); Cambridge, 1884, Proc. Zool. Soc. London, 196-205.
Phrynarachne tuberosa (Blackwall); Simon, 1895, Hist. Nat. des Araign. Paris, 1: 1045.

Description: Female

Total length- 9.07, carapace length- 3.64, carapace width- 4.71; abdominal length- 5.43, abdominal width- 6.93. Cephalothorax (Fig. 1) brown, globose, anteriorly narrowed with variably developed tubercles and abruptly depressed posteriorly. Caput strongly raised, rectangular, anteriorly broad, posteriorly narrowing, marginally marked by inward longitudinal depression, posterolateral angles strongly tuberculate, directed upward and weakly backward, anterior angles transversely tuberculate, midlongitudinally marked by black tuberculate carina, rest of the surface warty to tuberculate. Eyes 8, transparent, each ringed by black, disposed on the anterior part of caput in two recurved rows, posterior row much recurved, lateral eyes situated on tubercle, anterolaterals largest, anteromedians on either side of the down slope of the raised square area, ocular quad nearly square, eye diameter ALE>PLE>AME>PME. Inter ocular distance: AME-AME=0.57, ALE-AME=0.18, ALE-ALE=1.14, PME-PME=0.54, PLE-PME=0.43, PLE-PLE=1.60, ALE-PLE=0.29, AME-PME=0.29. Clypeus sloped, dark brown, clypeal angles obtusely produced, margin with lanceolate hairs and numerous granulations. Thoracic groove deeply distinct, radii equally so, in between with tubercles in outwardly directed series, fovea longitudinal on diffused black patch, little posterior to posterior tubercles of caput. Chelicerae (Fig. 2) dark brown, robust, rugose, strongly scopulate, retromargin with one small brown tooth and promargin with two pale rather large teeth. Fangs (Fig. 2) red brown, small, stout, strongly curved. Labium (Fig. 3) dark brown, longer than wide, anterior margin pale, basally notched, with strong long brown hairs. Maxillae (Fig. 3) brown, scopulate, with strong, long hairs, apical 1/3 yellowish brown, rest blackish, outer margin incurved near palpal base. Sternum (Fig. 4) dark brown, elongately cordate, anteriorly weakly concave, with hairs similar to maxillae. Legs brown black, dorsally marked by offwhite to yellow patches, coxae, trochanter, femur ventro- laterally with offwhite narrow to broad patch, femora with many small tubercles, tibiae and metatarsi with strong spines, tibial spines beset on small tubercles, patella triangular, femora I & II robust. Tarsi of leg I & II with 2 brown black pectinate claws with claw tuft , each with 7 teeth, 3rd one small and pale, claws of leg III & IV 2, pectinate. Leg formula 2134.

Abdomen (Fig. 1) subpentagonal, posteriorly broad, anteriorly round and straight overhanging the base of cephalothorax. Dorsum pale olive brown, with strong variably developed tubercles. Cardiac marking bar shaped, longitudinal, anteriorly marked by a muscular apodeme, posteriorly little distantly two submedian lateral broad apodeme. Either side of the cardiac bar with 3 red brown tubercles, the median largest appearing like a bivalve shell, posterior one smallest. Further laterally with two large yellow brown upwardly directed tubercles disposed obliquely to both anterior and median tubercles, two more apodemes of smaller dimension present between the median and the largest tubercles, anterior to anterior apodeme 2 more brown tubercles disposed transversely, posterior to posterior apodeme 2 such tubercles disposed transversely, further beyond in a oblique line 2 more rather large, outwardly and downwardly directed tubercles, further below with 2 smaller yellow tubercles little inwardly placed. Thus forming

3 rows of which the median one largest, the rows separated by a transverse infolding. Anterior margin with 4 moderately developed tubercles, laterally with 6 such, either side submarginally with 8 apodemes marked by black, otherwise rest of the dorsum with small to large tubercles of variable shape, marginally with 3 spiniform apophysis on either side, posterior margin wavy, marked by tubercles. Venter black with offwhite markings, these marginally broad, medially with muscular apodemes in series, medians longitudinal, rest oblique, converging towards spinnerets. The black above the epigastric furrow with arm like extension, separating the branchial lamellae, infolded further below the 2nd pair of lamellae.

Epigynum-Internal genitalia (Figs.5 & 6): Spermatheca bean shaped, copulatory duct at the micropyler region, fertilization duct distinct, atrium narrow.

Variation: Total length: Female: 8.97-9.07.

Male: Unknown.

Material Examined: 1 female, Nepuchapur T. E., Dooars, West Bengal, 18.iii.2009, Coll. D. C. Dhali; 1 female, Nagrakata T. E., Dooars, West Bengal, 22.iii.2009, Coll. T. K. Roy; 2 female (immature), Kailashpur T. E., Dooars, West Bengal, 30.i.2010, Coll. S. Saha.

Distribution: India (Platnick, 2010): West Bengal (New Record).

Remark: Both Blackwall and Cambridge indicated the record of the species from East Indies (East India). They however, did not mention other taxonomic data.

Phrynarachne peeliana (Stoliczka, 1869)

(Figs. 7- 13 & 15)

Thomisus peelianus Stoliczka 1869, J. Asiatic Soc. Bengal, 38: 201-251.

Phrynarachne peeliana (Stoliczka); Simon, 1895. Hist. Nat. des Araign. Paris,1: 1044.

Description: Female

Total length- 11.29, carapace length- 4.21, carapace width- 4.36; abdominal length- 6.32, abdominal width- 7.07. Cephalothorax (Fig. 7) grayish brown, margin offwhite, globose, anteriorly narrowed, truncate in front, with lanceolate hairs, surface warty, these denser anteriorly. Cephalic area raised medially, with a Y-shaped groove, arms of which extending from the area between AME and ALE converging to the base of ocular quad further extending between the PME upto anterior one-third. Eyes 8, transparent, ringed with black, arranged in two recurved rows, posterior row strongly so, lateral eyes on tubercles, such with further raised triangular tubercles, anterior row on the slope, posterior row on the edge, anterolaterals largest, ocular quad nearly square, anteriorly narrow, medially raised, this midlongitudinally grooved forming two gibbosities, each at its tip with a brown long spine like seta, eye diameter: ALE>PLE>AME>PME. Inter ocular distance: AME-AME=0.32, ALE-AME=0.21, ALE-ALE=0.94, PME-PME=0.46, PLE-PME=0.14, PLE-PLE=1.29, ALE-PLE=0.29, AME-PME=0.14. Clypeus broad, on slope, margin with ten small tubercles, each with a strong transparent lanceolate hair. Further anteromedially with a large offwhite tubercle. Cervical furrows deeply distinct, fovea marked by a shallow groove, radii distinct, with basal mid-longitudinal groove, posterolateral angles dark brown. Pedicelar node garlic like. Chelicerae (Fig. 8) brown, offwhite at base, short, stout, subtriangular, basally broad, covered with thick hairs, scopulate, each margin with two teeth, fang brown, strongly curved. Maxillae and labium (Fig. 9) offwhite, maxillae apically broad, incurved near palpal base, thickly hairy. Labium elongate, constricted basally, forming a basal stalk, strongly hairy. Sternum (Fig.

10) offwhite, marginally grey brown, basally with a small midlongitudinal black line, pitcher like, anterior margin weakly incurved, thickly hairy. Legs yellow brown basally and apically darker with offwhite patches, femora I & II ventrally with tubercles, each with a transparent lanceolate hair, tubercles on femora III & IV in decreasing number. Each leg with two brown, curved, basally pectinate claw with claw tuft. Tibia and metatarsi of all legs with two rows of spines laterally. Leg formula 1=243.

Abdomen (Fig. 7) greyish brown, margin with offwhite, this posterolaterally strongly so, pentagonal, posteriorly broad, anteriorly narrowed, both ends nearly truncate and tuberculate, surface anteriorly and laterally with small warts, this medially and posteriorly scanty. Dorsum midlongitudinally grooved, the groove medially marked by offwhite, on either side of it medially with a pair of transverse offwhite muscular apodemes, further marginally with two rows of such apodemes faintly marked by offwhite, rows apparently converging to the apodemes at tip of the longitudinal depression, again a pair of large muscular apodemes located lateral to the posteromedian longitudinal offwhite marking. Anterior margin with four tubercles leaving the median area free, each anterolateral margin with three such of smaller dimension, posterior area with four median large tubercles, anterior two largest, anterior to it two such small tubercles, two small tubercles on either side of the posteromedian, spiniform apophysis three on either side, each tubercle at its tip with a small spiny hair excepting the last pair. Venter entirely offwhite with grey brown patches medially arranged in longitudinal line, posteriorly with three triangularly arranged tubercles on either side of the spinnerets, lateral ones largest. Behind the spinnerets with a tongue shaped hairy projection (Fig. 13), surface with several muscular apodemes marked by grey brown.

Epigynum-Internal genitalia (Figs.11 & 12): Spermatheca oval, fertilization duct inwardly curved, copulatory duct medially produced from spermatheca, atrium distinct.

Male: Unknown

Material examined: 2 female, Buxa Tiger Reserve, Dooars, West Bengal, 11.iv.2009, Coll. D. Raychaudhuri.

Distribution: India (Platnick, 2010): Assam (Stoliczka, 1869), West Bengal (New Record).

Remark: Stoliczka (1869) provided the collection locality only. No more information is available in the original literature.

ACKNOWLEDGEMENTS

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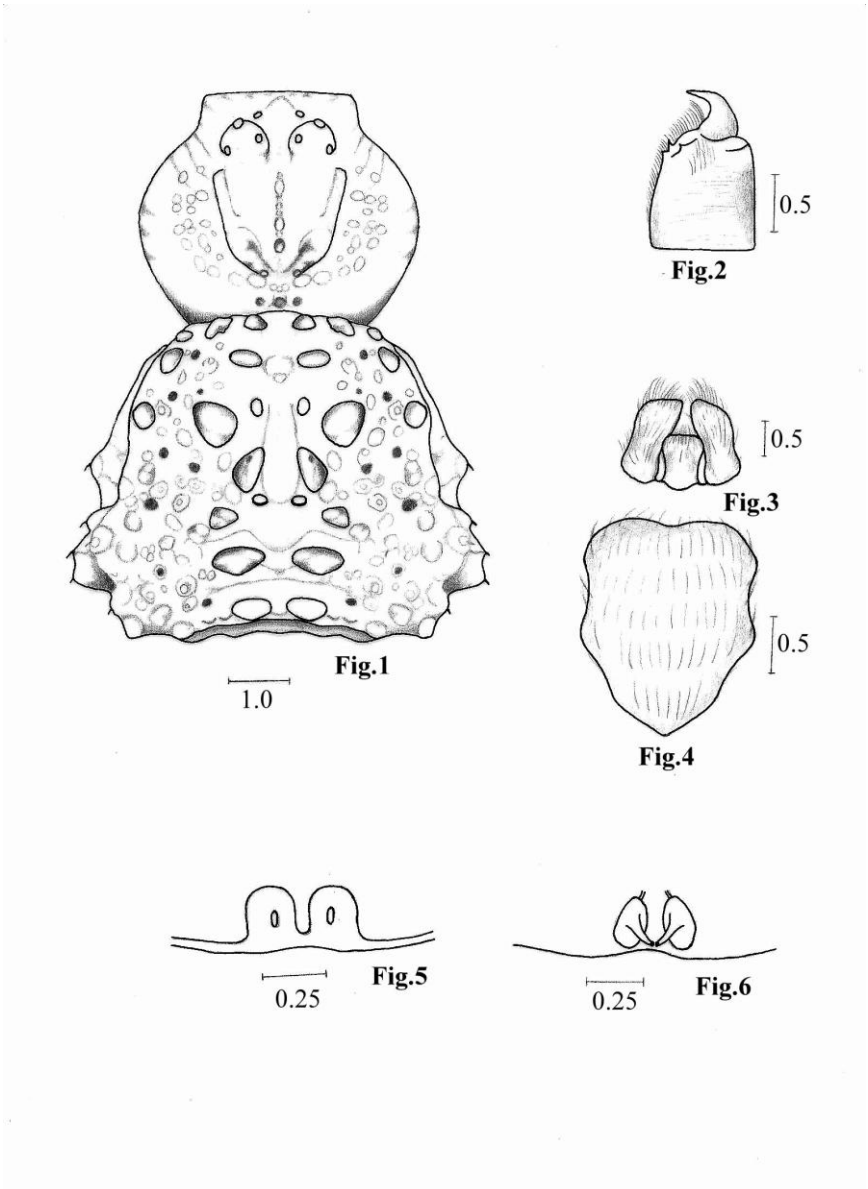
Table 1. Length of legs of female of *Phrynarachne tuberosa* (Blackwall, 1864)

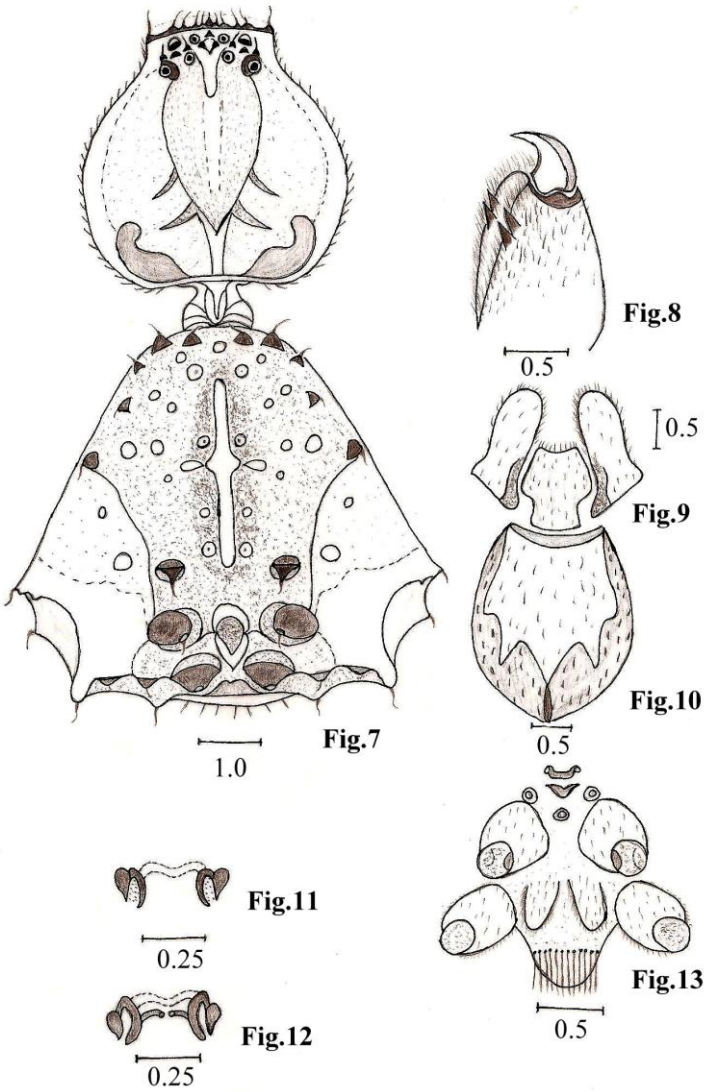
Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	3.23	1.93	2.16	1.81	1.25	10.38
II	3.18	1.93	2.16	1.93	1.25	10.45
III	2.05	1.25	1.36	1.02	0.90	6.58
IV	1.36	1.31	1.36	0.85	0.68	5.56

Table 2. Length of legs of female of *Phrynarachne peeliana* (Stoliczka, 1869)

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	4.11	1.89	2.89	3.44	1.56	13.89
II	4.11	1.89	3.00	3.22	1.67	13.89
III	2.44	0.56	1.78	1.00	1.00	6.78
IV	2.78	0.89	2.78	1.00	1.11	8.56



Figures 1-6. *Phrynarachne tuberosa* (Blackwall): Female: 1. Whole body, 2. Chelicerae, 3. Maxillae and Labium, 4. Sternum, 5. Epigynum, 6. Internal genitalia.



Figures 7-13. *Phrynarachne peeliana* (Stoliczka): Female: 7. Whole body, 8. Chelicerae, 9. Maxillae and Labium, 10. Sternum, 11. Epigynum, 12. Internal genitalia, 13. Spinnerets.

Figures 14-15. 14. *Phrynarachne tuberosa* (Blackwall): Photograph, 15. *Phrynarachne peeliana* (Stoliczka): Photograph.

NEW NAMES FOR HOMONYM SPECIES AND GENERA OF OSTRACODA (ARTHROPODA: CRUSTACEA)

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[Kempf, E. K. 2010. New names for homonym species and genera of Ostracoda (Arthropoda: Crustacea). Munis Entomology & Zoology, 5 (2): 551-558**]**

ABSTRACT: Amongst ostracod species five primary junior homonyms were detected for which the following replacement names are proposed: *Xestoleberis adriatica* nom. nov. for *Xestoleberis obtusa* Klie, 1942; *Xestoleberis pratapsinghi* nom. nov. for *Xestoleberis obtusa* Singh, 1997; *Bradleya kenmckenziei* nom. nov. for *Bradleya mckenziei* Yassini & Jones, 1995; *Carbonita rogerkaesleri* nom. nov. for *Carbonita ovata* Retrum & Kaesler, 2005; and *Carbonita eskridgensis* nom. nov. for *Carbonita triangulata* Retrum & Kaesler, 2005. Amongst ostracod genera four primary junior homonyms were detected for which the following replacement names are proposed: *Raybatella* nom. nov. for *Batella* Khosla, Jakhar & Mohammed, 1997; *Mendelgrammia* nom. nov. for *Grammia* Kotschetkova, 1980; *Bakharevilla* nom. nov. for *Furcilla* Bakharev, 1988; and *Dickhoarea* nom. nov. for *Kendrickia* Hoare, 2008. Finally, the case of *Delosia* Gailite, 1967 is analysed for which *Cemalia* Özdikmen, 2010 is the valid substitutional name.

KEY WORDS: nomenclatural changes, junior homonyms, replacement names, Ostracoda.

Order Podocopida
Family Xestoleberididae
Genus *Xestoleberis* Sars, 1866
Xestoleberis adriatica nom. nov.

Xestoleberis obtusa Klie, 1942. Zool. Anz. 138: 199. Preoccupied by *Xestoleberis obtusa* Lienenklaus, 1900. Z. Deutsch. Geol. Ges. 52: 533.

Remarks on nomenclatural change: With the publication of the first volume from my database of marine Ostracoda (Kempf, 1986) that case of homonymy has been made evident. The publication of volume 16 (Kempf, 2004) revealed that nobody did care about that until now.

Comparison of the published figures of the well documented *Xestoleberis obtusa* Klie, 1942 with the figures of *Xestoleberis obtusa* Lienenklaus, 1900 reveals that besides of the difference in age of about 35 million years there are also distinct differences in size and outline of the shell.

Consequently, according to the International Code of Zoological Nomenclature (1999) *Xestoleberis obtusa* Klie, 1942 represents a junior primary homonym, for which *Xestoleberis adriatica* nom. nov. is herewith introduced as the necessary new name.

Etymology: The new name refers to the type locality of this species in the Adriatic Sea, near to the Institute of Oceanography at Split (= Spalato) from a water depth of 3 to 4 m.

Xestoleberis pratapsinghi nom. nov.

Xestoleberis obtusa Singh, 1997. Geoscience Journal, 18: 163. Preoccupied by *Xestoleberis obtusa* Lienenklaus, 1900. Z. Deutsch. Geol. Ges. 52: 533.

Remarks on nomenclatural change: With the publication of volume 11 from my database of marine Ostracoda (Kempf, 2008) that case of homonymy has been made evident. Until now I could not register any action.

Comparison of the published figures of *Xestoleberis obtusa* Singh, 1997 with the figures of *Xestoleberis obtusa* Lienenklaus, 1900 reveals that both species are of similar size, but in lateral and in dorsal view of the carapace there are remarkable differences in outline.

Consequently, according to the International Code of Zoological Nomenclature (1999) *Xestoleberis obtusa* Singh, 1997 represents a junior primary homonym, for which *Xestoleberis pratapsinghi* nom. nov. is herewith introduced as the necessary new name.

Etymology: The new name is dedicated to Dr. Pratap Singh in recognition of his contributions to the micropalaeontology and biostratigraphy of Rajasthan, India.

Order Podocopida
Family Thaerocytheridae
Genus *Bradleya* Hornibrook, 1952
***Bradleya kenmckenziei* nom. nov.**

Bradleya mckenziei Yassini & Jones, 1995. Recent Foraminifera and Ostracoda from estuarine and shelf environments on the southeastern coast of Australia: 360. Preoccupied by *Bradleya mckenziei* Benson, 1972. Smithsonian Contributions to Paleobiology, 12: 42.

Remarks on nomenclatural change: In November 2000 I informed Dr. Iradj Yassini of this homonymy. He answered that from the beginning of the year 2000 he had completely abandoned the study of Ostracoda.

Comparison of the published figure of *Bradleya mckenziei* Benson, 1972 from the Bass Strait between Australia and Tasmania with the figures of *Bradleya mckenziei* Yassini & Jones, 1995 from off the coast of New South Wales, Southeast Australia reveals that both species are quite different from each other.

Consequently, according to the International Code of Zoological Nomenclature (1999) *Bradleya mckenziei* Yassini & Jones, 1995 represents a junior primary homonym, for which *Bradleya kenmckenziei* nom. nov. is herewith introduced as the necessary new name.

Etymology: As originally intended, the new name is honouring the late Dr. Kenneth Glencoe McKenzie in recognition of his many significant contributions to ostracodology.

Order Podocopida
Family Carbonitidae
Genus *Carbonita* Strand, 1928
***Carbonita rogerkaesleri* nom. nov.**

Carbonita ovata Retrum & Kaesler, 2005. J. Micropalaeont. 24: 188. Preoccupied by *Carbonita ovata* Kummerow, 1953. Geologie, Beiheft 7: 21.

Remarks on nomenclatural change: In August 2006 I informed Professor Kaesler of this homonymy. But owing to his illness and untimely death he could not clarify the problem himself as he intended.

Comparison of the published figures of *Carbonita ovata* Kummerow, 1953 from the Upper Carboniferous of Poland with the figures of *Carbonita ovata* Retrum & Kaesler, 2005 from the Lower Permian Speiser Shale of Kansas reveals that there are distinct differences in size, outline and surface ornamentation.

Consequently, according to the International Code of Zoological Nomenclature (1999) *Carbonita ovata* Retrum & Kaesler, 2005 represents a junior primary homonym, for which *Carbonita rogerkaesleri* nom. nov. is herewith introduced as the necessary new name.

Etymology: The new name is dedicated in remembrance of the late Dr. Roger Leroy Kaesler, Professor of Geology at the University of Kansas, in recognition of his many contributions to ostracodology.

***Carbonita eskridgensis* nom. nov.**

Carbonita triangulata Retrum & Kaesler, 2005. J. Micropalaeont. 24: 188. Preoccupied by *Carbonita triangulata* Samoilova & Smirnova, 1960. Materialy po geologii i poleznym iskopaemym tsentralnykh rayonov evropeyskoy chasti SSSR, 3: 82.

Remarks on nomenclatural change: In August 2006 I informed Professor Kaesler of this homonymy. But owing to his illness and untimely death he could not clarify the problem himself as he intended.

Comparison of the published figures of *Carbonita triangulata* Samoilova & Smirnova, 1960 from the Tul'skiy horizon of the Russian Carboniferous with the figures of *Carbonita triangulata* Retrum & Kaesler, 2005 from the Lower Permian Speiser Shale of Kansas reveals that the shells of the Russian species are distinctly longer, higher and more triangular.

Consequently, according to the International Code of Zoological Nomenclature (1999) *Carbonita triangulata* Retrum & Kaesler, 2005 represents a junior primary homonym, for which *Carbonita eskridgensis* nom. nov. is herewith introduced as the necessary new name.

Etymology: The new name refers to the type locality of this species which is situated approximately 3 km northwest of Eskridge, Kansas.

Order Podocopida
Family Progonocytheridae
Genus *Raybatella* nom. nov.

Batella Khosla, Jakhar & Mohammed, 1997. Micropaleontology 43: 12 (Crustacea: Ostracoda). Preoccupied by *Batella* Holthuis, 1955. Zool. Verh. Leiden 26: 92 (Crustacea: Decapoda: Caridea: Alpheidae).

Remarks on nomenclatural change: The genus name *Batella* was coined by Holthuis (1955) as a nomen novum for *Cheirothrix* Bate, 1888 (Crustacea: Decapoda), an invalid junior homonym of *Cheirothrix* Pictet & Humbert, 1866 (Pisces). It is in current use as an available valid genus name in Crustacea, Decapoda.

Subsequently, the genus *Batella* was erected by Khosla, Jakhar & Mohammed (1997) for a fossil ostracod.

Thus the genus name *Batella* Khosla, Jakhar & Mohammed, 1997 is a primary junior homonym of the valid genus name *Batella* Holthuis, 1955. Herewith I propose to replace *Batella* Khosla, Jakhar & Mohammed, 1997 with the new substitutional name *Raybatella*.

Type species: *Raybatella befotakaensis* (Grekoff, 1963) **comb. nov.**,
Original binomen: *Progonocythere befotakaensis* Grekoff, 1963

Other species: *Raybatella falcula* (Grekoff, 1963) **comb. nov.**

Raybatella clavata (Khosla, Jakhar & Mohammed, 1997) **comb. nov.**
Raybatella depressa (Khosla, Jakhar & Mohammed, 1997) **comb. nov.**

According to Mette (in Mette & Geiger 2004: 78) the genus *Batella* Khosla, Jakhar & Mohammed, 1997 should rank only as a subgenus of the genus *Fastigatocythere* Wienholz, 1967. If that interpretation will generally be adopted in the future, the new combinations should read as follows:

Fastigatocythere (*Raybatella*) **new rank**
Type species: *Fastigatocythere (Raybatella) befotakaensis* (Grekoff, 1963) **comb. nov.**

Other species: *Fastigatocythere (Raybatella) falcula* (Grekoff, 1963) **comb. nov.**
Fastigatocythere (Raybatella) clavata (Khosla, Jakhar & Mohammed, 1997) **comb. nov.**
Fastigatocythere (Raybatella) depressa (Khosla, Jakhar & Mohammed, 1997) **comb. nov.**

Etymology: As originally intended, the new name is dedicated to Dr. Raymond Holmes Bate, Director of Stratigraphic Services International Ltd., Guildford, England, in recognition of his significant contributions to ostracodology and biostratigraphy.

Order Podocopida
Family Pachydomellidae
Genus *Mendelgrammia* nom. nov.

Grammia Kotschetkova, 1980. Novye pozdneturneyskie ostrakody yuzhnogo Urala: 62 (Crustacea: Ostracoda). Preoccupied by *Grammia* Rambur, 1866. Catalogue systematique des Lépidoptères de l'Andalousie, 2: 261 (Arthropoda: Lepidoptera: Arctiidae).

Remarks on nomenclatural change: Firstly, the genus *Grammia* was erected by Rambur (1866) which is still widely used as an available valid genus name in Lepidoptera.

Subsequently, the genus *Grammia* was erected by Kotschetkova (1980) for fossil Ostracoda.

Thus the genus name *Grammia* Kotschetkova, 1980 is a primary junior homonym of the valid genus name *Grammia* Rambur, 1866. Herewith I propose to replace *Grammia* Kotschetkova, 1980 with the new substitutional name *Mendelgrammia*.

Type species: *Mendelgrammia elongata* (Kotschetkova, 1980) **comb. nov.**
Other species: *Mendelgrammia zilimica* (Kotschetkova, 1980) **comb. nov.**
Mendelgrammia tarda (Buschmina, 1968) **comb. nov.**
Mendelgrammia aculeata (Buschmina, 1975) **comb. nov.**
Mendelgrammia lorenzi (Lethiers & Casier, 1996) **comb. nov.**
Mendelgrammia famenniensis (Lethiers & Casier, 1999) **comb. nov.**

Etymology: As originally intended, the new name is honouring the late Dr. Mendel Naumovich Gramm in recognition of his valuable contributions to ostracodology.

Order Palaeocopida
Family Drepanellidae
Genus *Bakharevilla* nom. nov.

Furcilla Bakharev, 1988. Trudy Inst. Geol. i Geofiz. 718: 37 (Crustacea: Ostracoda). Preoccupied by *Furcilla* Martin, 1975. Occ. Pap. Calif. Acad. Sci. 119: 76 (Arthropoda: Insecta: Diptera: Asilidae). Preoccupied by *Furcilla* Stokes, 1890. Proc. Amer. Phil. Soc. 28: 77 (Protozoa: Flagellata: Pantostomata).

Remarks on nomenclatural change: The genus *Furcilla* was described for flagellate Protozoa by Stokes (1890). It is in current use as an available valid genus name in Eukaryota: Chlorophyta: Chlamydomonaceae. Another genus *Furcilla* was described within the Insecta by Martin (1975). It is also in current use, but treated as a homonym. Subsequently, a genus *Furcilla* was erected by Bakharev (1988) for fossil Ostracoda.

Thus the genus name *Furcilla* Bakharev, 1988 is a primary junior homonym of the valid genus name *Furcilla* Stokes, 1890 or, if that genus name should be treated as a plant, of *Furcilla* Martin, 1975. Herewith I propose to replace *Furcilla* Bakharev, 1988 with the new substitutional name *Bakharevilla*.

Type species: *Bakharevilla furcata* (Bakharev, 1988) **comb. nov.**
Other species: *Bakharevilla distincta* (Bakharev, 1988) **comb. nov.**

Etymology: The new name is composed of Bakharev, author's name of *Furcilla* (Ostracoda), and the ending -illa.

Order Palaeocopida
Family unknown
Genus *Dickhoarea* nom. nov.

Kendrickia Hoare, 2008. Revista Espanola de Micropaleontologia 40: 69 (Crustacea: Ostracoda) Preoccupied by *Kendrickia* Solem, 1985. Rec. West. Austr. Mus., Suppl. No. 20: 804 (Mollusca: Gastropoda: Stylommatophora: Camaenidae).

Remarks on nomenclatural change: The genus *Kendrickia* was described by Solem (1985). It is in current use as an available valid genus name in Gastropoda. Subsequently, the genus *Kendrickia* was erected by Hoare (2008) for a fossil ostracod.

Thus the genus name *Kendrickia* Hoare, 2008 is a primary junior homonym of the valid genus name *Kendrickia* Solem, 1985. Herewith I propose to replace *Kendrickia* Hoare, 2008 with the new substitutional name *Dickhoarea*.

Type species by monotypy: *Dickhoarea asketos* (Hoare, 2008) **comb. nov.**

Etymology: The new name is dedicated to Dr. Richard D. Hoare, Emeritus Professor of Geology at Bowling Green State University, Ohio, USA, in recognition of his significant contributions to palaeontology.

Order Palaeocopida
Family Aechminidae
The case of *Delosia* Gailite, 1967

In 1967 Gailite erected the genus *Delosia* with the monotypic *Delosia cuneata* n. sp. as type species. She was not aware of the fact that already in 1924 a genus *Delosia* had been erected by Bolivar within the Insecta.

In 1987 Schallreuter described *Delosia nondelosia* as a second new species within the genus *Delosia* Gailite, 1967 non Bolivar, 1924. The species name *nondelosia* was chosen to make clear that this species with certainty does not belong to an ostracod genus with *Delosia* as genus name, as this name represents a homonym.

In 1995 Schallreuter in a misleading manner erected *Nondelosia* gen. nov., citing as synonym *Delosia* Gailite, 1967 non Bolivar, 1924. The type species was not given explicitly, but indirectly under "derivatio nominis" of the genus name: after the species name of the type species.

In Kempf (1995) *Nondelosia* Schallreuter, 1995 is registered as a substitutional name for *Delosia* Gailite, 1967 with *Nondelosia nondelosia* (Schallreuter, 1987) as type species.

In 2010 Hüseyin Özdikmen published *Cemalia* nom. nov. as a substitutional name for *Delosia* Gailite, 1967.

At first sight I thought *Cemalia* Özdikmen, 2010 is representing a synonym of *Nondelosia* Schallreuter, 1995.

However, by analysing the whole story it becomes evident that Schallreuter did not mention *Delosia cuneata*, the type species of *Delosia* Gailite, 1967, when erecting the genus *Nondelosia*.

As a consequence, *Nondelosia* Schallreuter, 1995 has to be considered as a separate monotypic genus with *Nondelosia nondelosia* (Schallreuter, 1987) as type species.

Cemalia Özdikmen, 2010, however, has to be taken as the substitutional name for *Delosia* Gailite, 1967 with the monotypic *Cemalia cuneata* (Gailite, 1967) **comb. nov**. as type species.

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AN INVESTIGATION TO THE SUBFAMILY OF LIXINAE FROM KHORASAN JUNOUBI AND RAZAVI PROVINCES OF IRAN (COLEOPTERA: CURCULIONIDAE)

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[Moderres Awal, M. & Hossein Pour, F. 2010. An investigation to the subfamily Lixinae from Khorasan Junoubi and Razavi provinces of Iran (Coleoptera: Curculionidae). Munis Entomology & Zoology, 5 (2): 559-562**]**

ABSTRACT**:** During 2006-2008 subfamily of Lixinae was surveyed in North eastern and east provinces of Iran. In total, 27 species belonging to 15 genera were determined. Among them three species including of *Larinus sericatus* (Boheman, 1834), *Bangasternus provincialis* (Fairmaire, 1863) and *Conorhynchus verucundus* (Faust, 1883) are new record for Iran fauna.

KEY WORDS: Curculionidae, Lixinae, Khorasan, Iran, new records.

Khorasan is the widest region in Iran (with total area 315686 Km²) that is divided in three provinces concern Khorasan Junoubi, Razavi and Shomali. This area surrounded by Turkmenistan and Afghanistan, also linked with four provinces include Kerman, Balouchestan, Yazd and Semnan. Curculionidae is currently the largest family of insects in the world with at least 3600 genera and 41000 species. Lixinae is a subfamily of true weevils, included three tribes Cleonini, Lixini and Rhinocyllini. Main characteristic of this subfamily include tarsal claws are fused at the base, and labial palps are short and telescoping. In addition, their body is elongated shape as for some other weevils, tibiae bear and uncus on its distal end and the rostrum is forwardly directed (Boothe et al., 1990). The species of Lixinae are mainly root feeders and thus several of those are used in biological control of invasive weeds, namely knapweeds (*Centaurea*) (Hoffmann, 1950). Regardless of Lixinae species potential for biological control of weeds, there is no information on these fauna in mentioned provinces. Therefore, the objective of this study was the identification of Lixinae species in Khorasan Junoubi and Razavi provinces of Iran.

MATERIALS AND METHODS

The material was collected during 2006 - 2008 on the different plant hosts in the pastures, gardens, agriculture fields and grasslands. The specimens were collected either by sweeping net or directly by forceps. All samples were lodge in killing jar (Ethanol 70%) and transferred to the laboratory and then pinned as well labeled. The specimens were sent to Dr. Fabio Talamelli in Centro Studi Naturalistici Valconca San Giovanni in Marignano, Italy to identify or confirm. All species are deposited in the Entomology Collection of Plant Protection Department College of Agriculture, Fertdowsi Uni8versity of Mashhaad, Iran.

RESULTS

In this research 27 species belonging to 15 genera and 3 tribes are presented. Among them three ones including *Larinus sericatus*, *Bangasternus provincialis*

and *Conorhynchus verucundus* are new for Iran fauna and those were showed by an asterisk. List of species give in below.

Family: Curculionidae Latreille, 1802
Subfamily: Lixinae Schönherr, 1823
Tribe: Lixini Schönherr, 1823

Larinus latus (Herbst, 1783)
Material studied: Mashhad: 3 specimens, May 2006. On grasses.
Note: This species has been reported from Ardabil, East Azarbaijan, Esfahan, Fars, Ghazvin, Ghom, Hormozgan, Kermanshah, Kordestan, Lorestan, Mazandaran and Tehran provinces (Afshar, 1994, Balachowsky, 1963, Baroughi, 1977, Broumand, 1998).
Larinus mellificus Jekel, 1859
Material studied: Mashhad: 1 specimen, April, 1 specimen, June 2006;1 specimen, June 2007. On grasses.
Note: This species has been reported from Ilam, Khorasan and Tehran provinces (Modarres Awal, 1997).
****Larinus sericatus*** Boheman, 1843
Material studied: Mashhad: 3 Specimens, May 2007. On grasses.
Lixus desertorum Gebler, 1830
Material studied: Mashhad: 3 Specimens, May 2007. On grasses.
Note: This species has been reported from Khorasan and Semnan provinces Modarres Awal, 1997).
Lixus cardui Olivier, 1807
Material studied: Mashhad: 10 Specimens, June 2008; Torbat Jam: 1 Specimen, April 2007. On grasses.
Note: This species is distributed in Ardabil, East Azarbaijan, Esfahan, Fars, Ghom, Golestan, Kermanshah, Khuzestan, Kohkilouyeh and Boyerahmad and Tehran provinces (Afshar, 1994, Brouumand, 1998, Modaress Awal, 1997).
Lixus angustatus (Fabricius, 1775)
Material studied: Fariman: 2 Specimens, June 2007. On grasses.
Note: This species found in large area of Iran (Modarres Awal, 1997).
Lixus incanescens Boheman, 1835
Material studied: Mashhad: 2 Specimens, July 2006. On grasses.
Note: This species has been reported from East Azarbaijan, Esfahan, Fars, Kerman, Kermanshah and Tehran provinces on sugar beet, red root, black-weed, kali and mountian spinach (Esmaili et al., 1991, Farahbakhsh, 1961, Gardenhire, 1959, Kheyri, 1989, Kheyri and Davatchi, 1966, Modarres Awal, 1997, Parvizi and Javan Moghaddam, 1988).

Tribe: Rhinocyllini Lacordaire, 1863

****Bangasternus provincialis*** (Fairmaire, 1863)
Material studied: Mashhad: 4 Specimens, May 2007. On grasses.
Bangasternus planifrons (Brullé, 1832)
Material studied: Mashhad: 3 Specimens, April 2008. On grasses.

Tribe: Cleonini Schönherr, 1826

Chromosomus persicus Fermuth, 1987
Material studied: Ghaen: 5 Specimens, May 2006. On grasses.
Note: This species has been reported from Sistan and Balouchestan provinces (Modarres Awal, 1997).
Xanthochelus cinctiventris (Fahraeus, 1842)
Material studied: Mashhad: 5 Specimens, April 2008. On grasses.
Temnorhinus subfuscus (Faust, 1883)
Material studied: Mashhad: 3 Specimens, June 2007. On grasses.

Temnorhinus pilipes Gebien, 1917
Material studied: Kashmar: 5 Specimens, July 2007. On grasses.
Temnorhinus strabus (Gyllenhal, 1834)
Material studied:Mashhad: 3 Speimens, May 2006. On grasses.
Pachycerus cordiger (Germar, 1818)
Material studied:Mashhad (Torghabeh): 2 Specimens, June 2007. On grasses.
Note: This species is disterbuted in East Azarbaijan, Fars, Ghazvin, Hormozgan, Kermanshah, Khorasan, Khuzestan and Tehran provinces on sugar beet (Broumand, 1998, Modarres Awal, 1997).
Leucomigus candidatus (Pallas, 1771)
Material studied: Mashhad: 4 Specimens, April 2008. On grasses.
Note: This species has been reported from Ardabil, Kerman, Mazandaran and Tehran provinces (Modarres Awal, 1997).
Coniocleonus nigrosuturatus (Goeze, 1777)
Material studied: Mashhad: 4 Specimens, May 2007. On grasses.
Note: This species has been reported from East Azarbaijan, Fars, Kermanshah, Lorestan, Mazandaran, Sistan and Balouchestan and Tehran provinces on sugar beet (Broumand, 1998, Modarres Awal, 1997).
Entymetopus klapperichi Voss, 1959
Material studied: Mashhad: 4 Specimens, May 2008. On grasses.
Note: This species has been reported from Kerman and Sistsn and Balouchestan provinces (Modarres Awal, 1997).
Conorhynchus nigrivittis (Pallas, 1781)
Material studied: Farouj: 1 Specimen, July 2008; Mashhad: 4 Specimens, April, June and July 2008. On grasses.
Note: This species without defining its hosts has been reported from East Azarbaijan, Khorasan and Tehran provinces (Modarres Awal, 1997).
****Conorhynchus verucundus*** (Faust, 1883)
Material studied: Mashhad: 3 Specimens, May 2007. On grasses.
Conorhynchus brevirostris (Gyllenhal, 1834)
Material studied: Mashhad: 4 Specimens, June 2006. On grasses.
Note: This species is disturbuted in East Azarbaijan, Fars, Kerman, Khorasan and Tehran provinces on sugar beet, black-weed, anabasis, purslane and salicornia (Asadeh and Mosaddegh, 1991, Davatchi and Kheyri, 1964, Hoffmann, 1950, Kheyri, 1989, Modarres Awal, 1997).
Conorhynchus hololeucus (Pallas, 1781)
Material studied: Mashhad: 2 Specimens, April 2006. On grasses.
Conorhynchus lacerta Chevrolat, 1873
Material studied: Mashhad: 3 Specimens, May 2007. On grasses.
Notes: This species has been reported from Ardabil, East Azarbaijan, Esfahan, Fars, Khorasan, Markazi, Semnan and Tehran provinces (Broumand, 1976,1998).
Ammocleonus aschabadensis (Faust, 1884)
Material studied: Esfarayen: 1 Specmen, May 2007; Sarakhs: 2 Specimens, July 2006. On grasses.
Note: This species has been reported from Boushehr, East Azarbaijan, Fars, Ghom, Gilan, Hormozgan, Ilam, Kerman, Khorasan, Kohkilouyeh and Boyerahmad, Khuzestan, Markazi, Sistan and Balouchestan and Tehran provinces on sugar beet (Broumand, 1998, Modarres Awal, 1997).
Trichocleonus leucophyllus (Fischer de Waldheim, 1821)
Material studied: Mashhad: 4 Specimens, June 2007. On grasses.
Asproparthenis obsoletefasciatus (Menetries, 1842)
Material studied: Chenaran: 1 Specimen, April 2006; Mashhad: 1 Specimen, May 2007. On grasses.
Bothynoderes* (= *Asproparthenis) nubeculosus (Schöenherr, 1834)
Material studied: Mashhad: 3 Specimens, June 2008. On grasses.
Mecaspis darwini Faust, 1883
Material studied: Mashhad: 4 Specimens, April 2006. On grasses.

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CHECKLIST OF THE HARVESTMEN OF TURKEY (ARACHNIDA: OPILIONES)

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[Bayram, A., Çorak, İ., Danışman, T., Sancak, Z. & Yiğit, N. 2010. Checklist of the harvestmen of Turkey (Arachnida: Opiliones). Munis Entomology & Zoology, 5 (2): 563-585**]**

ABSTRACT: Till recent, 50 species plus three subspecies of Opiliones inhabiting Turkey are recorded. These species take place in 25 genera in 6 families in 3 suborders. In this study, the authors present a short historical faunistic review of the harvestmen, and give records and geographical distributions of the species in Turkey.

KEY WORDS: Harvestmen, Opiliones, Turkey, new record, checklist, zoogeography.

Most of harvestmen live in trophical regions of the South Hemisphere. They found in different ecosystems such as forests, fields, steppes, mountains, caves, and prefer moist places (Nosek, 1905; Ljovuschkin & Starobogatov, 1963; Maclde, 1970; Jennings, 1983; Hillyard & Sankey, 1989; Snegovaya & Chemeris, 2004). Harvestmen feed mostly on soft bodied arthropods but they feed also on fruit remnants and mushrooms (Adams, 1984; Philipson, 1960 a,b; Gruber & Martens, 1968; Edgar, 1971). Harvestmen do not prefer polluted places. Therefore ecologists point out their peculiarities beeing indicator species (Sunderland & Sutton, 1980; Adams, 1984).

About 6300 species are located in Opiliones. Opiliones is divided four suborders: Cyphopthalmi, Laniatores, Dyspnoi and Eupnoi. Cyphopthalmi is a small group and contains primitive species. The members resemble the opiliocarid mites. Laniatores is the largest group. The members are widespread in the tropics and subtropics. The members of Dyspnoi and Eupnoi are mostly found on the North Hemisphere.

As in many groups the first researcher of harvestmen is Linnaeus (1758). After Linnaeus some arachnologists such as Fabricius, Degeer, Herbst, Hermann, Kraepelin, Meade, Koch and Thorell introduced hundreds of species and were established the harvestmen fauna of European countries. In 20th Century, Roewer (1912, 1923, 1950, 1956, 1959) made a lot of works in the Palearctic Region and published many articles on harvestmen. In Europe, taxonomical, faunistical and ecological studies have performed. Gruber himself (1968, 1969, 1976, 1978, 1979, 1984, 1988, 1993, 1996a-b, 1998, 2000, 2001), Gruber & Martens (1968), Stol (1993), Komposch (1999, 2004, 2009), Komposch & Gruber (2004), Starega (2000) have worked on harvestmen fauna of Germany, Belgium, France, Spain, Italy, Avustria, Yugoslavia, Greece, Bulgaria, Romania, Poland, Ukraine, Denmark, Irelanda, Tunusia and given records of many species from these countries. In addition, Karaman (1990, 1992, 1993, 1995, 1996) has worked on harvestmen fauna of Yugoslavia, Serbia and Balkan Peninsula.

On the other hand, Starega (1966) and Snegovaya (1999) have worked on harvestmen fauna of Caucasus and Azerbaijan. Snegovaya (1999) has raised the

species number from 42 to 52. Then Snegovaya & Chemeris (2004) raised this number to 60 with contributions. Chevrizov (1979) has investigated the harvestmen fauna of the Eastern Europe and Russia. Novak & Gruber (2000) revized the harvestmen fauna of Slovenia. Silhavy worked on the harvestmen of the Caucasian Kuban Mountains (1966) and Southern Slovakia (1968). Martens (1965, 1969, 1978) investigated on the harvestmen fauna of the Karpat Mountains, Greece, the Aegean Islands, Crete, Rhodos and Kos. Martens (1978) and Cokendolpher (1990) collected specimens from Syria, Lebanon, Israel and Egypt and gave many species records from these countries.

Çorak (2004) exemined harvest specimens collected from different parts of Turkey and recorded 7 species belong to 6 genera in 2 families in her MSc Thesis. Among the species four are new records for the Turkish harvestmen fauna. Also, Kurt (2004) collected harvestmen of Niğde and environments, and established 13 species belong to 8 genera in 3 families. In this study, 10 species are new records for Turkey. Bayram et al. (2006) investigated the harvestmen fauna of the Soğuksu National Park in Ankara, and established 5 species from the park. Among these species two are new records for Turkey. In addition, *Leiobunum rotundum, L. rupeste, Mitopus morio* and *Ischyropsalis helwigii* were given as new records for the Turkish harvestmen fauna by Kurt et al. (2008).

In this paper, the species list of the Turkish harvestmen and their geographical distributions are given. The checklist also contains one new record for the Turkish harvestmen fauna with drawings of the taxonomical items. In identification, the keys of Simon (1926), Roewer (1956), Martens (1965), Silhavy (1966), Gruber (1969), Chevrizov (1979) and Hillyard & Sankey (1989) were used. The species number was determined after a critical review of all available records from the literatures concerning the harvestmen in Turkey and a revision of the existing materials in Arachnology Museum of Kırıkkale University (KUAM). The zoogeographical classification of the species was made on basis of literature data reflecting their current distribution (Giribet 2000, Kury 2006, Hillyard & Sankey 1989). The specimens were deposited in KUAM. The species available in KUAM were marked by an asteriks in Table 1.

GEOGRAPHICAL REGIONS OF TURKEY

Turkey is located on crossection of the boreal, Euro-Siberian, Irano-Turan and Mediterranean elements. It binds the elements of Central Asia, Mesopotamia, Caucassus and Balkans (Akman 1993). Turkey is surrounded by seas, has got high mountains and mountain chains, plateaus and wide plains. With these features Turkey is divided into seven geographical regions: Marmara Region, Black Sea Region, East Anatolian Region, Southeast Anatolian Region, Mediterrranean Region, Aegean Region, Central Anatolia Region (the Anatolian plateau). In order to show detailed distribution, the Blacksea Region divided into three parts: the West-, the Middle- and the East Black Sea Regions. Like this the Mediterranean Region divided into two parts: the West- and the East Mediterranean Regions.

The Marmara Region includes the European part of Turkey. It has got wide plains. The terrestrial climate is dominant but the Mediterranean climate can be seen too. The Black Sea Region has got long mountain chains. The mountains lay parallel to the sea. The climate is moderate. The nort sides of the mountain chains are covered with dens forests. Especially the East Black Sea Region is the most moisture part. However, the south sides of the mountain chains have got steppes and show the terrestrial climate. The East Anatolian Region is the highest part of Turkey. Many high mountains such as Ağrı, Allahuekber, Tendürek, Süphan,

Nemrut and Cilo Mountains are located in this part. For example, the mean altitude from sea level on the Erzurum-Kars Plateau is 2100 metres. The typical terrestrial climate is dominant in this region. The vegetation type is steppe or oak forest. The Southeast Anatolian Region has got plains and plateau located between Dicle and Fırat Rivers. The mountains are not high. Dominant vegetation is steppe. The Mediterranean Region is located in the south part of Turkey. The West- and Middle Taurus Mountain chains lay parallel to the sea. Osmaniye, Adana and Antalya have got aluvial and productive plains. Citrus trees, cotton and greenhouses are widespread. The vegetation type ise maquis, the climate type is the mediterranean. The Aegean Region is located in west part of Turkey. The mountains are not high and parallel to the sea. The plains are wide and productive. On the coast part the mediterranean, in the inside part the terrestrial climate is dominant. In this region, tobacco, olive, cotton, fig and grapes are grown. The Central Anatolia Region is covered with plateaus and unproductive plains. The most grown plant is wheat. The vegetation type is steppe, the climate type is terrestrial (Fig. 1). The abbreviations used for geographical regions in the paper are as follows: MR = Marmara Region, WBSR = West Blacksea Region, MBSR = Middle Blacksea Region, EBSR = East Blacksea Region, EAR = East Anatolian Region, SEAR = Southeast Anatolian Region, EMTR = East Mediterranean Region, WMTR = West Mediterranean Region, AR = Aegean Region, CAR = Central Anatolian Region.

RESULTS AND DISCUSSION

The harvestmen fauna of Turkey is represented by 50 species and 3 subspecies belong to 25 genera in 6 families in 3 suborders: Sironidae 1 species (plus 2 subspecies), Trogulidae 7 species in 4 genera, Nemastomatidae 5 species (plus 1 subspecies) in 4 genera, Dicranolasmatidae 5 species in 1 genus, Ischyropsalididae 2 species in 1 genus, Phalangiidae 30 species in 14 genera, (Table 1, Figs. 1-3). The distribution maps of the species in Turkey are shown in the Appendix. The maps are given according to the species order in the Table 1.

As it is subjected above, Turkey has got many different ecosystems and biological diversity is high. Turkey binds the elements of Balkans, Caucasia, Central Asia and Mesopotamia. For this reason a great many species should take place in the checklist but very limited works were performed on harvestmen in Turkey. According to Blick and Komposch (2004) from Belgium 27, Netherlands 27, Denmark 19, Norway 17, Sweden 20, Finland 12, Poland 36, Germany 49, Switzerland 49, Austria 61, Czech Republic 33, Slovakia 32, Hungary 33, Slovenia 58 (in 2006 this number raised to 64, Novak et al. 2006) are known.

In some articles such as Joseph 1868 and Roewer 1914, 1956, the locality of the collected specimen was not clear (e.g. Asia Minor, Anatolia, Klein Asien). So, the exact locality could not be shown on the map. In order to establish the harvestmen fauna of Turkey, more works are needed.

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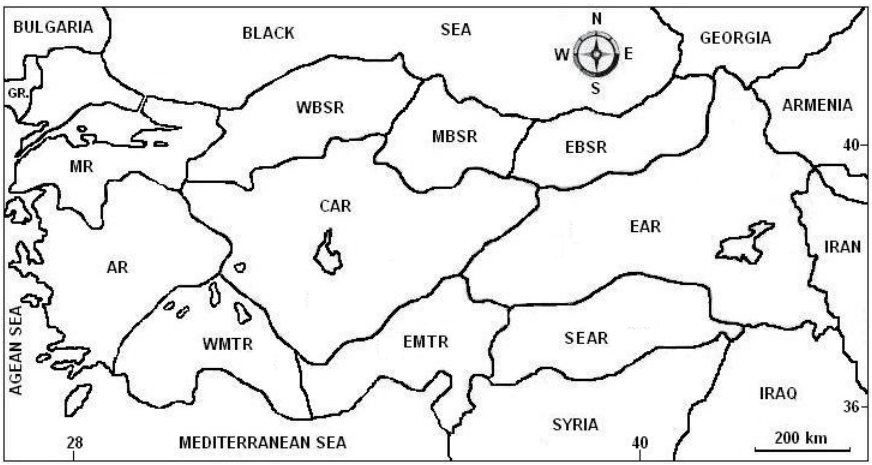

Figure 1. The geographical regions of Turkey.

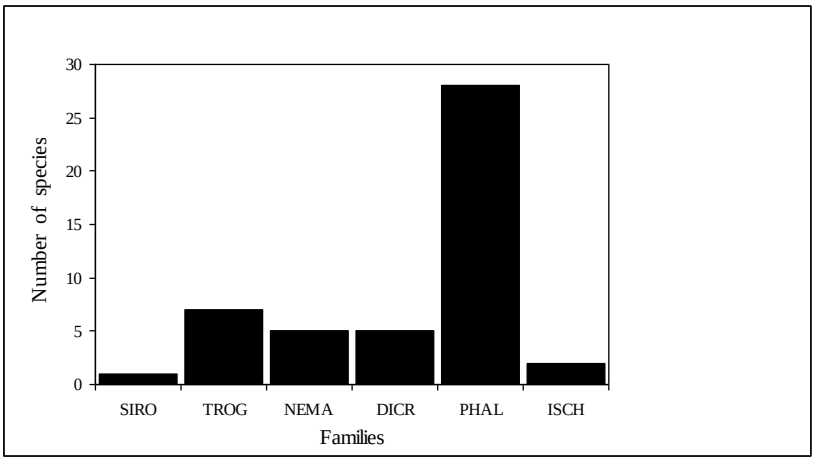

Figure 2. Number of harvestmen species per family in Turkey (SIRO: Sironidae, TROG: Trogulidae, NEMA: Nemastomatidae, DICR: Dicranolasmatidae, PHAL: Phalangiidae, ISCH: Ischyropsalididae).

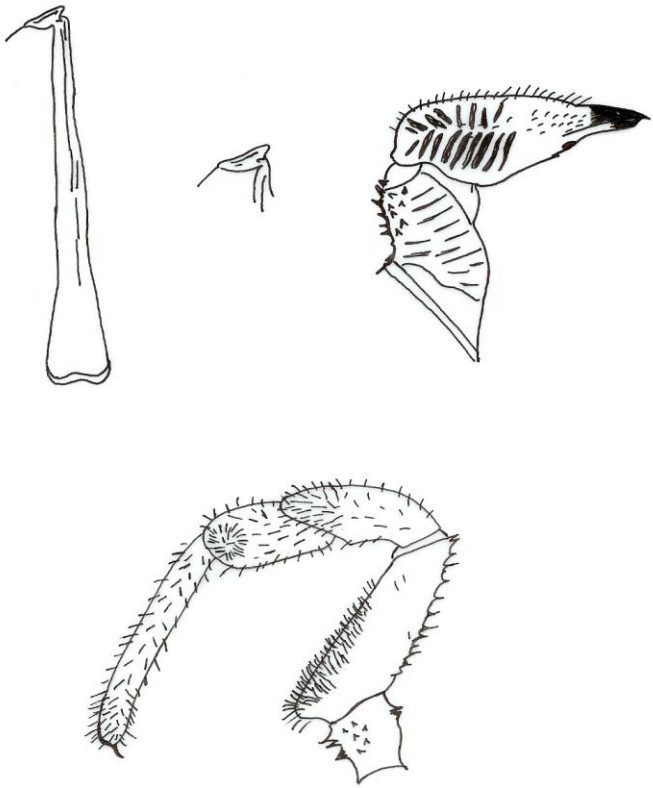

Figure 3. *Metaplatybunus petrophilis*. A- Chelicera; B- Pedipalpus; C- Penis; D- Penis, head.

Table 1. List of the harvestmen species distributed in Turkey.

S P E C I E S	Distribution in Palearctic	Distribution in Turkey	R e f e r e n c e
CYPHOPTHALMI			
Sironidae			
1. Cyphophthalmus duricorius duricorius Joseph 1868	Austria, Croatia, Yugoslavia	---	Joseph, 1868
1a. C. duricorius bithynicus (Gruber,1969) (*)	Turkey	MR (Bursa) AR (Manisa)	Gruber, 1969 Bayram (Unpubl. data)
1b. C. d. yalovensis (Gruber,1969)	Turkey	MR (Yalova)	Gruber, 1969
D Y S P N O I			
Trogulidae			
2. Calathocratus beieri Gruber, 1968	Turkey	EMTR (Mersin)	Gruber, 1968
3. Platybessobius caucasicus Silhavy, 1966	Northern Caucasus, Azerbaijan, Georgia	Anatolia	Snegovaya, 1999
4. Platybessobius singularis Roewer, 1940	Crete, Greece, Turkey	WBSR (Bolu), MR (Bursa, İstanbul)	Gruber, 1969
5. Trogulocratus rhodiensis Gruber,1963	Rhodos, Karpatos, Turkey	AR (Muğla)	Gruber, 1978
6. Trogulus gypseus Simon, 1879	Italy, Crete, Karpathos, Saria, Kos, Turkey, Syria, Israel, Egypt	Anatolia	Cokendolpher, 1990
7. Trogulus tricarinatus (Linnaeus 1758)	Southeast Europe, Germany, Austria, Eastern Alps, Slovenia, Turkey	MR (İstanbul)	Gruber, 1969
8. Trogulus uncinatus Gruber,1966	Turkey	MR (Yalova, Bursa, İstanb.) WBSR (Bolu)	Gruber, 1969
Nemastomatidae			
9. Giljarovia turcica Gruber, 1976	Turkey	MBSR (Amasya, Samsun, Ordu)	Gruber, 1976
10. Mediostoma ceratocephalum Gruber, 1976	Turkey	EMTR (Mersin)	Gruber, 1976
11. Nemastoma bidentatum Roewer, 1914	Austria, Southeast Alps	--	Roewer, 1914
11a. N. b. sparsum Gruber&Martens, 1968	Austria, Eastern Alps, Slovenia, Yugoslavia, Romania, Bulgaria, Turkey	Anatolia	Gruber&Martens, 1968
12. Pyza anatolica (Roewer, 1959) (*)	Turkey	EAR (Van Edremit), SEAR (Mardin, Siirt, Diyarbakır)	Bayram (Unpubl. data) Gruber, 1979
13. Pyza taurica Gruber, 1979	Turkey	WMTR (Antalya, Isparta, Burdur), EMTR (Mersin), CAR (Niğde)	Gruber, 1979
Dicranolasmatidae			
14. Dicranolasma giljarovi Silhavi, 1966 (*)	Russia, Caucasus, Turkey	CAR (Ankara) EAR (Van)	Çorak, 2004 Bayram (Unpubl. data)
15. Dicranolasma hoberlandti Silhavy, 1956	Rhodos, Turkey, Israel	MR (Bursa), WBSR, MBSR, EMTR (Adana, Hatay)	Gruber, 1978

16. Dicranolasma ponticum Gruber, 1998	Turkey	MBSR (Samsun, Ordu)	Gruber, 1998
17. Dicranolasma ressli, Gruber, 1998	Turkey	CAR (Konya)	Gruber, 1998
18. Dicranolasma scabrum Herbst, 1798 (*)	Austria, Eastern Alps, Slovenia, Russia, Crete, Rhodos, Kos, Turkey	MR (İstanbul) CAR (Ankara, Kırıkkale) EAR (Van)	Gruber, 1969 Çorak, 2004 Bayram (Unpubl. data)
Ischyropsalididae			
19. Ischyropsalis turki Roewer, 1950	Turkey	AR (Aegean Islands)	Roewer, 1950
20. Ischyropsalis taunica Müler, 1923	Germany, Turkey	CAR (Niğde)	Kurt, 2004
E U P N O I			
Phalangiidae			
21. Dasylobus kulczynskii Nosek, 1905	Turkey	CAR	Nosek, 1905
22. Egaenus convexus (C.L.Koch, 1835)	Austria, Eastern Alps, Slovenia, Albania, Lesina, Romania, Russia, Turkey, Afrika	Anatolia	Roewer, 1956
23. Egaenus marenzelleri Nosek, 1905	Asia Minor	CAR	Nosek, 1905
24. Euphalangium nordenskioeldi (L.Koch, 1879)	Mongolei, Kamtschatka, Karakorum, Tibet, Turkey	CAR (Niğde)	Kurt, 2004
25. Lacinius ephippiatus (C.L. Koch, 1835)	Europe, Russia, Turkey, Caucasus,	EAR (Van, Bingöl)	Çorak vd., 2008
26. Leiobunum ghigii Di caporiacco, 1929	Italy, Turkey	AR, WMTR	Gruber, 1978
27. Leiobunum rotundum (Latreille, 1798)	Belgium, Austria, Eastern Alps, Slovenia, Russia, Turkey	CAR (Niğde)	Kurt, 2004
28. Leiobunum rupestre (Herbst, 1799)	Europe, Austria, Eastern Alps, Slovenia, Russia, Turkey	CAR (Niğde)	Kurt, 2004
29. Metaphalangium cirtaum (C.L.Koch, 1839)	Spain, Italy, Yugoslavia, Albania, Greece, Sicily, Sardinia, Corsica, Levkas, Zante, Crete, Rhodos, Turkey, Syria, Lebanon, Israel, Egypt, Algeria, Tunusia	Anatolia	Cokendolpher, 1990
30. Metaplatybunus petrophilus Martens, 1965	Rodos, Karpathos	CAR (Nevşehir), EAR (Van)	New Record (Çorak 2004)
31. Mitopus mongolicus Roewer, 1912	Mongolia, Turkey	CAR (Niğde)	Kurt, 2004
32. Mitopus morio (Fabricius, 1779)	Germany, Austria, Eastern Alps, Slovenia, Russia, Turkey	CAR (Niğde)	Kurt, 2004
33. Oligopus hanseni (Kraepelin, 1896)	Northern and Central Europe, Lithuania, Germany, Turkey	CAR (Niğde)	Kurt, 2004
34. Oligopus tridens (L.Koch, 1836) (*)	Germany, Austria, Eastern Alps, Slovenia, Turkey	CAR (Niğde) AR (Manisa)	Kurt, 2004 Bayram (Unpubl. data)
35. Opilio insulae Roewer, 1956	Ukrania, Aegean Islands, Samos Islands, Turkey	AR (İzmir)	Gruber, 1978

36. *Opilio lederi* Roewer, 1911	England, Germany, Austria, Eastern Alps, Slovenia, Bosnia, Greece, Crete, Holstain, Harz, Runland, Italy, Euboea, Toscana, Turkey, Caucasus, Azerbaijan, Russia, Turkistan, North Africa	EAR (Van Edremit) SEAR (Mardin, Siirt, Diyarbakır)	Gruber, 1979 Bayram (Unpubl. data)
37. *Opilio parietinus* (Degeer, 1778) (*)	Russia, Georgia, Azerbaijan, Armenia, Turkey	Anatolia, CAR (Konya, Kırşehir, Kırıkkale, Ankara, Niğde) WBSR (Kastamonu)	Çorak, 2004 Kurt, 2004 Bayram et. al., 2006 Bayram (Unpubl. data)
38. *Opilio saxatilis* C.L.Koch, 1839	Germany, Austria, Eastern Alps, Check Republic, Slovenia, Greece, Aegean Islands, Turkey, Russia	AR (Southern parts), CAR (Niğde)	Gruber, 1978 Kurt, 2004
39. *Opilio turcicus* Roewer, 1956	Turkey	MR (Bursa), WMTR, EMTR (Taurus Mountains)	Roewer, 1956
40. *Paropilio punctatus* Roewer, 1956	Turkey	EMTR (Taurus Mountains)	Roewer, 1956
41. *Phalangium opilio* Linnaeus, 1758 (*)	England, Germany, Austria, Eastern Alps, Italy, Spain, Slovenia, Bosnia, Albania, Yugoslavia, Inseln Thasos, Bulgaria, Turkey, Russia, North America	CAR (Ankara, Kırıkkale, Niğde)	Çorak, 2004; Kurt, 2004; Bayram et. al., 2006; Bayram (Unpubl. data)
42. *Phalangium pareissi* Roewer, 1956	Turkey	MBSR (Amasya)	Roewer, 1956
43. *Phalangium punctipes* (L.Koch, 1878)	Russia, Georgia, Azerbaijan, Armenia, Turkey	CAR (Niğde)	Kurt, 2004
44. *Phalangium savignyi* Audouin, 1825	Russia, Caucasus, Azerbaijan, Turkey, Syria, Lebanon, Israel, Jordan,Egypt, Italy	WMTR, EMTR	Cokendolpher, 1990
45. *Phalangium strandi* Nosek, 1905	Turkey	CAR	Nosek, 1905
46. *Platybunus anatolicus* Roewer, 1956	Cyprus, Rhodos, Turkey (Taurus)	CAR (Ankara), EMTR (Taurus)	Roewer, 1956
47. *Zacheus anatolicus* (Kulczynski, 1903)	Russia, Bulgaria, Aegean Islands, Cyprus, Turkey (Taurus)	EMTR (Taurus, Adana)	Roewer, 1956
48. *Zacheus crista* (Brulle, 1832) (*)	Greece, Morea, Mythileni, Albania, Rhodos, Karpathos, Kos, Lesbon, Thasos, Crete, Turkey, Azerbaijan	CAR (Ankara, Kırıkkale, Niğde)	Gruber, 1978; Çorak, 2004; Kurt, 2004; Bayram et. al., 2006
49. *Zacheus hebraicus* (Simon, 1884)	Turkey, Israel	AR (Manisa)	Roewer, 1956
50. *Zacheus macrinus* Roewer, 1956	Turkey	AR (Aydın)	Roewer, 1956

APPENDIX

Kırklareli
Edirne
İstanbul
Tekirdağ
Bartın
Zonguldak
Kastamonu
Sinop
Karabük
Samsun
Artvin
Ardahan
Rize
Kocaeli
Düzce
Yalova
Sakarya
Bolu
Çankırı
Çorum
Amasya
Ordu
Giresun
Trabzon
Gümüşhane
Kars
Çanakkale
Bursa
Bilecik
Tokat
Bayburt
Erzurum
Iğdır
Balıkesir
Ankara
Kırıkkale
Yozgat
Ağrı
Eskişehir
Sivas
Erzincan
Kütahya
Kırşehir
Tunceli
Bingöl
Muş
Manisa
Van
Uşak
Afyon
Nevşehir
Kayseri
Malatya
Elazığ
İzmir
Aksaray
Bitlis
Diyarbakır
Siirt
Aydın
Isparta
Konya
Niğde
Kahramanmaraş
Batman
Denizli
Adıyaman
Şırnak
Hakkari
Muğla
Burdur
Adana
Mardin
Antalya
Karaman
Osmaniye
Şanlıurfa
Gaziantep
Kilis
Mersin
Hatay
Province status of Turkey

1a

1b

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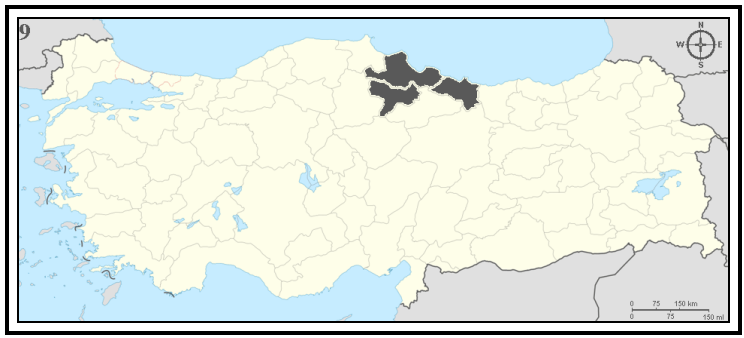
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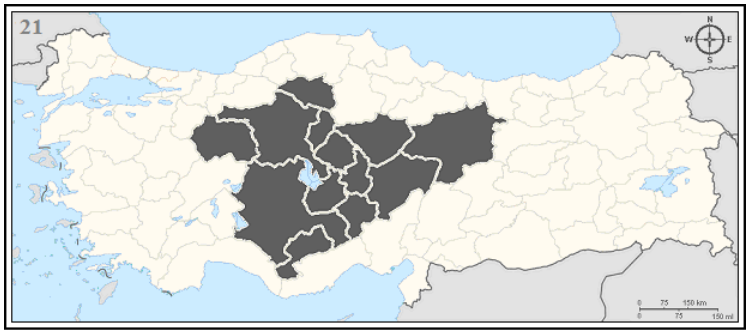
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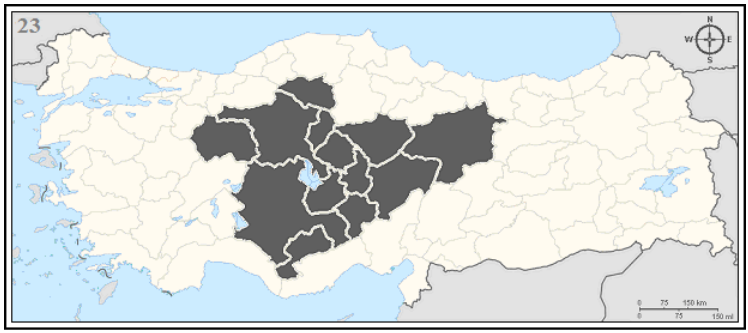
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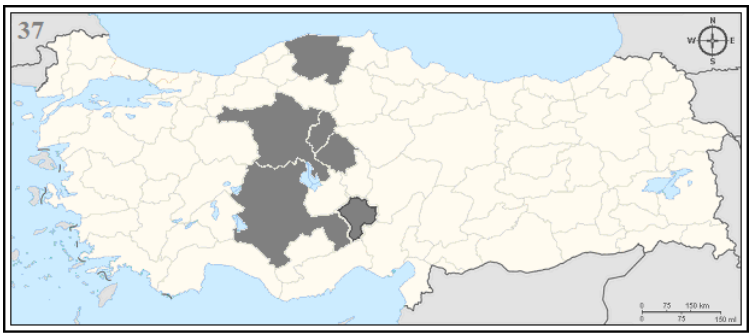
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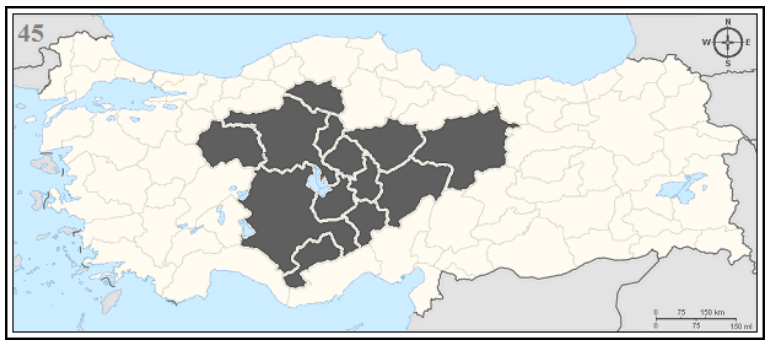
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FAUNISTIC STUDY ON FLOWER FLIES OF ZUNUZ REGION IN EAST AZERBAYJAN PROVINCE-IRAN (DIPTERA; SYRPHIDAE)

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[Khaghaninia, S. 2010. Faunistic study on flower flies of Zunuz region in East Azerbayjan province-Iran (Diptera; Syrphidae). Munis Entomology & Zoology, 5 (2): 586-593**]**

ABSTRACT: Syrphid fauna of Zunuz region in Iran was studied during 2008- 2009. The specimens were collected using malaise trap and hand net in eighteen localities. Among of 365 collected specimens, 33 species belonged to 19 genera and two subfamilies were verified that all of them are as new records for studied area and a species, *Lejogaster metallina* (Fabricius), 1776, is as new record for Iran fauna.

KEY WORDS: Fauna, Zunuz region, hover flies, flower flies, pollinator, Syrphidae.

Zunuz, in northeastern of East Azarabayjan province- Iran, is located in 38°07' to 38°56'N; 45°15' to 45°50'E with varying latitude from 1650 m to 2300 m. This mountainous area, located in western mountainside of Sultan Senjer mountain with height of 3168 m, has very expansive and rich grasslands as well as native variety planted apple orchards. Zunuz is one of the most important centers for producing apple and animal husbandry in East Azarabayjan province.

Syrphidae is one of the largest families of the order Diptera with more than 6000 described species over the world. Considering the ability to keep the body motionless in the air for quite a period of time during flight as well as visiting the flowers, they comprises the popularly called hover flies or flower flies (Kevan & Baker, 1983). This large family consists of small to medium flies 6- 18 mm long, most of which have yellow and black striped bodies resembling bees or wasps. Adults, hovering near flowers, feed on nectar and pollen (Faegri & van der Pijl, 1979; Sarıbıyık, 2003). These floral resources enhance the longevity and fecundity of adult flies (Topham & Beardsley, 1975). These flies are common pollinators almost wherever flowers are found. Larvae are pale green to yellow maggots resembling slugs which pray on aphids, scales and other insects. Recently, the fauna of syrphid has been studied by the related taxonomists as well in Iran (Modarres Awal, 1997; Khiaban et al. 1998; Dousti, 1999; Gharali et al., 2000; Alichi et al., 2002; Gharali et al., 2002; Goldasteh et al., 2002; Sadeghi et al., 2002; Golmohammadi & Khiaban, 2004; Gilasian, 2005; Khaghaninia et al., 2010). Checklists of Iranian hover flies were listed by Peck (1988) and Dousti & Hayat (2006). Unfortunately, so far the syrphid fauna of this area has been poorly studied so it subjected for present study.

MATERIAL AND METHODS

Studied specimens were collected twice a month, during 2008- 2009. Flies were caught using sweeping entomological net in eighteen localities as well as four malaise traps which are situated through all the working area (Fig. 1).

The collected specimens were placed in ordinary paper envelopes after killing them in cyanid bottle in order to bring them in laboratory. The collection thus brought was placed in a desiccator (having water at its bottom) for about 24 h in

order to soak and soften them. Thereafter, they were pinned using 000, 00, 0, 1 and 2 mounted pins and their wings and legs set on appropriate setting boards to facilitate morphological studies and the others were put into tubes filled with 70% alcohol. For identification, the materials were examined under a Nikon (SMZ 1000) binocular microscope manufactured by Japan. The identification was done upto the specific level with the help of relevant literature such as Vockeroth & Tompson (1987), Bei- Bienko (1988), Stubbs & Falk (2002), Lyneborg & Barkemeyer (2005) and Speight (2006).

RESULTS

Thirty three species belonged to 19 genera and two subfamilies were revealed through this study. All of the verified species are as new records for studied area and a species which marked by an asterisk newly introduced to Iran fauna that totally listed as follows:

Subfamily Syrphinae

***Episyrphus balteatus* (De Geer, 1776)**

Mém. Ins., 6: 116 (*Musca*). Type locality: not given (Sweden).
Material examined: 24 specimens (9♂♂, 15♀♀).
Distribution: Fennoscandia to the Mediterranean; Canary Isles, Azores and N Africa; Ireland through Eurasia to the Pacific coast; south through the Oriental region to Sri Lanka;Australia. This is an extremely migratory species with records from offshore islands of northern Europe. Iran.

***Scaeva albomaculata* (Macquart, 1842)**

Mém. Soc. Sci. Agric. Lille, 1841(1): 146 and Dipt. exot., 2(2): 86 (*Syrphus*). Type localities:"Mont-sinai" (Egypt)."Alger" (Algeria).
Material examined: 5 specimens (1♂♂, 4♀♀).
Distribution: Iberian peninsula and round the Mediterranean basin to Morocco; Canary Islands; eastward through southern Russia, the Caucasus and southern Siberia to the far east and northern China; Afghanistan, Mongolia; highly migratory and occasionally reaches as far north as Britain. Iran.

***Scaeva pyrastri* (Linnaeus, 1758)**

Syst. Nat., Ed. 10, 1: 594 (*Musca*). Type locality: Svecia (Sweden).
Material examined: 7 specimens (4♂♂, 3♀♀).
Distribution: Fennoscandia south to Iberia, the Mediterranean, Canary Isles and North Africa; from Ireland east through much of Europe and Asia Minor into European Russia; through Siberia from the Urals to the Pacific coast (Kuril Isles); India; China; North America from Alaska to California and New Mexico. Iran.

***Eupeodes corollae* (Fabricius, 1794)**

Entom. Syst., 4: 306 (*Syrphus*). Type locality: Kilia [=Kiel] [Germany].
Material examined: 5 specimens (3♂♂, 2♀♀).
Distribution: From Iceland, Fennoscandia and the Faroes south to Iberia, the Mediterranean, Madeira, the Canary Isles and N Africa; coastal States of Africa down to and including S Africa; Mauritius; from Ireland eastwards through most of Europe into European parts of Russia; through Siberia from the Urals to the Pacific coast; Japan; China; Formosa. Iran.

***Eupeodes nuba* (Wiedemann, 1830)**

Aussereurop. Zweifl. Insekt., 2: 136 (*Syrphus*). Type locality: "Nubien" (Sudan).
Material examined: 5 specimens (3♂♂, 2♀♀).
Distribution: Canary Isles, Mediterranean basin, from southern France to Italy (Sicily) and parts of the former Yugoslavia, Crete, Cyprus, Lebanon, Israel, Egypt and Morocco; Switzerland in central Europe, Roumania; Transcausasus and south-western parts of Asia (Uzbekistan, Kirghizistan, Tajikistan) to Afghanistan and Mongolia. In eastern parts of the Afrotropical region from Ethiopia south to South Africa (inclusive), Iran.

***Ischidon aegyptius* (Wiedemann, 1830)**
Aussereurop. Zweifl. Insekt, 2: 133 (*Syrphus*). Type localities: "Egypten und Nubin" (Egypt and Sudan).
Material examined: 3 specimen (1♂, 2♀♀).
Distribution: Throughout the Afrotropical region and into N Africa to the coast of the Mediterranean and Yemen; southern Spain, southern Italy, the Balearic Islands and the Canaries, Iran.

***Sphaerophoria rueppelli* (Wiedemann, 1830)**
Aussereurop. zweifl. Insekt., 2: 141 (*Syrphus*). Type locality: Nubien; Abyssinia (lectotype des. Vockeroth, 1971:1633).
Material examined: 29 specimens (17♂♂, 12♀♀).
Distribution: From southern Norway and Sweden south to North Africa and the Canary Isles; from Ireland east through central and southern Europe, including Greece, Turkey and Mediterranean islands into Asia Minor, Russia and Afghanistan and on to the Pacific coast , China and Korea; in eastern parts of the Afrotropical region south to Kenya, Iran.

***Sphaerophoria scripta* (Linnaeus, 1758)**
Syst. Nat., Ed. 10, 1: 594 (*Musca*).Type locality: "Svecia" (Sweden); "Uppsala, Sweden" (lectoype des. Vockeroth, 1971: 1633).
Material examined: 31 specimens (19♂♂, 12♀♀).
Distribution: A highly migratory species; southwest Greenland, Iceland and Fennoscandia south to the Mediterranean, the Canary Isles and N Africa; from Ireland eastwards through much of the Palaearctic to the Pacific coast of Asia; Kashmir and Nepal, Iran.

***Sphaerophoria turkmenica* Bankowska, 1964**
Annls zool., Warsz., 22(15): 345 (*Sphaerophoria*). Type locality: "Turkmenische SSR, West Kopet Dag, Berg Siunt".
Material examined: 12 specimens (5♂♂, 7♀♀).
Distribution: Romania, USSR-South European territory, Transcaucasus, Soviet Middle Asia, Afghanistan (Peck, 1988) and Turkey (Hayat & Alaoglu, 1990), Iran.

***Syrphus ribesii* (Linnaeus, 1758)**
Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type locality: Svecia. (Sweden).
Material examined: 8 specimens (4♂♂, 4♀♀).
Distribution: From Iceland and Fennoscandia south to Iberia and the Mediterranean; Canary Isles; from Ireland eastwards through most of Europe into Turkey, European parts of Russia and Afghanistan; from the Urals to the Pacific coast (Kuril Isles); Japan; North America from Alaska south to central parts of the USA, Iran.

***Chrysotoxum elegans* Loew, 1841**
Stettin. ent. Ztg, 2: 140 (*Chrysotoxum*). Type locality: "Wien" (Austria).
Material examined: 13 specimens (4♂♂, 9♀♀).
Distribution: Fennoscandia south to Iberia and the Mediterranean; through central and southern Europe into European parts of Russia as far as the Caucasus Mountains and into Turkey, Iran.

***Chrysotoxum festivum* (Linnaeus, 1758)**
Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type locality: "Europa".
Material examined: 9 specimens (5♂♂, 4♀♀).
Distribution: Ireland, Great Britain, Norway, Sweden, Finland, Spain, Italy, Yugoslavia, Bulgaria, USSR from Kola to Transcaucasus, Kazakh SSR, Siberia, Far East, Asia: Mongolia, Japan, Oriental region.

***Chrysotoxum veralli* Collin, 1940**
Entomologist's mon. Mag., 76: 155 (*Chrysotoxum*, for *Chrysotoxum octomaculatum*: Verrall, 1901: British flies, 8: 647, not Curtis, 1837; misidentiflcation). Type localities "at Harpenden (Herts.), from Timworth (Suffolk), Chippenham Fen and Fleam Dyke (Cambs.), and Fowl Mere near Wretham (Norfolk)" (Great Britain).
Material examined: 13 specimens (6♂♂, 7♀♀).
Distribution: Denmark south to central France; Britain (Wales and central/southern England) eastwards through central Europe into European parts of Russia to the Caucasus and on into eastern Siberia, Iran.

***Melanostoma mellinum* (Linnaeus, 1758)**
Syst. Nat., Ed. 10, 1: 593 (*Musca*). Type-locality: Svecia (Sweden).

Material examined: 31 specimens (21♂♂, 10♀♀).
Distribution: From Iceland and Fennoscandia south to Iberia, the Mediterranean and North Africa; from Ireland eastwards through most of Europe into European parts of Russia; Siberia from the Urals to the Pacific coast; North America from Alaska to Quebec and south to Washington, Iran.

***Paragus bicolor* (Fabricius, 1794)**
Entom. Syst., 4: 297 (*Syrphus*). Type locality: "Barbariae" [= NW Africa].
Material examined: 11 specimens (4♂♂, 7♀♀).
Distribution: From Belgium (extinct) south to the Mediterranean and North Africa; from France eastwards through central and southern Europe to Mongolia; Iran and Afghanistan; North America, Iran.

***Paragus compeditus* Wiedemann, 1830**
Aussereurop. Zweifl. Insekt., 2:89 (*Paragus*). Type locality: "Egypten" (Egypt).
Material examined: 3 specimens (1♂, 2♀♀).
Distribution: USSR-South European territory, Transcaucasus, Kazakhstan, Soviet Middle Asia, Iran, Afghanistan, North China, Egypt (Peck, 1988) and Turkey (Hayat & Clauusen, 1997), Iran.

***Paragus haemorrhous* (Meigen, 1822)**
Syst. Beschr., 3: 182 (*Paragus*). Type locality: Osterreich (Austria); sudliches Frankreich (France).
Material examined: 6 specimens (2♂♂, 4♀♀).
Distribution: From northern Norway south to Iberia and the Mediterranean (including Sicily and Malta); North Africa, Israel and Turkey; also in the Afrotropical region; from Ireland eastwards through central and southern Europe (Italy, the former Yugoslavia) into European parts of Russia; in North America from the Yukon south to Costa Rica, Iran.

***Paragus tibialis* (Fallén, 1817)**
Syrphici Sveciae: 60 (*Pipiza*). Type locality: in Vestrogothia; in arvis montosis Scaniae [=prov. Vastergotland and prov. Skane] (Sweden).
Material examined: 2 specimens (2♂♂).
Distribution: Uncertain at present, due to confusion with other species until recently; apparently occurs from southern Norway, Sweden and Denmark south to the Mediterranean coast of Europe, North Africa and the Canary Isles; from Britain (southern England) eastwards through central and southern Europe to the former Yugoslavia, Turkey, Israel, Nearctic and Oriental Regions, Iran.

Subfamily Milesiinae

***Pipizella caucasica* Skufjin, 1976**
Ent. Obozr., 55(4): 932 (*Pipizella*).Type locality: plateau Lagonaki, North Caucasus.
Material examined: 3 specimens (1♂, 2♀♀).
Distribution: USSR-South European territory (North Caucasus), Turkey and Iran.

***Cheilosia proxima* (Zetterstedt, 1843)**
Dipt. Scand., 2:792 (Eristalis). Type- locality: "in Ostrogothia ...; ad Haradshammar" (Sweden).
Material examined: 8 specimens (6♂♂, 2♀♀).
Distribution: Europe: from Scandinavia to Italy, Yugoslavia, Bulgaria; USSR: from Leningrad region to Transcaucasus, West Siberia, East Siberia, Iran.

***Cheilosia scutellata* (Fallén, 1817)**
Syrphici Sveciae: 55 (*Eristalis*). Type localities: "Esperod Scaniae, Aras Wermlandiae" (Sweden).
Material examined: 15 specimens (11♂♂, 4♀♀).
Distribution: Fennoscandia south to Iberia and round the Mediterranean to Greece, Turkey and North Africa; from Ireland eastwards through Eurasia to the Pacific coast, Iran.

***Volucella inanis* (Linnaeus, 1758)**
Syst. Nat., Ed. 10, 1: 595 (*Musca*). Type locality: "Europa".
Material examined: 9 specimens (4♂♂, 5♀♀).
Distribution: From southern Fennoscandia south to Spain and the Mediterranean (including islands, e.g. Crete), north Africa and Asia Minor (Syria); from Britain (southern

England) eastwards through central and southern Europe into Turkey and European parts of Russia and on through Siberia to the Pacific; Afghanistan, Mongolia, China, Iran.

***Volucella zonaria* (Poda, 1761)**

Insect. Mus. Graecensis: 118 (*Conops*). Type locality: not given ("ad Graecium") [= environs of Graz] (Austria).

Material examined: 6 specimens (2♂♂, 4♀♀).

Distribution: From Poland south to the Mediterranean (including islands, e.g. Crete) and North Africa; from Britain (southern England) eastwards through central and southern Europe (Italy, the former Yugoslavia, Greece) into Turkey and European parts of Russia and on through Siberia to the Pacific; Mongolia, Iran.

***Chrysogaster viduata* (Linnaeus, 1758)**

Syst. Nat., Ed. 10, 1: 598 (*Musca*). Type-locality: "Europa".

Material examined: 11 specimens (5♂♂, 6♀♀).

Distribution: Norway, Sweden, Finland, Denmark, The Netherlands, Belgium, Luxembourg, Germany, Poland, Czech Republic and Slovakia, France, Austria, Hungary, Spain, Italy, the former Yugoslavia, Bulgaria, USSR-Central and South European territories, Transcaucasus, Iran.

****Lejogaster metallina* (Fabricius), 1776**

Species insect, 2: 431 (Syrphus). Type locality: "Germaniae".

***New record for the fauna of Iran.**

Material examined: 16 specimens (6♂♂, 10♀♀), The specimens sampled in June 2009, on weeds around Mahar spring, located in X; 38° 87' E, Y; 55° 36' N with 2300 m.

Distribution: Norway, Sweden, Finland, Spain, Italy, Yugoslavia, Rumania, North European territory to Transcaucasia, Kazakh, Soviet Middle Asia, West Siberia, East Siberia; Asia: Afghanistan.

Description: Tergites entirely metallic colored, with green reflections. Male eyes separated as females. Third antennal segment in males is black and wider than long but in females is either black or with some orange coloration beneath and about as board as long, rounded. The female abdomen is very board whilst, the male has a somewhat slender oval abdomen.

Note: Larvae have been reported from decaying vegetation of a floating mat of bulrush and other plants in an old pond. It is mainly associated with wet meadows, marshes, fens, mildly acid boggy flushes and similar situations.

***Eumerus basalis* Loew, 1848**

Stettin. Ent. Ztg , 9: 126 (*Eumerus*). Type locality: Rhodus [=Rhodos] (Greece).

Material examined: 7 specimens (2♂♂, 5♀♀).

Distribution: Mediterranean parts of Europe, from southern France (plus Corsica) to Greece (including Crete and Rhodes), Croatia, Montenegro and Serbia, plus Bulgaria, Roumania and the Ukraine; Turkey and Iran.

***Merodon armipes* Rondani, 1843**

Revue zool., 6: 43 and Mag. Zool., Paris 1845:154 *(Merodon)*. Type locality: "Parmenis prope torrentem" [=region of Parma] (Italy).

Material examined: 1 specimens (1♂).

Distribution: From north-east France (Rhine valley in Alsace) and adjacent parts of Germany. Through central Europe (Switzerland) and mountainous parts of northern Italy into the former Yugoslavia and on to Bulgaria, Roumania and the Crimea; Greece, Iran, Israel, North Africa.

***Eristalinus aeneus* (Scopoli, 1763)**

Ent. Carniolica: 356 sex?; (*Conops*).Type locality: Idria (Yugoslavia).

Material examined: 19 specimens (10♂♂, 9♀♀).

Distribution: Cosmopolitan; southern Sweden south to N Africa and the Canary Isles; on into the Afrotropical region south to Kenya and Tanzania; from Ireland eastwards through central and southern Europe and on through Russia and China to the Pacific and south into the Oriental region; Mauritius; in North America from Minnesota and Ontario south to California and Texas; Hawaii, Australia and the Gilbert and Ellis islands in Australasia; Bermuda, Iran.

***Eristalinus sepulchralis* (Linnaeus, 1785)**

Syst. Nat., Ed.10, 1: 596 (*Musca)*. Type locality: "Europa".

Material examined: 5 specimens (2♂♂, 3♀♀).

Distribution: Fennoscandia south to Iberia and the Mediterranean, including North Africa; from Ireland through most of Europe into Turkey and European parts of Russia; through Siberia to the Pacific coast; Japan; China; India, Iran.

***Eristalis arbustorum* (Linnaeus, 1758)**

Syst. Nat., Ed. 10, 1: 591 (*Musca*).Type locality: Europa.
Material examined: 9 specimens (4♂♂, 5♀♀).
Distribution: Throughout the Palaearctic region, including North Africa; North America from Wisconsin to Labrador and south to Kansas and South Carolina; reaches the Oriental region in northern India, Iran.

***Eristalis tenax* (Linnaeus, 1758)**

Syst. Nat., Ed. 10, 1: 591 (*Musca*).Type locality: Svecia (Sweden).
Material examined: 7 specimens (4♂♂, 3♀♀).
Distribution: Highly migratory; cosmopolitan; the most widely distributed syrphid species in the world, known from all regions except the Antarctic; found throughout Europe except in the far north, Iran.

***Syritta flaviventris* Macquart, 1842**

Mém. Soc.Sci. Agric. Lille, 1841 (1): 135 and Dipt. Exot., 2 (2): 75 (*Syritta*). Type locality: Senegal (W Africa).
Material examined: 6 specimens (2♂♂, 4♀♀).
Distribution: Portugal, Spain and round the Mediterranean from the southern coast of France to Turkey and on to north Africa; in eastern parts of the Afrotropical region to the southern tip of Africa and in Madagascar. Known from various Mediterranean islands: Corsica, Sardinea, Sicily, Crete, plus Cape Verde. Also cited from Argentina, Brazil and Chile in the Neotropical region and Easter Island in Oceania (to which it has supposedly been introduced), Iran.

***Syritta pipiens* (Linnaeus, 1758)**

Syst. Nat., Ed.10, 1: 594 (*Musca*).Type locality: Europa.
Material examined: 26 specimens (17♂♂, 9♀♀).
Distribution: Becoming cosmopolitan; known from most of the Palaearctic, including North Africa, most of North America, South America and the Oriental region. But records from the Afrotropical region are apparently erroneous, Iran.

ACKNOWLEDGEMENTS

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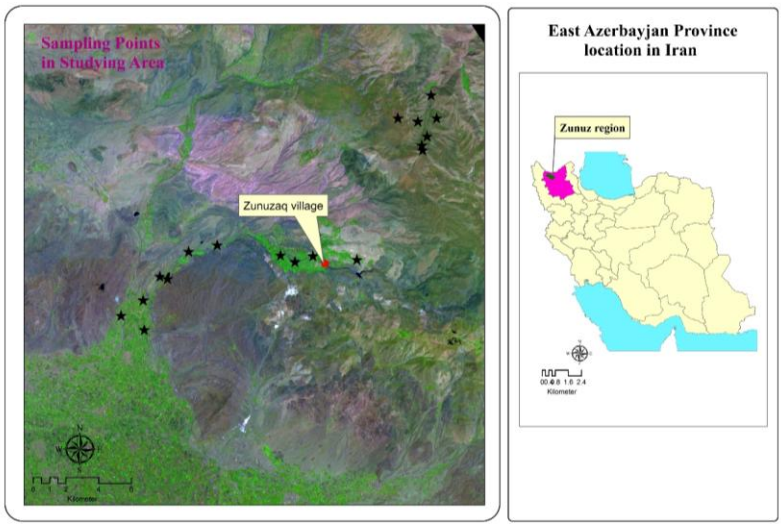

Figure 1. Location of sampling points on satellite image (SPOT) of Zunuz region.

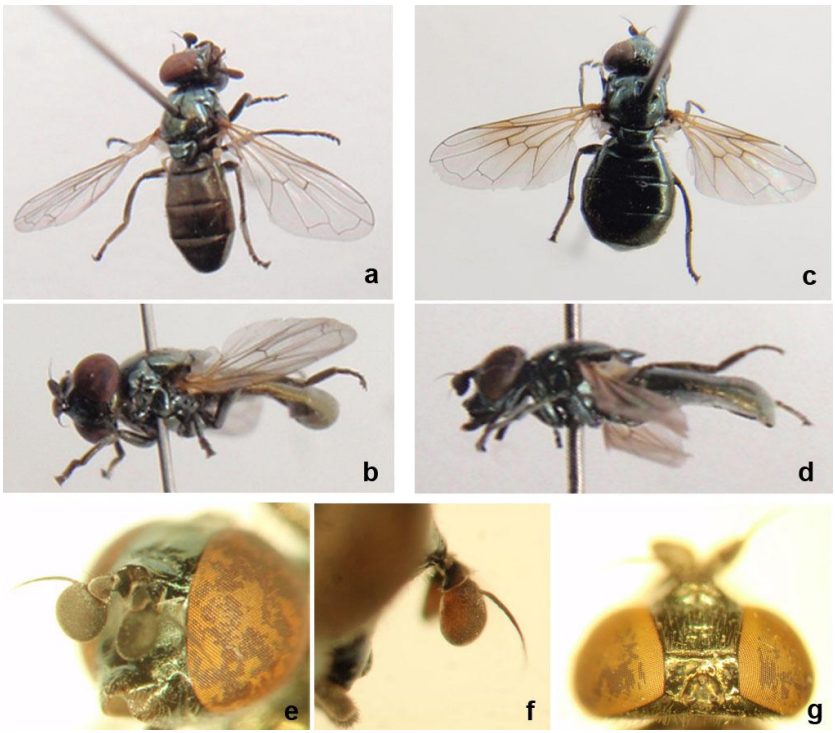

Figure 2. *Lejogaster metallina*, a: male; dorsal view, b: the same; lateral view, c: female; dorsal view, d: the same; lateral view, e: antenna (male); inner view, f: antenna (female); outer view, g: the head (male); dorsal view.

SUBSTITUTE NAMES FOR THREE NEOTROPICAL ROBBER FLIES GENERA (DIPTERA: ASILIDAE)

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ABSTRACT: Three junior homonyms were detected among neotropical robber flies genera and the following replacement names are proposed: *Hullmya* nom. nov. for *Amphicolops* Hull, 1962 (nec Graff, 1905), *Artigasus* nom. nov. for *Menexenus* Artigas, 1970 (nec Stål, 1875) and *Brazilogaster* nom. nov. for *Systellogaster* Hermann, 1926 (nec Gahan, 1917). Accordingly, new combinations are herein proposed for the species currently included in these genera: *Hullmya areolaris* (Walker, 1860) comb. nov., *Hullmya complens* (Walker, 1861) comb. nov., *Hullmya impiger* (Wulp, 1872) comb. nov. and *Hullmya mendax* (Walker, 1857) comb. nov. from the genus *Amphicolops* Hull, 1962; *Artigasus concepcionensis* (Bromley, 1932) comb. nov., *Artigasus schlingeri* (Artigas, 1982) comb. nov. and *Artigasus veredus* (Artigas, 1970) comb. nov. from the genus *Menexenus* Artigas, 1970; *Brazilogaster alba* (Martin, 1975) comb. nov., *Brazilogaster breviventris* (Rondani, 1848) comb. nov., *Brazilogaster calceolata* (Bigot, 1878) comb. nov., *Brazilogaster fascipennis* (Schiner, 1867) comb. nov., *Brazilogaster parva* (Martin, 1975) comb. nov. and *Brazilogaster silacea* (Martin, 1975) comb. nov. from the genus *Systellogaster* Hermann, 1926. In addition to this, the validity of the genus name *Furcilla* Martin, 1975 under ICZN is also discussed in the present text.

KEY WORDS: nomenclatural changes, homonymy, replacement names, robber flies, Asilidae, new combinations.

In an effort to reduce the number of homonyms in Asilidae, we found three robber flies genera whose names had been previously published for other taxa, making them junior homonyms. In accordance with the International Code of Zoological Nomenclature, we propose substitute names for these genera.

Family ASILIDAE
Genus *HULLMYA* nom. nov.

Amphiscolops Hull, 1962. Bull. U.S. natn. Mus. No. 224: 552. Bull. U.S. natn. Mus. No. 224: 91. (Diptera: Asiloidea: Asilidae: Asilinae). Preoccupied by *Amphiscolops* Graff, 1905. Tierreich, 23, 25. (Acoelomorpha: Acoela: Convolutidae).

Remarks on nomenclatural changes: Hull (1962) described the Oriental and Australasian robber fly genus *Amphiscolops* with the type species *Asilus mendax* Walker, 1857 by original designation from Oriental region (Indonesia and Sulawesi) in the family Asilidae. It is still used as a valid genus name. It has no any generic synonym.It has four species (including the type species) now.

Unfortunately, the generic name was already preoccupied by Graff (1905), who had proposed the objective replacement name *Amphiscolops* for the genus name *Amphicoerus* Graff, 1891 with the type species *Amphiscoerus cinereus* (Graff, 1874) in the family Convolutidae (Acoela). It is also still used as a valid genus name. It has three generic synonyms as *Amphicoerus* Graff, 1891; *Oruphiscolops* Kato, 1957 and *Amphiscolopus* Kato, 1957. It has at least ten species (including the type species) now as *Amphiscolops bermudensis* Hyman,

1939; *A. cinereus* (Graff, 1874); *A. evelinae* Marcus, 1947; *A. fuligineus* Peebles, 1913; *A. gemelliporus* Marcus, 1954; *A. japonicus* Kato, 1947; *A. marinelliensis* Beltagi & Khafagi, 1984; *A. mosaicus* Kozloff, 1998; *A. potocani* Achatz, 2008; *A. trifurcatus* (Beltagi, 1983) and *A. zeii* Riedl, 1956.

Thus, the genus *Amphiscolops* Hull, 1962 is a junior homonym of the generic name *Amphiscolops* Hull, 1962. According to Article 60 of the International Code of Zoological Nomenclature, I propose a new replacement name *Hullmya* **nom. nov.** for *Amphiscolops* Hull, 1962.

Etymology: This name is dedicated to F. M. Hull who is current author of the preexisting genus *Amphiscolops*.

Summary of nomenclatural changes:

Hullmya **nom. nov.**
pro *Amphiscolops* Hull, 1962 (nec Graff, 1905)

Hullmya areolaris (Walker, 1860) **comb. nov.**
from *Amphiscolops areolaris* (Walker, 1860)
Asilus areolaris Walker, 1860
Distribution: Indonesia (Oriental / Australasia) and Indonesia (Oriental / Australasia)-Celebes (Sulawesi)(Oriental)

Hullmya complens (Walker, 1861) **comb. nov.**
from *Amphiscolops complens* (Walker, 1861)
Asilus complens Walker, 1861
Distribution: Indonesia (Oriental / Australasia); Indonesia (Oriental / Australasia)-Irian Jaya (New Guinea) (Australasia) and Indonesia (Oriental / Australasia)- Maluku (New Guinea) (Australasia / Oriental)
Synonym: *Pamponerus nigritulus* Wulp, 1872

Hullmya impiger (Wulp, 1872) **comb. nov.**
from *Amphiscolops impiger* (Wulp, 1872)
Eccoptopus impiger Wulp, 1872
Distribution: Indonesia (Oriental / Australasia) and Indonesia (Oriental / Australasia)-Celebes (Sulawesi)(Oriental)

Hullmya mendax (Walker, 1857) **comb. nov.**
from *Amphiscolops mendax* (Walker, 1857)
Asilus mendax Walker, 1857
Distribution: Indonesia (Oriental / Australasia) and Indonesia (Oriental / Australasia)-Celebes (Sulawesi)(Oriental)
Synonym: *Asilus areolatus* Walker, 1861

Genus *ARTIGASUS* nom. nov.

Menexenus Artigas, 1970. Gayana (Zool.) No.17: 317. (Diptera: Asiloidea: Asilidae: Asilinae). Preoccupied by *Menexenus* Stål, 1875. Recensio Orth., 3, 18. (Phasmida: Verophasmatodea: Phasmatidae: Lonchodinae).

Remarks on nomenclatural changes: The name *Menexenus* was initially introduced by Stål (1875) for a phasmid genus (with the type species *Phasma lacertinum* Westwood, 1848 by original monotypy from India, Assam). It is still

used as a valid genus name. It has one generic synonym as *Menexus* Brunner von Wattenwyl, 1893.It has twelve species (including the type species) now as *Menexenus adveniens* Brunner von Wattenwyl, 1907; *M. batesii* (Kirby, 1896); *M. fruhstorferi* Brunner von Wattenwyl, 1907; *M. lacertinus* (Westwood, 1848); *M. nudiusculus* Hausleithner, 1992; *M. obtuselobatus* Brunner von Wattenwyl, 1907; *M. obtusespinosus* Sinéty, 1901; *M. perdentatus* Brunner von Wattenwyl, 1907; *M. quadrilobatus* Brunner von Wattenwyl, 1907; *M. rotunginus* Giglio-Tos, 1914; *M. semiarmatus* (Westwood, 1848) and *M. tenmalainus* Günther, 1938.

Subsequently, Artigas, 1970 described a new Neotropical genus of the family Asilidae (with the type species *Menexenus veredus* Artigas, 1970 from Chile) under the same generic name. It is also still used as a valid genus name. It has no any generic synonym.It has three species (including the type species) now.

Thus, the genus *Menexenus* Artigas, 1970 is a junior homonym of the genus *Menexenus* Stål, 1875. According to Article 60 of the International Code of Zoological Nomenclature, I propose for the genus *Menexenus* Artigas, 1970 the new replacement name *Artigasus* **nom. nov.**

Etymology: The name is dedicated to J. N. Artigas who is current authour of the preexisting genus *Menexenus*.

Summary of nomenclatural changes:

Artigasus **nom. nov.**
pro *Menexenus* Artigas, 1970 (nec Stål, 1875).

Artigasus concepcionensis (Bromley, 1932) **comb. nov.**
from *Menexenus concepcionensis* (Bromley, 1932)
Asilus concepcionensis Bromley, 1932
Distribution: Chile and Argentina (Neotropical)

Artigasus schlingeri (Artigas, 1982) **comb. nov.**
from *Menexenus schlingeri* Artigas, 1982
Distribution: Argentina (Neotropical)

Artigasus veredus (Artigas, 1970) **comb. nov.**
from *Menexenus veredus* Artigas, 1970
Distribution: Chile and Argentina (Neotropical)

Genus *BRAZILOGASTER* nom. nov.

Systellogaster Hermann, 1926. Verh. zool.-bot. Ges. Wien, 74-75, 149. (Diptera: Asiloidea: Asilidae: Leptogastrinae). Preoccupied by *Systellogaster* Gahan, 1917. Proc. U.S. nat. Mus., 53, no. 2197, 209. (Hymenoptera: Chalcidoidea: Pteromalidae: Pteromalinae).

Remarks on nomenclatural changes: The Nearctic genus *Systellogaster* was erected by Gahan (1917) with the type species *Systellogaster ovivora* Gahan, 1917 by monotypy in the chalcidoid wasps. It is still used as a valid genus name. However, Grissell (1985) placed it under the genus of *Tritneptis* Girault, 1908 as a synonym. Then, Heydon (1994) revived the status of it. It has two species (including the type species) now as *Systellogaster gahani* Wallace, 1973 that occurs in USA and *Systellogaster ovivora* Gahan, 1917 that occurs in USA and Canada.

Later, the Neotropical genus *Systellogaster* was described by Hermann (1926) with the type species *Lasiocnemus calceolatus* Bigot, 1878 from Brazil in the family Asilidae. It is also still used as a valid genus name. It has no any generic synonym. It has six species (including the type species) now.

However, the generic name *Systellogaster* Hermann, 1926 is invalid under the law of homonymy, being a junior homonym of *Systellogaster* Gahan, 1917. In accordance with the International Code of Zoological Nomenclature, I propose to substitute the junior homonym name *Systellogaster* Hermann, 1926 for the nomen novum *Brazilogaster*.

Etymology: This name is derived from Brazil (as the type locality of genotype *Lasiocnemus calceolatus* Bigot, 1878) and the preexisting genus name *Systellogaster*.

Summary of nomenclatural changes:

Brazilogaster **nom. nov.**
pro *Systellogaster* Hermann, 1926 (nec Gahan, 1917).

Brazilogaster alba (Martin, 1975) **comb. nov.**
from *Systellogaster alba* Martin, 1975
Distribution: Brazil (Neotropical)

Brazilogaster breviventris (Rondani, 1848) **comb. nov.**
from *Systellogaster breviventris* (Rondani, 1848)
Gonypes breviventris Rondani, 1848
Distribution: Brazil (Neotropical)

Brazilogaster calceolata (Bigot, 1878) **comb. nov.**
from *Systellogaster calceolata* (Bigot, 1878)
Lasiocnemus calceolatus Bigot, 1878
Distribution: Brazil (Neotropical)

Brazilogaster fascipennis (Schiner, 1867) **comb. nov.**
from *Systellogaster fascipennis* (Schiner, 1867)
Euscelidia fascipennis Schiner, 1867
Distribution: Brazil (Neotropical)

Brazilogaster parva (Martin, 1975) **comb. nov.**
from *Systellogaster parva* Martin, 1975
Distribution: Paraguay (Neotropical)

Brazilogaster silacea (Martin, 1975) **comb. nov.**
from *Systellogaster silacea* Martin, 1975
Distribution: Peru (Neotropical)
Synonym: *Systellogaster aurantiaca* Hermann, 1926 (nomen nudum)

Remarks on the validity of the genus name *FURCILLA* Martin, 1975 under ICZN

Furcilla Martin, 1975. Occ. Pap. Calif. Acad. Sci. 119: 76. (Diptera: Asiloidea: Asilidae: Apocleinae).

The Nearctic robber fly genus *Furcilla* was erected by Martin (1975) with the type species *Furcilla dorothyae* Martin, 1975 by original designation from Navajoa, Sonora (Mexico). It is still used as a valid genus name. It has no any generic synonym. It has two species (including the type species) now as *Furcilla dorothyae* Martin, 1975 and *Furcilla petila* Martin, 1975. Both are from Navajoa, Sonora, Mexico (Nearctic).

The genus group name *Furcilla* has been used for four different taxa until now. Chronologically, the genus name *Furcilla* was proposed by Stokes (1890) for Protozoa, Martin (1975) for Diptera (Insecta), Bakharev (1988) for Ostracoda (Crustacea) and Espinosa & Ortea (2000) for Cystiscidae (Mollusca: Neogastropoda). According to principle of priority, valid genus name must be *Furcilla* Stokes, 1890 and the others must be regarded as junior homonyms of it. According to Article 60 of the International Code of Zoological Nomenclature, the junior homonym names must be replaced.

Furcilla Stokes, 1890 is a genus of freshwater flagellates. Now, there is a question about it. Is *Furcilla* Stokes, 1890 a plant taxon or an animal taxon?

As commonly accepted that *Furcilla* Stokes, 1890 is a plant genus in algae (Plantae: Viridaeplantae: Chlorophyta: Chlorophyceae: Volvocales: Chlamydomonadaceae). Therefore, the flowering plants genus *Furcilla* Tiegh., 1895 (Plantae: Magnoliophyta: Magnoliopsida: Santalales: Loranthaceae) is an illegitimate later homonym (Vienna ICBN Art. 53) of *Furcilla* Stokes, 1890 that is unavailable for use. So *Furcilla* Tiegh., 1895 is regarded as a synonym of *Muellerina* Tiegh., 1895 by botanists. In this situation, *Furcilla* Martin, 1975 is an available and valid senior name for animal taxa.

For example, Espinosa & Ortea (2002) replaced the genus name *Furcilla* Espinosa & Ortea (2000) with a replacement name *Ticofurcilla* (Mollusca: Neogastropoda: Cystiscidae). Espinosa & Ortea (2002) never mentioned the genus name *Furcilla* Stokes, 1890. They accepted that *Furcilla* Espinosa & Ortea (2000) is a junior homonym of *Furcilla* Martin, 1975 (Insecta: Diptera) and *Furcilla* Bakharev, 1988 (Crustacea: Ostracoda).

However, sometimes *Furcilla* Stokes, 1890 is regarded as an animal taxon in Protozoa (Phytoflagellata: Volvocida: Volvocidae) by some authors. In this situation, *Furcilla* Martin, 1975 is an available junior name for animal taxa and must be replaced under ICZN. Since *Furcilla* Martin, 1975 is a junior homonym of *Furcilla* Stokes, 1890. According to Article 60 of the International Code of Zoological Nomenclature (1999), I propose for the genus name *Furcilla* Martin, 1975 the new replacement name *Martinofurcilla* **nom. nov.**. Species included: *Martinofurcilla dorothyae* (Martin, 1975) comb. nov. from *Furcilla dorothyae* Martin, 1975 and *Martinofurcilla petila* (Martin, 1975) comb. nov. from *Furcilla petila* Martin, 1975. This replacement name proposed for requires of both ICZN (1999) and International Code of Phylogenetic Nomenclature (ICPN, PhyloCode 2007).

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INSECTICIDAL ACTIVITIES OF TWO POWDERED SPICES, BLACK PEPPER AND RED PEPPER ON ADULTS OF *RHYZOPERTHA DOMINICA* (F.) AND *SITOPHILUS GRANARIUS* (L.)

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[Ashouri, S. & Shayesteh, N. 2010. Insecticidal activities of two powdered spices, black pepper and red pepper on adults of *Rhyzopertha dominica* (F.) and *Sitophilus granaries* (L.). Munis Entomology & Zoology, 5 (2): 600-607**]**

ABSTRACT: The experiment was conducted to investigate the insecticidal potency of black pepper (*Piper nigrum* L.) seed powder and red pepper (*Capsicum annuum* L.) fruit powder, against two important stored-product pests. These powders were mixed with 20 g wheat grains as direct admixtures at five different rates viz, 0, 0.15, 0.2, 0.27, 0.37 and 0.5% (w/w) for black pepper and 0, 0.5, 0.85, 1.5, 3 and 5% (w/w) for red pepper to assess for mortality and reduction of F_1 progeny. The treated grains were infested with 20 adults. All insects were removed after 14 days and the experiments were monitored for the extra 36 days in order to count the number of emerged adults. The results revealed that black pepper at 0.5% concentration caused 100% mortality of *S. granarius* in the first five days, also *R. dominica* showed complete mortality at 5% level after 14 days, but red pepper did not cause complete mortality on two insects after 14 days. Both plant materials caused complete reduction in F_1 progeny of *S. granarius* at highest tested dosages. Also they significantly reduced F_1 progeny emergence of *R. dominica*. This plant powders exhibited promising potential in protecting wheat grains against two species of insects.

KEY WORDS: Black pepper, powder, red pepper, *Rhyzopertha dominica, Sitophilus granarius*.

The efficient control of stored grain pests has long been the aim of entomologists throughout the world. Synthetic chemical pesticides have been used for many years to control stored grain pests (Salem et al., 2007). However, the potential hazards for mammals from synthetic insecticides, increased concern by consumers over insecticide residues in processed cereal products, the occurrence of insecticide-resistant insect strains, the ecological consequences, increasing cost of application and the precautions necessary to work with traditional chemical insecticides, call for new approaches to control stored-product insect pests (Aslam et al., 2002; Udo, 2005; Fields, 2006; Salem et al., 2007; Mahdian & Rahman, 2008). Therefore, there is a need to look for alternative organic sources that are readily available, cheap, affordable, relatively less poisonous and less detrimental to the environment (Udo, 2005).

Peasant farmers and researchers often claim successful use of material of plant origin in insect pest control including spices and powders of plant parts (Akinneye et al., 2006). Previous research indicated that some plant powders, oils and extracts have strong effects on stored grain insects such as toxicity and the inhibition of reproduction (Emeasor et al., 2005; Nadra, 2006).

The simplest way to apply plants to a stock of seeds is harvesting the plant and adding it to the seeds. The modes of action of powders vary, but with low to moderate dosages, the effect is always repellent or toxic, never mechanical

(Rajapakse, 2006). For the last few years the influence of different plant dried materials (added as powder to the products the pests feed on) on the cereal and flour pests has been widely researched (Blazejewska & Wyrostkiewicz, 1998).

The use of spices is also less costly, easily available, safer and don't do any hazard using in the stores (Aslam et al., 2002; Mahdian & Rahman, 2008).

A number of spices had been tried and found effective. Some include powders from red peppers (*Capsicum* spp.) and black peppers (*Piper* spp.) that were evaluated.

Javier & Morallo-Rejesus (1986), Morallo-Rejesus et al. (1990) and Javaid & Poswal (1995) evaluated the insecticidal effects of black pepper (*Piper nigrum* L.) powder on *S. zeamais, Callosobruchus chinensis* and *C. maculatus,* respectively. Ivbijaro & Agbaje (1986) and Zibokere (1994) tested insecticidal activities of dry red pepper (*Capsicum annuum* L.*)* powder on *C. maculates* (Fao, 1999).

Aslam et al. (2002) tested six spice powders against *C. chinensis*. Clove and black pepper were good protectants of stored chickpea against the beetle. Nadra (2004) showed that *Capsicum frutescens* caused high and significant mortality (85%) of *Trogoderma granarium* adults at all 1, 2, 4 and 6% concentrations within 7 days. Oparaeke & Bunmi (2006) showed *Piper guineense* powder exhibited acute toxicity on *C. subinnotatus* (Pic.) (Over 90% mortality in all the three concentrations: 2.5, 5.0 and 7.5 % per 150 g seed) assayed in 48 h. It also significantly reduced oviposition by 85.44 to 90 percent while adult emergence and seed damage were reduced by 100 percent each. Echezona (2006) stated that dried and ground fruits of four pepper cultivars (*Capsicum* spp.) significantly increased adult mortality of *C. maculatus* (F.) earlier than the no protectant control. Owoade (2008) conducted an experiment to expose *Dermestes maculatus* larvae (24 - 48 hour old) to three concentrations (15, 20 and 25g/kg) of *P. guinees*. Mortalities monitored for the first five days showed that *P. guineese* gave mortality up to 100% at the end of 24 hours and by the end of 72 hours, 100% mortality was recorded in all three concentrations. Mahdian & Rahman (2008) investigated the insecticidal potency of some spices such as black pepper (*P. nigrum*), Ceylon cinnamon (*Cinnamomum zeylanicum*), turmeric (*Curcuma longa*) and red pepper (*C. frutescens*), against the pulse beetle, *C. maculatus* (F.) on stored black gram (*Phaseolus bengalensis* L.). All the spices were effective as protectants of black gram seeds and black pepper was the most effective.

In the present investigation, the insecticidal activity of black pepper (*Piper nigrum* L.) seed powder and red pepper (*Capsicum annuum* L.) fruit powder were evaluated in order to determine their effects on the mortality and progeny production (adult emergence) of two stored-grain insects, the lesser grain borer (*Rhyzopertha dominica* F.) and the granary weevil (*Sitophilus granarius* L.) in laboratory experiments wheat grains.

MATERIALS AND METHODS

The experiments were carried out in the laboratory of the Department of Entomology, University of Urmia, Iran, during 2008-2009.

Preparation of plant products & stored grains

Black pepper (*Piper nigrum* L.) (Piperaceae) seed and red pepper (*Capsicum annuum* L.) (Solanaceae) fruit powders were used in this investigation. They were selected based on assumption of absence of mammalian toxicity owing to its use as a popular spice in several diets. The powders and a local variety of wheat grains were obtained from a local market in Urmia, Iran. The powders were sieved with a

40-mesh sieve to obtain a fine dust before application to the grains. The spices were stored in airtight plastic containers at room temperature before use. Wheat grains were disinfested by keeping them in a freezer at -18°C for a day and subsequently in room temperature before being used for experimental purposes.

Rearing of experimental insects

Local strains of two important stored-product insects namely granary weevil (*Sitophilus granarius* L.) and lesser grain borer (*Rhyzopertha dominica* F.) were reared on uninfected whole kernels of wheat. Insects were obtained from wheat flour factories, Urmia, Iran. Insects were released at the rate of 200 adults in containing 400 kg of wheat grains. The jars were covered with muslin cloth and tied with a rubber band and kept in an incubator maintained at a temperature of 28 ± 1°C and 70 ± 5% relative humidity (RH). After two weeks of oviposition, the parent insects were separated and egg laid grains were maintained and re-cultured to produce newly emerged adults of same generation. For this purpose, the insects emerged after four weeks were removed. One-14 day old adults for *S. granarius* and 1-4 day old adults for *R. dominica* were used in the experiments.

Mortality and progeny assessment assays

Powders were added separately to 20 g of wheat in plastic containers (9cm high, 7cm diameter) at five dosages 0.15, 0.2, 0.27, 0.37 and 0.5% (w/w) for black pepper and 0.5, 0.85, 1.5, 3 and 5% (w/w) for red pepper, while the control treatment had no plant seed powder. All treatments were replicated four times. The test materials were admixed thoroughly and gently in the containers by manual agitation until the materials were evenly distributed among the grains and ensure a homogeneous admixture. The contents of the plastic containers were allowed to settle down for about 30 minutes before introducing adults into each jar. Twenty adult beetles (1-14 days old for *S. granarius* and 1-4 days old for *R. dominica*) were introduced into the each container. The plastic containers were securely covered with white perforated muslin cloth held in place with rubber bands to ensure adequate ventilation. The containers were placed in an incubator maintained at a temperature of 28 ± 1°C and 70 ± 5 % RH. The content of each of the boxes was poured in a dish and dead insects were counted. Mortality counts in each treatment were recorded after 1, 3, 5, 7 and 14 days (Data were recorded on days to 100% mortality). The insects were allowed to mate and oviposit for 14 days. All adults in both treated and untreated containers were removed after 14 days and the experiments were monitored for the extra 36 days. At the end of the period, the number of emerged adults was counted. Percentage of reduction in progeny production was determined using Aldryhim's (1990) formula: $[\frac{C-T}{C} \times 100]$, where:

C: Number of emerged adults in control.
T: Number of emerged adults in treatment.

Statistical analysis

Data were corrected for mortalities in the control by using Abbott's formula (Abbott, 1925) {[(Sc – St) / Sc] ×100, where Sc = % survival in control while St = % survival in treated} and transformed with an arcsin (percentages) method. Adult emergence data were transformed with arcsin or the square root method. The resulting data were subjected to analysis of variance. Analyses of Variance (ANOVA) were employed on the data using a 2-way ANOVA of the MSTAT-C statistical package. The experimental design for mortality tests was completely

randomized design. The data obtained from progeny assays were analyzed statistically using randomized complete block design, one-way ANOVA ($P< 0.05$). Means of the four replicates of treatments were tested by Duncan's new multiple range test (DNMR) for significance of their differences.

RESULTS

The results revealed that black pepper seed powder and red pepper fruit powder had significant insecticidal effects on the adults of *R. dominica* and *S. granarius* as compared to the control. They were found to be very effective in causing mortality and reducing adult emergence of both insects. A highly significant differences ($P<0.05$) were found among all the treatments.

Mean mortality of the adults of *R. dominica* and *S. granarius* exposed to five concentration levels of two plant powders is presented in Tables 1 and 2. A direct mortality rate was observed. It means that the toxicities of these powders increased with increase in dosage as well as increase in the period of exposure to the plant powders. The results indicated that both of powdered spices significantly ($P<0.05$) reduced the number of both tested insects. In general, toxicity for two powders was observed and black pepper was more toxic than red pepper powder to both insects.

Black pepper seed powder significantly ($P<0.05$) causing complete mortality at highest concentration level tested (0.5%). The best protection with application of black pepper was observed on *S. granarius* because it caused complete mortality in the first five days but *R. dominica* showed complete mortality after 14 days so that *S. granarius* adults were more susceptible than *R. dominica* adults.

The red pepper fruit powder did not cause complete mortality on two insects, but good results were obtained at highest dosage (5%) after 14 days. Both adult insects were equally susceptible to the toxicity of it.

Tables 3 and 4 show the mean adult emergence count of *R. dominica* and *S. granarius* after being exposed to the black pepper and red pepper powder at five concentrations after 50 days. Adult emergence was significantly suppressed by two plant powders (100% efficiency). All dosages of both powdered spices caused significant reduction of adult emergence of *S. granarius* and at the highest dosages completely inhibited that. Also significant reductions were found on *R. dominica*. Treatment with red pepper was less effective than black pepper against *R. dominica*.

DISCUSSION

Results reported in this study show that both plant powders have insecticidal effects on *S. granarius* and *R. dominica* at all levels of treatment but varied with the exposure period and powder concentration.

Unfortunately, there is not any references (in accessible literatures) regarding effects of the black pepper (*Piper nigrum* L.) seed powder and red pepper (*Capsicum annuum* L.) fruit powder on *R. dominica* and *S. granarius* to be compared with the results obtained in the present study.

Even thought, these finding are similar with the observation of Udo (2005) who reported that powder of *P.guineense* on maize weevil (*Sitophilus zeamais* Mots) at 1% and 5% concentrations, caused significant mortality and also progeny production was significantly influenced by it ($P<0.05$).

Also this result is similar with what Asawalam et al. (2007) found who showed that at 2% concentration the powders of *P. guineense* and *C. frutescens* had the

highest percentage mortality against *S. zeamais* (Mots) 79.8 and 75.1 respectively, and significantly reduced adult emergence when compared with control.

Also, Donald et al. (2008) stated that 5 and 10% powder of *P. guineense* was significantly toxic to *S. zeamais* and suppressed F_1 progeny emergence compared to 1% powder and the control. It also corresponds to the studies of other researchers who study about powders of black and red peppers effects on *Callosobruchus* spp. that are cited in the introduction.

These results certify our results that black pepper and red pepper powder are effective in causing mortality and suppressing F_1 adult emergence and there is an inverse relationship between count of adult emergence and tested dosages.

On the bases of the findings it could be concluded that plant powders pose potential in protecting wheat against two species of tested insects. Regarding the side effects of synthetic pesticides, the study demonstrates that these plant powders can play an important role in protection of wheat from insect invasion during storage. This technology is cheap, safe, environmentally friendly and easy to adopt by small-scale farmer.

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Table 1. Mean mortality of adults of *R. dominica* exposed to wheat grains treated with black pepper (A) and red pepper (B) powders at different concentrations and after different exposure times.

(A)

Dosage [w/w]	Exposure time [day]				
	1	3	5	7	14
0.15	3.23±3.23 n	18.44±0.00 kl	27.21±2.63 ij	35.80±5.01 gh	39.09±3.66 fg
0.2	3.23±3.23 n	20.62±1.26 jk	32.33±2.05 ghi	45.02±2.04 ef	53.02±0.74 d
0.27	3.23±3.23 n	24.60±1.80 ijk	36.26±1.23 gh	51.58±1.88 de	58.52±2.09 cd
0.37	11.07±3.91 m	27.35±1.72 ij	37.77±0.86 fgh	56.21±2.71 d	69.42±1.26 b
0.5	12.16±4.67 lm	30.82±0.80 hi	39.98±0.73 fg	63.55±1.47 bc	90.00±0.00 a

(B)

Dosage [w/w]	Exposure time [day]				
	1	3	5	7	14
0.5	12.93±0.00 l	15.69±1.59 kl	19.24±2.34 hijkl	22.65±1.66 ghijk	26.49±1.47 efghi
0.85	12.93±0.00 l	17.07±1.38 jkl	21.28±2.92 ghijkl	27.44±0.86 efgh	33.93±1.93 de
1.5	18.15±1.59 ijkl	20.62±1.26 ghijkl	29.01±2.43 efg	32.39±1.51 def	39.20±2.10 cd
3	19.24±2.34 hijkl	25.41±2.61 fghij	33.63±4.82 def	39.89±3.25 cd	46.47±1.86 bc
5	21.71±1.09 ghijk	34.36±4.64 de	42.79±4.33 c	52.53±4.33 b	60.23±2.46 a

* Means in the same box followed by the same letters are not significantly different by Duncan's multiple range test at the 5% level ($P<0.05$).
* Values are means of four replicates ± S.E.
* Means subjected to arcsin-transformation.

Table 2. Mean mortality of adults of *S. granarius* exposed to wheat grains treated with black pepper (A) and red pepper (B) powders at different concentrations and after different exposure times.

(A)

Dosage [w/w]	Exposure time [day]		
	1	3	5
0.15	29.26±2.37 h	42.06±1.18 fg	52.11±0.90 de
0.2	31.00±2.28 h	42.79±0.75fg	59.41±4.34 cd
0.27	35.00±2.28 gh	49.06±2.43 ef	62.68±2.73 c
0.37	35.74±2.48 gh	49.78±2.12 ef	71.52±6.70 b
0.5	38.03±2.79 gh	55.83±1.50 cde	90.00±0.00 a

(B)

Dosage [w/w]	Exposure time [day]				
	1	3	5	7	14
0.5	17.07±1.38 j	17.07±1.38 j	18.52±2.08 j	18.52±2.08 j	20.74±3.02 ij
0.85	20.62±1.26 ij	24.46±2.49 ghi	27.02±1.36 fgh	27.02±1.36 fgh	28.12±1.78 fg
1.5	21.57±1.96 hij	27.07±3.18 fgh	29.69±1.45 efg	29.69±1.45 efg	31.65±1.64 def
3	24.69±1.09 ghi	29.10±1.60 efg	34.72±0.52 de	36.26±1.25 d	42.73±2.60 c
5	26.49±1.47 fgh	31.53±2.09 def	37.06±1.05 d	48.81±2.32 b	59.22±1.40 a

* Means in the same box followed by the same letters are not significantly different by Duncan's multiple range test at the 5% level ($P<0.05$).
* Values are means of four replicates ± S.E.
* Means subjected to arcsin-transformation.

Table 3. Mean reduction of F_1 adult emergence of *R. dominica* exposed to wheat grains treated with black pepper (A) and red pepper (B) powders at different concentrations after 50 days.

(A)

Dosage [w/w]				
0.15	0.2	0.27	0.37	0.5
57.25±0.22 d	65.69±0.12 c	76.48±0.83 b	76.68±0.72 b	80.81±0.27 a

(B)

Dosage [w/w]				
0.5	0.85	1.5	3	5
33.40±0.88 d	39.45±0.23 c	47.27±0.26 b	59.02±0.34 a	60.32±0.37 a

* Means in the same box followed by the same letters are not significantly different by Duncan's multiple range test at the 5% level ($P<0.05$).
* Values are means of four replicates ± S.E.
* Means subjected to arcsin-transformation.

Table 4. Mean reduction of F_1 adult emergence of *S. granarius* exposed to wheat grains treated with black pepper (A) and red pepper (B) powders at different concentrations after 50 days.

(A)

Dosage [w/w]				
0.15	0.2	0.27	0.37	0.5
9.60±0.01 e	9.69±0.01 d	9.79±0.02 c	9.85±0.03 b	10.00±0.00 a

(B)

Dosage [w/w]				
0.5	0.85	1.5	3	5
9.93±0.03 b	9.94±0.03 b	9.97±0.02 ab	10.00±0.00 a	10.00±0.00 a

* Means in the same box followed by the same letters are not significantly different by Duncan's multiple range test at the 5% level ($P<0.05$).
* Values are means of four replicates ± S.E.
* Means subjected to square root -transformation.

HYDRAENIDAE SPECIES DIVERSITY OF SOUTH MARMARA REGION IN TURKEY (COLEOPTERA)

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[Ertorun, N. & Tanatmış, M. 2010. Hydraenidae species diversity of South Marmara Region in Turkey (Coleoptera). Munis Entomology & Zoology, 5 (2): 608-622**]**

ABSTRACT: 5194 samples from 78 localities were collected between 2004 and 2006 to investigate the Hydraenidae (Coleoptera) fauna of South Marmara Region inTurkey. 31 species and 1 subspecies belonging to 3 genera were determined. Of identified species *L.* (s.str.) *rubropiceus*, *Ochthebius* (s.str.) *difficilis, O.* (s.str.) *fausti, O.* (s.str.) *inconspicuus, O.* (s.str.) *lividipennis, O.* (s.str.) *meridionalis, O.* (s.str.) *ragusae, O.* (s.str.) *uskubensis, O. (Asiobates) minimus, H.* (s.str.) *falcata, H.* (s.str.) *grandis, H.* (s.str.) *grata, H.* (s.str.) *lapissectilis, H.* (s.str.) *ancyrae, H.* (s.str.) *anatolica, H.* (s.str.) *paganettii* were recorded from the research area for the first time. The aim of this study is to reveal information about Hydraenidae fauna of South Marmara Region which is transition area between Europe and Anatolia since the glacial age.

KEY WORDS: Coleoptera, fauna, Hydraenidae, South Marmara Region, Turkey.

Genera *Hydraena*, *Ochthebius* and *Limnebius* of Hydraenidae show quite wide distribution in Palaearctic region of the world. In Turkey, 107 *Hydraena*, 72 *Ochthebius* and 19 *Limnebius* species have been reported so far (Audisio et al., 1993; Jäch, 1984; 1985; 1988a; 1988b; 1989a; 1989b; 1989c; 1990a; 1990b; 1991; 1992a; 1992c; 1992d; 1993b; 1993c; 1994; 1997a; 1997b; 1997c; 1997d; Jäch et al., 2003; Jäch and Diaz, 2001; Jäch and Kasapoğlu, 2006; Jäch and Delgado, 2008; Kasapoğlu, 2002; Kasapoğlu and Erman, 2002; Kasapoğlu et al., 2004; 2006). However, fauna of aquatic Coleoptera in Turkey has not fully been introduced. Therefore, the primary focus of this paper is to reveal information about Hydraenidae fauna of South Marmara Region which is transition area between Europe and Anatolia since the glacial age.

MATERIALS AND METHODS

Totally, 5194 adult specimens from 78 different freshwater localities were collected around Balıkesir, Bilecik, Bursa, Çanakkale, Kocaeli and Sakarya provinces between 2004 and 2006 (Figure 1, Table 1). Aedeagus of collected specimens were stored in 30% lactic acid solution during 24 hours to clean and make them transparency. Audisio et al. (1993); Jäch (1984; 1987b; 1988a; 1988b; 1989a; 1989c; 1990a; 1991; 1992a; 1992b; 1992c; 1993a; 1995; 1998; 1999); Jäch and Diaz (2001); Kasapoğlu (2002) were used during identification studies as the main sources.

RESULTS

31 species and 1 subspecies belonging to 3 genera were determined during the present study. Localities of these species in Turkey and their distributions in the world are given below.

FAMILY: HYDRAENIDAE
Genus: *Limnebius* Leach, 1815
Subgenus: *Limnebius* Leach, 1815

Limnebius* (s.str.) *claviger Jäch, 1993
Materials examined: 03.07.2004, 3 male (31); 09.07.2005, 1 male, 4 female (52); 24.08.2004, 19 male, 66 female (56); 08.07.2004, 2 male, 2 female; 03.08.2006, 6 male, 5 female (59).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Balıkesir (Jäch, 1993a).
Remark: First record for the provinces of Bilecik, Bursa and Çanakkale.

Limnebius* (s.str.) *stagnalis Guillebeau, 1890
Materials examined: 30.07.2004, 3 male, 24 female; 09.08.2006, 1 male, 2 female (32); 30.07.2004, 12 male, 4 female; 13.08.2005, 1 male, 7 female (34); 13.08.2005, 1 male, 4 female (37); 09.08.2006, 1 male (38); 09.08.2006, 2 male, 1 female (39); 05.07.2004, 1 male, 4 female; 05.07.2005, 9 male, 16 female; 01.08.2006, 6 male, 6 female (42); 06.07.2005, 1 male, 1 female; 02.08.2006, 1 male (48); 02.08.2006, 2 male, 1 female (49); 15.08.2006, 2 male, 2 female (55); 08.07.2004, 2 male, 1 female (58); 03.08.2006, 2 male, 29 female (59).
Distribution in the world: Albania, Austria, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Greece, Hungary, Macedonia, Romania, Slovakia, Slovenia, Turkey, Ukraine, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey**:** Artvin, Erzurum (Kasapoğlu, 2002); Balıkesir, Bitlis, Bolu, Bursa, Çanakkale, Diyarbakır, Edirne, Erzincan, Gümüşhane, İstanbul, Kars, Kırklareli, Ordu, Rize, Sinop, Sivas, Tekirdağ, Van (Jäch, 1993a).
Remark: First record for the province of Bilecik.

Limnebius* (s.str.) *rubropiceus Kuwert, 1890
Material examined: 30.07.2004, 5 male, 1 female (32).
Distribution in the world: Armenia, Greece, Macedonia, Turkey (Jäch, 2004).
Distribution in Turkey: Artvin, Erzurum (Kasapoğlu, 2002); Bolu, Edirne, İstanbul, Kars, Kayseri, Rize, Tekirdağ (Jäch, 1993a).
Remark: First record for the province of Bilecik.

Subgenus: *Bilimneus* Leach, 1883

Limnebius (Bilimneus) corfidius d'Orchymont, 1945
Materials examined: 08.07.2005, 1 male, 5 female (15); 09.07.2005, 2 male (16); 13.08.2005, 1 male (34); 09.08.2006, 1 male (39); 08.07.2005, 1 male (60); 08.07.2005, 1 male, 2 female (70); 03.08.2006, 1 male (71).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Balıkesir, Bursa, Çanakkale, İstanbul, Muğla (Jäch, 1993a).
Remark: First record for the province of Bilecik.

Limnebius (Bilimneus) atomus (Duftschmid, 1805)
Materials examined: 02.08.2006, 3 male, 1 female (9), 02.08.2006, 1 male (23); 01.08.2006, 1 male, 4 female (42); 06.07.2004, 1 male (45); 02.08.2006, 1 male, 2 female (46); 03.07.2004, 1 male, 1 female, 21.08.2004, 1 male (78).
Distribution in the world: Albania, Austria, Belarus, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Finland, France, Great Britain, Greece, Hungary, Italy, Macedonia, Norway, Poland, Romania, Russia, Russia: West Siberia, Slovakia, Switzerland, The Netherlands, Turkey, Ukraine, Yugoslavia (Serbia, Montenegro),. (Jäch, 2004).
Distribution in Turkey: Bursa, Kırklareli, Samsun (Jäch, 1993a).
Remark: First record for the provinces of Bilecik and Sakarya.

Limnebius (Bilimneus) corybus d'Orchymont, 1945
Materials examined: 09.07.2005, 2 male, 05.08.2006, 1 male (17), 09.07.2005, 1 male (19); 08.07.2004, 1 male (59); 07.07.2005, 1 male, 1 female (65), 16.08.2005, 2 male, 3 female (67); 04.08.2006, 8 male, 6 female (70), 05.08.2006, 1 male, 1 female (76).
Distribution in the world: Greece, Turkey (Jäch, 2004).
Distribution in Turkey: Balıkesir, Bitlis, Bursa, Çanakkale, Gümüşhane, Muğla, Ordu (Jäch, 1993a); Erzurum (Kasapoğlu, 2002).

Limnebius (Bilimneus) myrmidon Rey, 1883
Materials examined: 09.07.2005, 1 male (16), 31.08.2005, 3 male (17); 30.07.2004, 2 male, 6 female, 13.08.2005, 1 male, 1 female (34); 09.08.2006, 9 male, 18 female (39); 07.07.2004, 1 male, 1 female, 24.08.2004, 14 male, 7 female (56); 24.08.2004, 1 male, 1 female, 15.08.2005, 3 male (64).
Distribution in the world: Austria, Bosnia Herzegovina, Bulgaria, Croatia, France, Greece, Italy, Poland, Slovenia, Spain, Turkey, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Artvin, Erzurum (Kasapoğlu, 2002); Balıkesir, Bitlis, Bursa, Çanakkale, İstanbul, Muğla, Ordu (Jäch, 1993a).
Remark: First record for the province of Bilecik.

Limnebius (Bilimneus) perparvulus Rey, 1884
Materials examined: 23.08.2004, 25 male, 23 female (1); 06.07.2004, 12 male, 10 female, 23.08.2004, 10 male, 44 female (3); 07.07.2004, 36 male, 48 female (5); 24.08.2004, 25 male, 10 female, 07.07.2005, 14 male, 89 female, 02.08.2006, 18 male, 24 female (7); 08.07.2005, 4 male, 5 female (15); 09.07.2005, 34 male, 28 female, 05.08.2006, 24 male, 26 female (16); 31.08.2005, 24 male, 19 female (17); 05.08.2006, 31 male, 19 female (18); 31.08.2005, 11 male, 9 female (19); 15.08.2005, 15 male, 27 female (20); 15.08.2005, 1 male, 2 female (21); 03.08.2006, 18 male, 39 female (24); 05.08.2006, 19 male, 47 female (25); 05.08.2006, 3 male, 2 female (26); 05.08.2006, 5 male, 16 female (27); 27.08.2004, 4 male, 11 female (35); 27.08.2004, 4 male (36); 13.08.2005, 10 male, 35 female, 09.08.2006, 30 male, 41 female (38); 09.08.2006, 1 male (39); 24.08.2004, 1 male, 2 female, 05.07.2005, 1 male, 3 female (41); 23.08.2004, 1 male (47); 23.08.2004, 1 male, 4 female (48); 06.07.2004, 8 male, 2 female, 23.08.2004, 21 male, 19 female, 02.08.2006, 4 male, 24 female (49); 09.07.2005, 2 male, 2 female (52); 17.08.2005, 6 male, 5 female (53); 15.08.2006, 32 male, 47 female (54); 15.08.2006, 9 male, 29 female (55); 07.07.2004, 29 male, 33 female, 24.08.2004, 8 male, 15 female (56); 08.07.2004, 2 male, 2 female (58); 08.07.2004, , 7 male, 14 female (59); 08.07.2004, 1 male, 1 female, 08.07.2005, 15 male, 29 female (60); 07.07.2005, 4 male, 11 female, 16.08.2005, 15 male, 14 female, 03.08.2006, 13 male, 21 female (61); 08.07.2004, 25 male, 7 female (62); 15.08.2005, 58 male, 74 female (64); 07.07.2005, 16 male, 21 female (65); 16.08.2005, 74 male, 47 female (67); 04.08.2006, 36 male, 58 female (68); 08.07.2005, 1 male, 3 female (69); 04.08.2006, 9 male, 27 female (70); 03.08.2006, 2 male, 9 female (71); 03.08.2006, 15 male, 13 female (72); 03.08.2006, 1 male, 3 female (73); 04.08.2006, 13 male, 46 female (74); 04.08.2006, 25 male, 53 female (75); 21.08.2004, 17male, 38 female (77).
Distribution in the world: Albania, Algeria, Bosnia Herzegovina, France, Greece, Israel, Italy, Lebanon, Morocco, Tunisia, Turkey (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu 2002); Ankara, Antalya, Balıkesir, Çanakkale, Diyarbakır, Hatay, İzmir, Kocaeli, Mersin, Muğla, Tekirdağ (Jäch, 1993a).
Remark: First record for the provinces of Bilecik, Bursa and Kocaeli.

Genus: *Ochthebius* Leach, 1815
Subgenus: *Ochthebius* Leach, 1815

Ochthebius* (s.str.) *metallescens metallescens Rosenhauer, 1847
Materials examined: 13.08.2005, 1 male, 5 female (37); 06.07.2004, 1 male, 1 female; 23.08.2004, 1 male (49); 15.08.2006, 1 male (55).
Distribution in the world: Albania, Austria, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Great Britain, Greece, Italy, Macedonia, Poland, Romania, Slovakia,

Slovenia, Spain, Switzerland, The Netherlands, Turkey, Ukraine, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Bursa, Erzincan, Kahramanmaraş, Toros dağları (Jäch, 1999).
Remark: First record for the provinces of Bilecik.

Ochthebius* (s.str.) *difficilis Mulsant, 1844
Materials examined: 23.08.2004, 1 male (3); 08.07.2005, 10 male, 8 female (5); 08.07.2004, 1 male, 3 female (58); 08.07.2004, 7 male, 3 female (59); 08.07.2004, 1 male, 07.07.2005, 1 male, 1 female (61).
Distribution in the world: Albania, Algeria, Armenia, Bosnia Herzegovina, Cyprus, France, Georgia, Greece, Iran, Israel, Italy, Lebanon, Morocco, Spain, Syria, Tunisia, Turkey (Jäch, 2004).
Distribution in Turkey: Artvin, Erzurum (Kasapoğlu, 2002); Adıyaman, Antalya, Bayburt, Bitlis, Gaziantep, Gümüşhane, İzmir, Kars, Kilis, Konya, Malatya, Manisa, Mersin, Muğla, Muş, Siirt, Ordu, Tekirdağ, Van (Jäch, 1992b).
Remark: First record for the provinces of Balıkesir and Çanakkale.

Ochthebius* (s.str.) *fausti Sharp, 1887
Materials examined: 06.07.2005, 17 male, 17 female (11); 09.07.2005, 4 male, 1 female (18); 31.08.2005, 28 male, 38 female (19); 09.07.2005, 1 male (52); 03.08.2006, 5 male (71).
Distribution in the world: Bulgaria, Greece, Iran, Russia: South European Territory, Turkey, Turkmenistan (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Ankara, Gaziantep, İzmir, Manisa, Sivas (Jäch, 1991).
Remark: First record for the provinces of Balıkesir, Bursa and Çanakkale.

Ochthebius* (s.str.) *foveolatus Germar, 1824
Materials examined: 23.08.2004, 13 male, 29 female, 15.08.2005, 15 male, 19 female (1); 06.07.2004, 4 male, 7 female, 23.08.2004, 5 male, 7 female (3); 24.08.2004, 6 male, 2 female, 07.07.2005, 15 male, 9 female, 02.08.2006, 3 male, 5 female (7); 08.07.2005, 2 male, 4 female (15); 09.07.2005, 1 male, 1 female (16); 09.07.2005, 5 male, 10 female, 05.08.2006, 11 male, 25 female (18); 09.08.2006, 4 male, 10 female (38); 05.07.2005, 1 male (41); 23.08.2004, 3 male, 2 female, 02.08.2006, 1 male, 1 female (49); 17.08.2005, 34 male, 36 female (53), 15.08.2006, 12 male, 19 female (54), 15.08.2006, 14 male, 19 female (55); 15.08.2005, 16 male, 8 female (64); 24.08.2004, 1 male, 07.07.2005, 1 male, 1 female (65).
Distribution in the world: Austria, Bosnia Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, France, Great Britain, Italy, Poland, Romania, Slovakia, Yugoslavia (Serbia, Montenegro), Turkey (Jäch, 2004).
Distribution in Turkey: Ankara, Balıkesir, Erzurum, İzmir, İzmit, Ordu, Sivas (Jäch, 1991; Kasapoğlu, 2002).
Remark: First record for the provinces of Bilecik, Bursa and Çanakkale.

Ochthebius* (s.str.) *inconspicuus Jäch, 1991
Materials examined: 07.07.2004, 5 male, 2 female (5), 08.07.2004, 40 male, 20 female (59).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Sinop (Jäch, 1991).
Remark: First record for the provinces of Balıkesir and Çanakkale.

Ochthebius* (s.str.) *lividipennis Peyron, 1858
Materials examined: 06.07.2004, 15 male, 12 female, 23.08.2004, 1 male (1); 09.07.2005, 20 male, 36 female (2); 08.07.2005, 1 male, 1 female (4); 07.07.2004, 5 male, 2 female, 08.07.2005, 1 male (5); 24.08.2004, 2 male, 6 female, 07.07.2005, 1 male, 02.08.2006, 14 male, 9 female (7); 24.07.2004, 11 male, 13 female (8); 06.07.2005, 9 male, 18 female, 02.08.2006, 21 male, 26 female (9); 06.07.2005, 5 male, 7 female (10), 06.07.2005, 1 male, 1 female (11); 09.07.2005, 1 male, 3 female (16); 05.08.2006, 1 male, 1 female (19); 15.08.2005, 10 male, 17 female (20); 15.08.2005, 1 male (22); 02.08.2006, 5 male, 9 female (23); 03.08.2006, 2 male, 5 female (24); 01.08.2006, 1 male (42); 06.07.2004, 1 male (45);

9 male, 15 female (46); 23.08.2004, 7 male, 4 female, 06.07.2005, 2 male, 8 female, 16.08.2005, 11 male, 9 female (47); 06.07.2004, 3 male, 4 female, 23.08.2004, 2 male, 1 female, 06.07.2005, 1 male, 1 female, 02.08.2006, 2 male, 3 female (48); 02.08.2006, 2 male, 8 female (49); 17.08.2005, 5 male (53); 08.07.2004, 1 male, 1 female (57); 08.07.2004, 1 male, 5 female (58); 08 07 2004, 3 male, 03.08.2006, 1 male, 1 female (59); 03.08.2006, 5 male (61); 08.07.2004, 1 male, 24.08.2004, 21 male, 31 female (63); 24.08.2004, 14 male, 17 female (65); 07.07.2005, 9 male (66); 08.07.2005, 1 male (69); 04.08.2006, 1 male (70); 03.08.2006, 18 male, 25 female (71); 03.08.2006, 1 male, 1 female (72); 03.08.2006, 3 male, 8 female (73); 04.08.2006, 1male (76).
Distribution in the world: Azerbaijan, Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Egypt, Greece, Hungary, Iran, Israel, Italy, Poland, Romania, Slovakia, Syria, Turkey, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Adana, Antalya, Diyarbakır, Edirne, Gaziantep, Hatay, Iğdır, İzmir, Kars, Kırklareli, Kilis, Mersin, Sivas, Şanlıurfa (Jäch, 1992c).
Remark: First record for the provinces of Balıkesir, Bursa and Çanakkale.

Ochthebius* (s.str.) *mediterraneus (Ienistea, 1988)
Materials examined: 09.07.2005, 2 male, 1 female (16), 05.08.2006, 4 male (18); 09.07.2005, 2 male, 1 female (19); 03.08.2006, 2 male, 8 female (24); 05.08.2006, 3 male, 1 female (27); 02.08.2006, 1 male (49); 09.07.2005, 1 male (52); 15.08.2006, 1 male (54); 08.07.2004, 40 male, 20 female (59); 07.07.2005, 1 male, 2 female, 03.08.2006, 28 male, 20 female (61); 16.08.2005, 4 male, 2 female (67); 08.07.2005, 18 male, 26 female, 04.08.2006, 11 male, 19 female (68); 09.08.2006, 9 male, 9 female (77).
Distribution in the world: Albania, Algeria, Azerbaijan, Bosnia Herzegovina, Bulgaria, France, Greece, Italy, Morocco, Spain, Turkey (Jäch, 2004).
Distribution in Turkey: Artvin (Kasapoğlu, 2002); Ankara, Balıkesir, Çanakkale, İzmir, İzmit, Sivas, Trabzon (Jäch, 1991).
Remark: First record for the province of Bursa.

Ochthebius* (s.str.) *meridionalis Rey, 1885
Materials examined: 07.07.2005, 1 male, 3 female (13), 06.07.2004, 1 male, 2 female (49).
Distribution in the world: Armenia, Austria, Azerbaijan, Bulgaria, Croatia, Czech Republic, Egypt, France, Greece, Hungary, Iran, Iraq, , srael, Italy, Morocco, Poland, Romania, Russia: South European Territory, Saudi Arabia, Slovakia, Spain, Switzerland, Tunisia, Turkey, Turkmenistan, Ukraine, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Burdur, Çorum, Kars, Konya, Samsun, Van (Jäch, 1992c).
Remark: First record for the provinces of Balıkesir and Bursa.

Ochthebius* (s.str.) *ragusae Kuwert, 1887
Materials examined: 06.07.2004, 1 male, 3 female (3).
Distribution in the world: Afghanistan, Albania, Azerbaijan, Cyprus, Egypt: Sinai, France, Georgia, Greece, Iran, Israel, Italy, Lebanon, Macedonia, Saudi Arabia, Tajikistan, Turkey, Turkmenistan, Uzbekistan (Jäch, 2004).
Distribution in Turkey: Ankara, Bitlis, Burdur, Erzincan, Erzurum, Gümüşhane, Mersin, Niğde, Van (Jäch, 1989a; Kasapoğlu, 2002).
Remark: First record for the province of Balıkesir.

Ochthebius* (s.str.) *uskubensis Hebauer, 1986
Materials examined: 09.07.2005, 3 male, 2 female, 05.08.2006, 17 male, 23 female (18); 09.07.2005, 8 male, 12 female, 31.08.2005, 8 male, 13 female (19); 05.08.2006, 35 male, 32 female (27); 06.07.2005, 1 male, 1 female (48); 23.08.2004, 5 male, 8 female, 02.08.2006, 6 male, 12 female (49); 09.07.2005, 1 male, 2 female (52).
Distribution in the world: Albania, Bulgaria, Caucasus, Macedonia, Turkey (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Sivas (Jäch, 1992c).
Remark: First record for the provinces of Balıkesir and Bursa.

Ochthebius* (s. str.) *pusillus Stephens, 1835
Materials examined: 09.07.2005, 9 male, 6 female (2); 07.07.2004, 20 male, 34 female (6); 07.07.2005, 1 male, 1 female, 02.08.2006, 1 male (7); 07.07.2005, 4 male, 21 female (8); 06.07.2005, 16 male, 13 female, 02.08.2006, 8 male, 13 female (9); 06.07.2005, 1 male (10); 07.07.2005, 4 male, 5 female (12); 09.07.2005, 2 male, 1 female, 05.08.2006, 33 male, 36 female (19); 15.08.2005, 8 male, 10 female (20); 15.08.2005, 7 male, 8 female (21); 02.08.2006, 1 male (23); 03.08.2006, 1 male, 1 female (24); 05.08.2006, 1 male (27); 03.07.2004, 2 male, 2 female (29); 01.08.2006, 3 male, 2 female (42); 06.07.2004, 4 male, 2 female (45); 21.08.2004, 1 male, 02.08.2006, 7 male, 16 female (46); 23.08.2004, 5 male, 7 female, 16.08.2005, 3 male, 2 female (47); 23.08.2004, 1 male, 1 female, 02.08.2006, 3 male (48); 02.08.2006, 1 male, 3 female (49); 16.08.2005, 1 male (61); 07.07.2005, 1 male, 03.08.2006, 3 male, 2 female (66); 03.08.2006, 1 male (72); 23.08.2004, 1 male (78).
Distribution in the world: Albania, Austria, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Great Britain, Greece, Hungary, Italy, Lithuania, Luxembourg, Moldavia, Poland, Romania, Russia, Slovakia, Slovenia, Switzerland, The Netherlands, Turkey, Ukraine, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Balıkesir, Edirne, İstanbul, Kastamonu, Kırklareli, Samsun (Jäch, 1992c).
Remark: First record for the provinces of Bilecik, Bursa, Çanakkale and Sakarya.

Subgenus: *Asiobates* Thomson, 1859

Ochthebius (Asiobates) minimus (Fabricius, 1792)
Materials examined: 06.07.2004, 1 male, 2 female, 15.08.2005, 1 male, 2 female (1); 24.08.2004, 1 male, 2 female, 02.08.2006, 3 male, 2 female (7); 24.07.2004, 1 male, 1 female (8); 06.07.2005, 28 male, 18 female, 02.08.2006, 5 male, 13 female (9); 06.07.2005, 2 male, 1 female (10); 15.08.2005, 6 male, 5 female (20); 02.08.2006, 1 male, 2 female (23); 03.07.2004, 9 male, 5 female (29); 09.08.2006, 1 male, 1 female (39); 06.07.2005, 3 male (46); 23.08.2004, 7 male, 9 female, 06.07.2005, 1 male, 1 female, 16.08.2005, 1 male, 2 female (47); 15.08.2006, 45 male, 40 female (55).
Distribution in the world: Austria, Belarus, Belgium, Bosnia Herzegovina, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Macedonia, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Swedan, Switzerland, The Netherlands, Turkey, Ukraine, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Samsun (Jäch, 1990a).
Remark: First record for the provinces of Balıkesir, Bilecik and Bursa.

Ochthebius (Asiobates) striatus (Laporte, 1840)
Materials examined: 08.07.2005, 1 male (14); 01.08.2006, 1 male, 5 female (42); 06.07.2004, 2 male (48).
Distribution in the world: Albania, Croatia, Cyprus, Greece, Hungary, Israel, Lebanon, Russia: South European Territory, Turkey, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Artvin, Balıkesir, Bitlis, Çanakkale, Diyarbakır, Gaziantep, Hakkari, Hatay, İstanbul, İzmir, Kastamonu, Mersin, Siirt, Tekirdağ (Jäch, 1990a).
Remark: First record for the province of Bursa.

Genus: *Hydraena* Kugelann, 1794
Subgenus: *Hydraena* Kugelann, 1794

Hydraena* (s.str.) *bodemeyeri Jäch & Diaz, 2001
Materials examined: 30.07.2004, 1 male, 22 female (34); 01.08.2006, 1 male (42); 13.08.2005, 1 male, 3 female, 01.08.2006, 1 male (50); 21.08.2004, 1 male, 5 female (77).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Bursa (Jäch and Diaz, 2001).
Remark: First record for the provinces of Bilecik and Kocaeli.

Hydraena* (s.str.) *ancyrae Jäch, 1992
Materials examined: 30.07.2004, 10 male, 26 female (32); 30.07.2004, 3 male, 26 female (33); 13.08.2005, 4 male, 5 female(34); 27.08.2004, 1 male (36); 01.08.2006, 1 male (42); 21.08.2004, 1 male, 09.08.2006, 1 male (77).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Amasya, Ankara, Artvin, Çankırı, Erzurum, İzmit, Kars, Kastamonu, Ordu, Rize, Trabzon (Jäch, 1992a).
Remark: First record for the provinces of Bilecik and Bursa.

Hydraena* (s.str.) *falcata Jäch, 1992
Materials examined: 09.08.2006, 2 male, 4 female (32); 13.08.2005, 1 male (34); 27.08.2004, 1 male (36); 04.07.2004, 4 male, 2 female (40); 24.07.2004, 2 male, 13.08.2005, 6 male, 01.08.2006, 3 male (50); 24.07.2004, 1 male, 4 female (51).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Kastamonu, Sinop (Jäch, 1992c).
Remark: First record for the provinces of Bilecik and Bursa.

Hydraena* (s.str.) *grandis Reitter, 1885
Materials examined: 08.07.2004, 1 male (59).
Distribution in the world: Bosnia-Herzegovina, Bulgaria, Greece, Macedonia, Romania, Turkey, Yugoslavia (Jäch, 2004).
Distribution in Turkey: Artvin, Erzurum (Kasapoğlu, 2002); Diyarbakır (Jäch, 1988b).
Remark: First record for the province of Çanakkale.

Hydraena* (s.str.) *lapissectilis Jäch, 1992
Materials examined: 05.08.2006, 1 male, 1 female (28); 06.07.2004, 1 male, 2 female (48); 08.07.2004, 1 male, 2 female (59); 04.08.2006, 1 male, 1 female (76).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Muğla (Jäch, 1992a).
Remark: First record for the provinces of Balıkesir, Bursa and Çanakkale.

Hydraena* (s.str.) *prusensis Jäch, 1992
Materials examined: 24.07.2004, 3 male, 13.08.2005, 4 male, 3 female, 01.08.2006, 3 male (50).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Bursa (Jäch, 1992a).

Hydraena* (s.str.) *helena d'Orchymont, 1929
Materials examined: 08.07.2005, 1 male (15); 03.07.2004, 1 male, 2 female (30); 09.08.2006, 22 male, 37 female (32); 30.07.2004, 5 male, 14 female, 13.08.2005, 7 male, 10 female (34); 27.08.2004, 4 male, 7female (35); 27.08.2004, 6 male, 2 female (36); 13.08.2005, 10 male, 29 female (37); 13.08.2005, 1 male (38); 09.08.2006, 8 male, 9 female (39); 05.07.2005, 1 male, 2 female (41); 05.07.2005, 22 male, 25 female, 01.08.2006, 5 male, 12 female (42); 05.07.2004, 2 male, 1 female (43); 05.07.2004, 2 male (44); 06.07.2004, 7 male, 16 female, 06.07.2005, 1 male, 2 female (48); 02.08.2006, 1 male, 2 female (49); 13.08.2005, 1 male, 3 female (50); 03.08.2006, 1 male (59); 08.07.2004, 1 male (60); 24.08.2004, 3 male (65); 04.08.2006, 3 male, (74); 21.08.2004, 2 male, 09.08.2006, 1 male (77).
Distribution in the world: Bulgaria, Greece, Macedonia, Turkey, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Antakya, Bitlis, Çanakkale, Diyarbakır (Jach, 1988a; 1988b); Artvin, Erzurum (Kasapoğlu, 2002).
Remark: First record for the provinces of Balıkesir, Bilecik, Bursa and İzmit.

Hydraena* (s.str.) *grata d'Orchymont, 1944
Materials examined: 09.08.2006, 3 male (32); 30.07.2004, 5 male, 3 female (33); 30.07.2004, 9 male; 13.08.2005, 6 male (34); 13.08.2005, 4 male, 2 female (37);

09.08.2006, 2 male, 3 female (39); 05.07.2004, 1 male; 05.07.2005, 3 male, 6 female (42); 13.08.2005, 2 male, 2 female (50); 08.07.2004, 1 male (58).
Distribution in the world: Greece, Turkey (Jäch, 2004).
Distribution in Turkey: İstanbul, İzmir, Manisa (d'Orchymont A., 1944).
Remark: First record for the provinces of Bilecik, Bursa and Çanakkale.

Hydraena* (s.str.) *anatolica Janssens, 1963
Materials examined: 30.07.2004, 1 male, 2 female (34).
Distribution in the world: Azerbaijan, Turkey (Jäch, 2004).
Distribution in Turkey: Artvin (Kasapoğlu, 2002); Bitlis, Bolu, Erzincan, Erzurum, Gümüşhane, Hakkari, İstanbul, Kars (Jach, 1995).
Remark: First record for the province of Bilecik.

Hydraena* (s.str.) *plastica d'Orchymont, 1943
Materials examined: 24.07.2004, 1 male, 01.08.2006, 1 male (50).
Distribution in the world: Turkey (Jäch, 2004).
Distribution in Turkey: Bursa (Jäch, 1992a).

Hydraena* (s.str.) *paganettii Ganglbauer, 1901
Materials examined: 09.07.2005, 1 male, 2 female (16), 15.08.2006, 1 male, 1 female (55), 21.08.2004, 7 male, 11 female (77).
Distribution in the world: Austria, Azerbaijan, Bosnia Herzegovina, Croatia, Czech Republic, Greece, Hungary, Israel, Italy, Lebanon, Macedonia, Romania, Slovakia, Turkey, Yugoslavia (Serbia, Montenegro) (Jäch, 2004).
Distribution in Turkey: Erzurum (Kasapoğlu, 2002); Afyon, Mersin (Jäch, 1988a).
Remark: First record for the provinces of Balıkesir, Bursa and İzmit.

CONCLUSION AND DISCUSSION

A total of 5194 specimens belonging to 3 genera of Hydraenidae family were determined during the present study. The most abundant species were *L. perparvulus* (40.2%), *O. lividipennis* (10.8%), *O. foveolatus* (7.3%), *O. pusillus* (6.5%) and *H. helena* (5.6%). Sample numbers of these species form 70.4% of total samples (Figure 2).

This study is hoped to contribute the information about the Hydraenidae fauna of Turkey.

It is assumed that the Hydraenidae species might have wider distribution areas because of South Marmara Region (Turkey) is important part of migration way between Europe and Anatolia since glacial age.

The Hydraenidae species which is new record for the provinces of South Marmara Region (Turkey) are given in table 2.

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Table 1. Numbers for the map refer to sampling sites listed in Figure 1

Locality	Provinces	Exact locality, types of water sources	Coordinates	Altitudes
1	Balıkesir	Susurluk-Balıkesir road 4.km. Susurluk stream,	N: 39.53.826 E: 028.09.603	46 m
2	Balıkesir	Balıkesir-Kepsut road 5.km, Üzümcü stream	N: 39.40.988 E: 027.57.745	116 m
3	Balıkesir	Kepsut, Üzümcü stream	N: 39.41.076 E: 028.08.895	86 m
4	Balıkesir	Balıkesir-Bigadiç road, 5km to Bigadiç, Simav stream	N: 39.24.893 E: 028.06.028	86 m
5	Balıkesir	Gölcük-Balıkesir road, Üzümcü stream	N: 39.21.028 E: 027.57.996	271 m
6	Balıkesir	Gölcük-Balıkesir road, 20km to Balıkesir, Pamukçu village	N: 39.27.360 E: 027.54.819	186 m
7	Balıkesir	Gönen-Manyas road, Kayacaköy, Koca stream	N: 40.04.419 E: 027.57.866	32 m
8	Balıkesir	Gönen-Manyas road 5.km, Çarpeş bridge	N: 40.06.189 E: 027.41.078	46 m
9	Balıkesir	Karacabey-Bandırma road 3. km, Karadere bridge	N: 40.13.633 E: 028.19.900	14 m
10	Balıkesir	Karacabey-Bandırma road 7. km, Ağadeğirmeni bridge	N: 40.14.260 E: 028.17.675	23 m
11	Balıkesir	Bandırma-Gönen road, 10 km to Gönen, Çerpeş stream	N: 40.09.144 E: 027.41.136	41 m
12	Balıkesir	Gönen-Manyas road 15. km, Şevketiye village	N: 40.06.555 E: 027.42.848	74 m
13	Balıkesir	Gönen-Biga road 10. km, Sarıdere-1 bridge	N: 40.11.998 E: 027.36.433	34 m
14	Balıkesir	Balıkesir-Bigadiç road, 7 km to Bigadiç, Simav stream	N:39.24.785 E: 028.06.030	85 m
15	Balıkesir	Gölcük, Üzümcü stream	N: 39.13.443 E: 28.07.413	249 m
16	Balıkesir	Kepsut-Harmancık road 6. km, Değirmençay bridge	N: 39.39.082 E: 028.12.748	164 m
17	Balıkesir	Dursunbey-Harmancık road 6. km, Balat stream	N: 39.36.990 E: 028.39.157	607 m
18	Balıkesir	Dursunbey-Harmancık road 25. km, Emet stream	N: 39.37.565 E: 028.47.644	320 m
19	Balıkesir	Dursunbey-Harmancık road 40. km, Emet stream	N: 39.37.300 E: 028.56.166	347 m
20	Balıkesir	Susurluk-Manyas road, Çamlıköy bridge	N: 40.03.335 E: 028.03.435	27 m
21	Balıkesir	Susurluk-Manyas road, Tellibağ village	N: 40.03.576 E: 028.02.137	26 m
22	Balıkesir	Gönen-Balya road, 10 km to Balya, Koca stream	N: 39.46.207 E: 027.36.137	130 m
23	Balıkesir	Bandırma-Manyas road, Kuş lake	N: 40.07.368 E: 028.03.397	16 m
24	Balıkesir	Gönen-Biga road 8. km, Keçidere bridge	N: 40.11.240 E: 027.36.596	31 m
25	Balıkesir	Havran-Balıkesir road 10. km, Gelinderesi-8 bridge	N: 39.34.080 E: 027.14.142	324 m
26	Balıkesir	Havran-Balıkesir road 30. km, Dedeler bridge	N: 39.36.143 E: 027.31.539	187 m

27	Balıkesir	Balıkesir-Harmancık road, 28 km to Harmancık, Emet stream	N: 39.37.146 E: 028.54.040	192 m
28	Balıkesir	Dursunbey-Harmancık road, 5 km to Harmancık, Emet stream	N: 39.40.288 E: 029.06.171	624 m
29	Bilecik	Bozüyük-Bilecik road 12 km. Karaköy	N: 39.56.547 E: 030.01.299	219 m
30	Bilecik	Bozüyük-Bilecik road 22. km. Karasu stream	N: 40.03.831 E: 030.00.922	202 m
31	Bilecik	Bilecik-Osmaneli road, 10. km from Osmaneli, Sakarya stream	N: 40.23.443 E: 029.59.299	106 m
32	Bilecik	Bozüyük-Bursa road, Aksutekke village, Mezit stream	N: 39.54.291 E: 029.49.102	793 m
33	Bilecik	Bozüyük-Bursa road 18. km, Mezit stream	N: 39.54.407 E: 029.48.485	791 m
34	Bilecik	Bozüyük-Bursa road 20. km, Mezit stream	N: 39.55.122 E: 029.46.361	500 m
35	Bilecik	İnegöl-Eskişehir road, Mezit stream, Mezit-2 bridge	N: 39.59.277 E: 029.39.078	680 m
36	Bilecik	İnegöl-Eskişehir road, Mezit stream, Mezit-11 bridge	N: 39.55.111 E: 029.46.374	735 m
37	Bilecik	Bozüyük-Bursa road 30. km, Mezit stream	N: 39.56.115 E: 029.43.017	540 m
38	Bilecik	Bozüyük-Bursa road 35. km, Mezit stream	N: 39.59.187 E: 029.39.139	393 m
39	Bilecik	Bozüyük-Bursa road 25. km, Mezit stream	N: 39.55.410 E: 029.44.181	622 m
40	Bursa	Uludağ-Sarıalan area	N: 40.07.830 E: 029.06.858	1636 m
41	Bursa	Bursa- Keles road, Misi village, Misi stream	N: 40.10.776 E: 028.58.422	156 m
42	Bursa	Misi village, Misi dam	N: 40.08.319 E: 028.56.657	490 m
43	Bursa	Bursa-Keles road, 30 km to Keles, Orhaneli stream	N: 40.04.886 E: 029.00.105	350 m
44	Bursa	Bursa-Orhaneli road, Orhaneli stream	N: 40.05.211 E: 028.55.994	361 m
45	Bursa	Bursa-Karacabey road, 10 km to Karacabey, Simav stream	N: 40.12.854 E: 028.28.766	16 m
46	Bursa	Bursa-Karacabey road, Uluabat bridge	N: 40.12.851 E: 028.26.768	19 m
47	Bursa	Bursa-Karacabey, Canbolu stream	N: 40.11.749 E: 028.21.182	13 m
48	Bursa	Mustafakemalpaşa-Çaltılıbük road, Hacıali stream	N: 39.58.293 E: 028.31.111	45 m
49	Bursa	Mustafakemalpaşa-Çaltılıbük road, Aliova stream	N: 39.58.289 E: 028.31.119	43 m
50	Bursa	Kestel, Seyitabat fall	N: 40.08.540 E: 029.13.348	556 m
51	Bursa	Seyitabat fall-Bursa road 5. km	N:40.08.510, E: 029. 13. 341	542 m
52	Bursa	Orhaneli-Bursa road, Kocasu bridge, Orhaneli stream	N: 39.55.949 E: 028.58.292	362 m
53	Bursa	İnegöl-Yenişehir road 10. km, Hamzabey bridge	N: 40.08.128 E: 029.31.015	270 m
54	Bursa	İnegöl-Oylat road, Gündüzlü bridge	N: 39.58.599 E: 029.36.416	361 m
55	Bursa	İnegöl-Domaniç road 11. km, Göksu stream	N: 39.58.577 E: 029.36.444	360 m

56	Çanakkale	Balya-Yenice road 38. km, Gönen stream	N: 39.50.053 E: 027.19.890	179 m
57	Çanakkale	Yenice-Çan road, Çan stream	N: 40.01.528 E: 027.03.120	73 m
58	Çanakkale	Çan-Bayramiç road, 10 km to Bayramiç	N: 39.52.725 E: 026.40.577	152 m
59	Çanakkale	Bayramiç-Yiğitler road, Küçükmenderes stream	N: 39.50.095 E: 026.36.336	75 m
60	Çanakkale	Ayvacık-Behramkale road, Tuzla stream	N: 39.29.959 E: 026.19.964	109 m
61	Çanakkale	Çanakkale-Çan road 10. km, Atıkhisar dam	N: 40.07.778 E: 026.30.642	54 m
62	Çanakkale	Biga-Gönen road, Biga stream	N: 40.07.784 E: 026.30.644	54 m
63	Çanakkale	Biga-Gönen road, Gönen stream,	N: 40.06.671 E: 027.38.828	51 m
64	Çanakkale	Balya-Yenice road, Müstecap stream	N: 39.45.080 E: 027.31.541	209 m
65	Çanakkale	Çan-Biga road 15. km, Çan stream	N: 40.07.055 E: 027.11.256	51 m
66	Çanakkale	Gündoğdu-Beyçayı road, Gündoğdu bridge	N: 40.15.768 E: 027.05.293	38 m
67	Çanakkale	Çanakkale-Çan road, Serçeler village, Çanakkale stream	N: 40.03.373 E: 026.35.628	105 m
68	Çanakkale	Bayramiç-Ezine road, Harharik bridge	N: 39.46.368 E: 026.25.604	50 m
69	Çanakkale	Ezine-Ayvacık road, Bahçeli bridge	N: 39.41.346 E: 026.23.455	91 m
70	Çanakkale	Ayvacık-Behramkale road, Avçay bridge	N: 39.35.224 E: 026.23.814	263 m
71	Çanakkale	Biga-Bakacak road 10. km, Biga stream	N: 40.12.493 E: 027.07.356	27 m
72	Çanakkale	Çanakkale-Çan road, Şerbetli bridge	N: 40.00.462 E: 026.51.454	129 m
73	Çanakkale	Çanakkale-Çan road, Ahlatlıburun bridge	N: 40.00.430 E: 026.52.127	135 m
74	Çanakkale	Bayramiç-Evciler road 10. km, Küçükmenderes stream	N: 39.46.320 E: 026.41.307	160 m
75	Çanakkale	Bayramiç-Evciler road, 30. km Küçükmenderes stream	N: 39.47.213 E: 026.43.034	162 m
76	Çanakkale	Evciler-Ayazma road, Kaz mountain	N: 39.45.134 E: 026.48.360	340 m
77	Kocaeli	Karamürsel-İznik road 20. km, Yalakdere village	N: 40.34.599 E: 029.31.423	121 m
78	Sakarya	Bilecik-Adapazarı road, Derbent village, Sapanca lake	N: 40.42.150 E: 030.18.556	34 m

Table 2. The Hydraenidae species which is new record for the provinces of South Marmara Region (Turkey)

Species	Balıkesir	Bilecik	Bursa	Çanakkale	Kocaeli	Sakarya
Limnebius claviger		X	X	X		
Limnebius stagnalis		X				
Limnebius rubropiceus		X				
Limnebius corfidius		X				
Limnebius atomus	X					X
Limnebius myrmidon		X				
Limnebius perparvulus		X	X		X	
Ochthebius metallescens		X				
Ochthebius difficilis	X			X		
Ochthebius fausti	X		X	X		
Ochthebius foveolatus		X	X	X		
Ochthebius inconspicuus	X			X		
Ochthebius lividipennis	X		X	X		
Ochthebius mediterraneus			X			
Ochthebius meridionalis	X		X			
Ochthebius ragusae	X					
Ochthebius uskubensis	X		X			
Ochthebius pusillus		X	X	X		X
Ochthebius minimus	X	X	X			
Ochthebius striatus			X			
Hydraena bodemeyeri		X			X	
Hydraena ancyrae		X	X			
Hydraena falcata		X	X			
Hydraena grandis				X		
Hydraena lapissectilis	X		X	X		
Hydraena helena	X	X	X		X	
Hydraena grata		X	X	X		
Hydraena anatolica		X				
Hydraena paganettii	X		X		X	

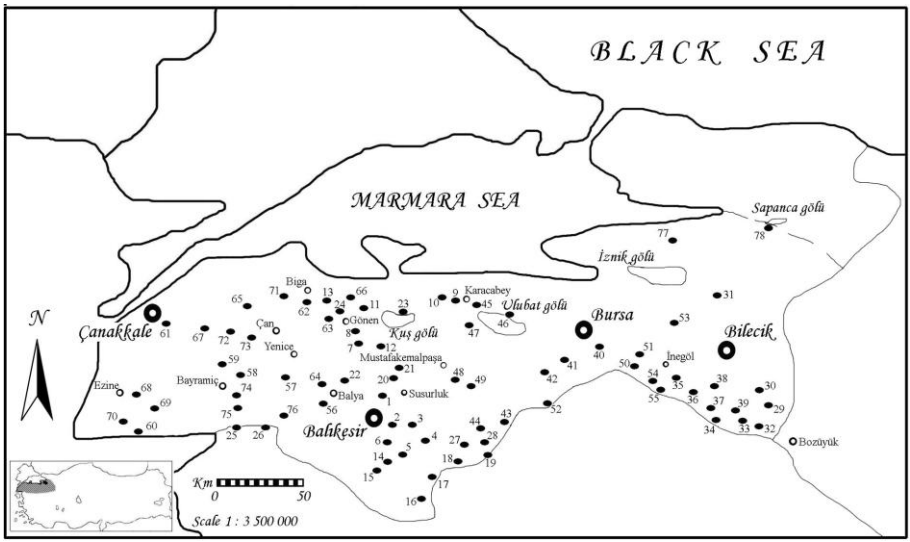

Figure 1. Localities studied in South Marmara Region (Turkey)

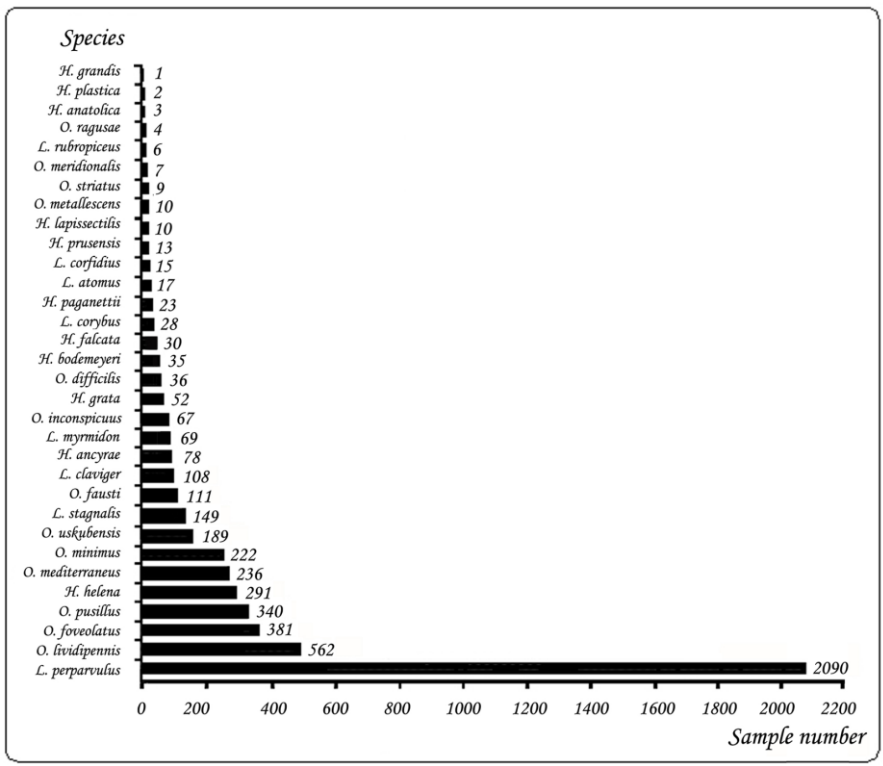

Figure 2. Number of specimens of Hydraenidae species sampled in 2004-2006.

A CONTRIBUTION TO THE SNOUT BEETLES FAUNA OF KHORASAN PROVINCE IN IRAN (COLEOPTERA: CURCULIONIDAE)

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[Moderres Awal, M. & Hossein Pour, F. 2010. A contribution to the snout beetles fauna of Khorasan province in Iran (Coleoptera: Curculionidae). Munis Entomology & Zoology, 5 (2): 623-626**]**

ABSTRACT: This study was conducted to identification of curculionid species in Khorasan province during 2006-2008. Results indicated that among 23 curculionid species determined, 7 ones including *Baris limbata* Brisouth, *Aspidapion radiolus* (Marsham), *Dorytomus hirtipennis* (Bedel), *D. longimanus* (Forstor), *Tychius medicaginis* Brisout, *T. turanensis* Faust and *Corigetus seistanicus* Suvorov were reported for the first time from Iran.

KEY WORDS: Curculioniddae, Mashhad, Iran, Fauna, New record.

The curculionid species show considerable variation in size, shape, colour and the form of the snout. The snout is fairly well developed in most species, with the antennae arising about the middle of the snout, whereas in some species of the nut weevils, the snout is long and slender, as long as the body or longer. All members of this family (except few occurring in ant nests) are plant feeders in both living and dead plants, and thus those are serious pests of cultivated crop plants such as alfalfa. Every part of plant may be attracted by curculionid species. For instance, while larvae usually feed inside the tissue of the plant, the adults drill holes in fruit, nuts and the other plant parts (Borror et al., 1989; Kheyri, 1989). In spite of the considerable economic damage of curculionid species, there is no information on those fauna in Khorasan province. Thus, the aim of this study focused on the identification of the curculionids in alfalfa fields.

MATERIAL AND METHODS

The species were collected from different kind of grasses and alfalfa fields in Khorasan province either by netting or directly by hand during 2006-2008. All species were put into killing jar, transferred to the laboratory, and then pinned. The species were sent to Dr. Fabio Talamelli in Institute Via della Resistenza, Marignano, Italy to identify or confirm. All spec-ies are deposited in the Entomology Collection of Plant Protection Department College of Agriculture, Fertdowsi Uni8versity of Mashhaad, Iran.

RESULTS AND DISCUSSION

In total 23 species of 18 genera representing 8 subfamilies (Apioninae, Baridinae, Cleoninae, Curculionidae, Dryophthorinae, Entiminae, Hyperinae and Uraniinae) were collected from Khorasan province. Among them 7 ones including *Baris limbata* Brisouth, *Aspidapion radiolus* (Marsham), *Dorytomus hirtipennis* (Bedel), *D. longimanus* (Forstor), *Tychius medicaginis* Brisout, *T. turanensis* Faust and *Corigetus seistanicus* Suvorov are new for Iran fauna. List of

curculionid species are presented below, and the species identified for the first time from Iran were showed by an asterisk.

Family: Curculionidae
Subfamily: Dryophthorinae

Sphenophorus piceus (Pallas, 1771)
Material studied: Mashhad: 3 specimens, May 2007. On grasses
Note: This species has been reported from Fars, Ghazvin, Kermanshah, Khuzestan and Sistan and Blouchestan provinces on sugar beet (Broumand, 1998, Kheyri, 1989).

Subfamily: Hyperinae

Hypera tenuicornis (Petri, 1901)
Material studied: Mashhad: 2 specimens, June 2007. On alfalfa
Note: This species has been reported from Ardabil, Hormozgan and Tehran provinces (Modarres Awal, 1997).

H. postica (Gyllenhall, 1813)
Material studied: Mashhad: 10 specimens, July 2006. On grasses.
Note: This species is distributed in Ardabil, Boushehr, East Azarbaijan, Esfahan, Fars, Ghazvin, Ghom, Golestan, Hormozgan, Ilam, Kerman, Khorasan, Khuzestan, Lorestan, Semnan, Sistan and Balouchestan, Tehran and West Azarbaijan provinces on alfalfa, sainfoin, bean, soybean and cotton (Broumand, 1998; Modarres Awal, 1997).

Subfamily: Entiminae

Phacephorus argyrostorum Gyllenhall, 1840
Material studied: Birjand: 5 specimens, May 2006. On grasses.
Note: This species, without defining its hosts has been reported from Boushehr, Golestan, Hormozgan, Khuzestan and Sistan and Blouchestan provinces (Broumand, 1998).

Esamus cylindricollis Reitter, 1891
Material studied: Mashhad: 10 specimens, June 2008. On grasses.
Note: This species is distributed in Ardabil, Boushehr, Hormozgan, Kerman, Khorasan, Khuzestan and Sistan and Blouchestan provinces (Broumand, 1998).

Schelopius planifrons (Fahraeus, 1840)
Material studied: Mashhad: 3 specimens, April 2008. On grasses.
Note: This species has been reported from Ardabil, Fars, Hormozgan, Khorasan, Khuzestan, Sistan and Blouchestan and Tehran provinces (Broumand, 1998; Modarres Awal, 1997).

Sitona cylindricollis (Fahraeus, 1840)
Material studied: Mashhad: 3 specimens, June 2007. On alfalfa.
Note: This species is distributed in Fars, Khorasan, Tehran and Semnan provinces (Broumand, 1998; Modarres Awal, 1997).

S. versicolor Faust, 1887
Material studied: Mashhad: 4 specimens, May 2007. On alfalfa.
Note: This species has been reported from Ardabil and West Azarbaijan provinces (Broumand, 1998).

Corigetus seistanicus Suvorov, 1915*
Material studied: Mashhad: 4 specimens, July 2006. On grasses.

Polydrusus inustus **Germar, 1824**
Material studied: Mashhad: 10 specimens, July 2006. On grasses.
Note: This species has been reported on alfalfa, lentil, sainfoin and wheat from Ardabil province (Modarres Awal, 1997).

Subfamily: Baridinae

Baris timida (Rossi, 1792)
Material studied: Mashhad: 3 specimens, April 2006. On grasses.
Note: This species has been reported from Ardabil, East Azarbaijan, Fars, Ghazvin, Golestan, Khuzestan, Kohkilouyeh and Boyerahmad, Lorestan, Mazandaran, Tehran and West Azar-baijan provinces (Borumand, 1976; 1998; Hoffmann, 1954).

B. limbata Brisouth, 1870*
Material studied: Mashhad: 2 specimens, May 2008; Neyshabour: 1 specimen, June 2007 . On grasses.

Subfamily: Apioninae

Aspidapion radiolus (Marsham, 1802)*
Material studied: Mashhad: 2 specimens, June 2007. On grasses.

Apion frumentarium (Linnaeus, 1758)
Material studied: Mashhad (Soran): 4 specimens, May 2007. On grasses.
Note: This species is distributed in East Azarbaijan province (Hoffmann, 1954; Modarres Awal, 1986).

Malvapion malvae (Fabricius, 1775)
Material study: Mashhad (Kazemabad): 3 specimens, June 2008. On alfalfa.
Note: This species has been reported from West Azarbaijan and Tehran provinces (Broumand, 1998).

Subfamily: Curculioninae

Dorytomus hirtipennis (Bedel, 1884)*
Material studied: Mashhad (Soran): 4 specimens, May 2008. On alfalfa.

D. longimanus (Forstor, 1771)
Material studied: Mashhad: 3 specimens, July 2007. On grasses.

Cionus olens (Fabricius, 1792)
Material studied: Mashhad: 3 specimens, April 2006. On grasses.
Note: This species is distributed in East Azarbaijan province (Broumand, 1998).

Sibina femoralis Germar, 1824
Material studied: Mashhad: 4 specimens, May 2008. On alfalfa.

Tychius medicaginis Brisout, 1863*
Material studied: Mashhad (Soran): 1 specimen, May 2007; 5 specimens, May 2008. On alfalfa.

T. turanensis Faust, 1887*
Material studied: Mashhad: 4 specimens, July 2006. On alfalfa.

Subfamily: Uraniinae

Alcides haemopterus Boheman, 1836
Material studied: Shirvan: 3 specimens, April 2008. On grasses.
Note: This species is distributed in Ghom, Golestan, Khorasan and Tehran provinces (Broumand, 1998).

Subfamily: Cleoninae

Menecleonus anxius (Gyllenhal, 1824)
Material studied: Mashhad: 2 specimens, May 2006; Sabzevar, 2 specimens, June 2006. On grasses.
Note: This species has been reported from Esfahan, Fars, Ghom Kerman, Khuzestan, Tehran and West Azarbaijan provinces on sugar beet (Balachowsky, 1963, Borumand, 1998, Farah-bakhsh, 1961, Kheyri, 1989, Modarres Awal, 1997).

Subfamily: Ceuthorrhynchinae

Ceuthorrhynchus sp.
Material studied: Mashhad: 8 Specimens, July 2006. On alfalfa.
Note: This species is distributed in Ardabil, Charmahal and Bakhtiari, Golestan and Lorestan provinces (Broumand, 1998).

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BIONOMICS OF *ODOIPORUS LONGICOLLIS* OLIVIER (COLEOPTERA: RHYNCHOPHORIDAE) ON BANANA PLANT (*MUSA PARADISICA*)

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ABSTRACT: The banana pseudostem weevil *Odoiporus longicollis* Olivier has been recorded for the first time in Poonch and Rajouri districts of Jammu region as a major pest of banana plant (*Musa* spp.) which are grown in patches in this area. Both larvae and adults caused extensive tunelling in the leaf sheaths as well as in core region. Percentage incidence ranged between 47-61.2 per cent with a mean of 54.55±2.28 per cent. Mating occurs in mating spaces between leaf sheaths. One egg laid in one air chamber. Egg is cylindrical, yellowish white. Larvae are apodous, soft, and cylindrical with dark brown head and pass through five larval instars. Elongated cylindrical cocoons are formed for pupation by winding short pieces of fibrous materials of the leaf sheath. The pests breed throughout the year and do not undergo winter rest. Black and reddish brown adults were recorded from the splitted pseudostems of the damaged banana plants and colour difference represents a phenomenon of non sex limited variation in conspecific sympatric phena of the pest.

KEY WORDS: Biology, banana, *Odoiporous longicollis*, Rajouri, Poonch.

Banana and plantains constitute the fourth most important crop of the developing world and India is the largest producer in the world. Of the 40 million tons of fruits produced in India, banana occupies the top position with an annual output of 13.5 million tons from an area of 4, 00,000 hac (Justin et al., 2008, Padmanaban et al., 2001). Banana (*Musa* spp.) is an important fruit commonly grown in tropical and subtropical parts of the world. Banana is attacked by number of pests, major insect pests include rhizome weevil *Cosmopolites sordidus*, banana aphid *Pentalonia nigronervosa*, fruit and leaf scarring beetle *Colaspis hypochlora,* burrowing nematode *Radopholus similis*, among which major key pest is banana pseudostem borer, *Odoiporus longicollis* Olivier, a monophagous pest of banana and plantains limiting the production and productivity, posing serious threat to banana production (Visalakshi et al., 1989, Valmayor et al., 1994, Shukla & Kumar, 1970). It is estimated that banana pseudostem borer causes 10-90 per cent yield loss depending on the growth stage of the crop and management efficiency (Padmanaban & Sathiamoorthy, 2001). Dutt & Maiti (1972a) have worked out the bionomics of the pest in Tamil Nadu. Bananas containing three natural sugars-sucrose, fructose and glucose combined with fiber. A banana gives an instant, sustained and substantial boost of energy. Research has proven that just two bananas provide enough energy for a strenuous 90 minute workout, when compared to an apple, it has four times the protein, twice the carbohydrate, three times the phosphorus, five times the vitamin A and iron, and twice the other vitamins and minerals, also rich in potassium and is one of the best value foods around. The information on this important insect pest under the condition prevailing in Jammu & Kashmir and adjoining states is very

limited and inadequate. In order to plan a suitable control measure, knowledge of the incidence of the pest and the population of the pest during different seasons is very much essential. Thus, an attempt has been made in order to find out the occurrence, mode, extent of damage, biology and life cycle of pseudostem borer of banana grown in Poonch & Rajouri districts of Jammu (J & K) and the pest population during different seasons under field conditions.

MATERIALS AND METHODS

Collections were made from Bhainchh, Kanoyian, Poonch, Khanetar and Lassana from Poonch and Rajouri districts of Jammu province, where the banana plant is commonly available. Studies were conducted during the period 2005-2008 when the occurrence of the pest was at peak. Rearings were made through culture on potted cage plants. As adults though copulated did not oviposit in captivity, oviposition was studied under field conditions in cages. Egg period was determined from freshly laid eggs. These eggs were placed in the niches and on moist filter paper in petridishes to prevent their desiccation before studying them for hatching.

In order to determine the individual larval periods cellular rearing was done. 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. For determining the instars, newly hatched larvae and the subsequent stages were subjected to Dyar's law (Dyar, 1890). For determing the pupal period matured larvae collected from the infested plants were observed at intervals till the emergence of adults. For morphological studies larvae, pupae and adults were preserved in 90 per cent ethyl alcohol. Eggs were preserved in 5 per cent formalin with few drops of glycerine. At each locality 3-5 plots were considered and samples of 12-140 plants observed per plot. For studying number of generations, the time taken to complete adult stage in one generation in capitivity was considered.

OBSERVATIONS AND DISCUSSION

Distribution

The results revealed the distribution in Jammu and Kashmir as: Rajouri, Poonch, Sunder Bani districts of Jammu; and from literature Tamil Nadu (Padmanaban, 2001 & Padmanaban et al., 2001); Kerala (Visalakshi et al., 1989); Manipur (Prasad & Singh, 1989; Mathew et al., 1997; Assam (Isahaque, 1978); Gorakhpur -U.P. (Shukla & Tripathi, 1978); Eastern Uttar Pradesh (Shukla & Kumar, 1969; 1970); Cachar, Sibsagar and Dalfa Assam; Kolkata, Murshidabad, Behrampore, Siliguri, Darjeeling, Kalimpong and Pashok; Purnea West Bengal; Andaman Islands (Lefroy, 1909), Hooghly, Howrah, Burdwan, 24-Parganas, Midnapur, Nadia, Murshidabad; Kalyani-West Bengal (Dutt & Maiti (1972a); Imphal, Manipur (Ram & Pathak, 1987); and Narmada and Surat, Gujarat (Patel & Jagadale, 2003); Bihar (Tiwary, 1971).

It is known from South and South-East Asia (Padmanaban & Sathiamoorthy, 2001); Java (Froggatt, 1928); Kwangtung, Hong Kong (Hoffman, 1933); Sri Lanka (Jepson, 1935; Dias, 1936); Taiwan (Kung, 1955), China, Malaysia, Indonesia and Thailand (Valmayor et al., 1994); Vietnam (Kiem, 1995); China (Zhou & Wu, 1986 and Luo et al., 1985); Kathmandu valley, Nepal (Singh, 1966; Lefroy, 1909, Froggatt, 1928, Shukla & Kumar, 1970; Isahaque, 1978); China, Japan, Andaman Isaland, Myanmar (Shukla & Kumar, 1969, 1970), Java, Sri Lanka (Zarazaga &

Lyal, 1999) also. Hence can be considered cosmopolitan to Asia, and is reported for the first time from Jammu region of Jammu and Kashmir.

Hosts

It is a monophagous pest of banana plants (*Musa* spp.); both larvae and adults cause severe damage to banana plants (Shukla & Kumar, 1970).

Pest status

Though both larvae and adults makes extensive tunnels and galleries in the pseudostems, throughout the year. Maximum of 51 adults and 61 individuals at different stages of development were recorded on single plant. Percentage incidence ranged between 47-61.2 per cent with a mean of 54.55±2.28 per cent and this reveals its serious pest status. Shukla & Kumar (1969) recorded it as a serious pest of plantain in the eastern part of Uttar Pradesh. Similar observations were made in West Bengal by Dutt & Maiti (1972b). Shukla & Kumar (1970) observed that 70 per cent of the banana plants were attacked by this pest in Uttar Pradesh. Isahaque (1978) reported the considerable loss caused by this pest to banana crop in Assam.

Seasonal occurrence

Adults breed throughout the year, though activity slows down during December to February. Being internal feeder adult do not undergo hibernation or winter rest; though, during winter the adults remained confined in the basal decomposed part of the pseudostem and become more active during monsoon period i.e. July to September tunneling the pseudostem in the upper parts even up to the bunches. Larvae starts feeding gregariously, making tunnels in the leaf sheaths of the pseudostem and move upwards till pupation, by making a cylindrical and elongated pupal cocoon of the fibrous plant material.

Nature and symptoms of damage

The major symptoms of infestation are exudation of sap from the leaf sheaths, small pin-head sized holes on the stem, fibrous extrusions from the bases of leaf petioles; exudation of a gummy substance from the holes on the pseudostem, yellowing and withering of leaves and decaying of peduncles resulting in the immature ripening of fruits. The holes are circular in outline, with brownish boundaries and about 1 mm in diameter. The sequence of holes is the characteristic feature found in a vertical line and approximately equidistantly placed; holes are found upto distance of 6 feet from the ground in heavily infested older plants, as compared to the younger ones.

In the advanced stage, pseudostem become pale, very short, foliage bends down and becomes yellow and the plants do not attain the desired size. The size of the bunch gets considerably reduced. If true stem and peduncles are tunneled after flowering, the fruit does not develop properly, presenting a dehydrated condition with premature ripening or complete blackening of the bunch itself.

The pseudostem of the infested plants when split open, exhibits extensive tunneling both in the leaf sheath and in the core region. It is observed that all the stages of the pest are found in large numbers mostly in the peripheral region of the plants. The depths of the tunnel made by the larva range between 8 and 10 cm. The tunnels may go as high as the fruit peduncle or to the lower most collar region nears the rhizome. Ultimately the hollow tunneled pseudostems break and topple either by the action of the wind or are unable to bear the weight of the maturing bunch. Larvae feed voraciously and riddle the pseudostem making holes

on the outer surface of the pseudostem for better aeration of the tunnels. The late stage larvae (fourth and fifth instars), cause maximum damage. Adults often remain within the decomposing tissues of the pseudostem.

Almost similar observations has already been made by Froggatt (1928), Hoffmann (1933), Kung (1955), Singh (1966), Shukla & Kumar (1969, 1970), Dutt & Maiti (1972b), Isahaque (1978), Luo et al., (1985), Prasad & Singh (1989), Visalakshi, et al., (1989), Zhou & Wu (1986), Padmanaban et al., (2001) and Padmanaban & Sathiamoorthy (2001).

Life Cycle

Mating behavior

Field observations revealed that mating occurs in the mating spaces specially encarved by the adults while feeding between the leaf sheaths. Frequent mating is observed.

Pre-oviposition and oviposition behavior

The pre-oviposition period is 15-30 days and the adult weevil mate throughout the day and night. During June-July females makes small slit with rostrum on the outer epidermal layer of the leaf sheath down up to the air chamber, and insert their ovipositor to lay single egg. Usually one egg is laid in one air chamber but under laboratory conditions a cluster of 4-5 eggs at the cut end of the pseudostem within the air chamber has been laid by the gravid female. Almost similar observations were recorded in Java by Froggatt (1928). There is a relationship between the diameter of the ovipositional slit, rostrum of the female and the ovipositor. The diameter of the ovipositional slit is 0.67±0.015 mm, diameter of rostrum base is 0.57±0.02 mm and the ovipositor diameter is 0.47±0.073 mm (Justin et al., 2008). The number of eggs deposited is considerably reduced as the number of weevils increases, indicating the existence of a spacing pheromone, epideitic compounds which acts as a deterrent to conspecific females (Ranjith & Lalitha, 2001; Justin et al., 2008).

Egg & Incubation period (Fig. 1)

Freshly laid eggs are yellowish-white, more or less cylindrical with rounded ends, with somewhat prominent area of air space at the anterior end. The egg measures 2.21±0.02 mm in length ranging from 2.06-2.32 mm and 1.02±0.01 mm in width ranging from 0.93-1.12 mm. Incubation period varies from 3-5 days in summer and 5-8 days in winter (Dutt & Maiti, 1972a).

Larva (Fig. 2, 3 & 4)

There are 5 instars. Full grown larva apodous, not "C" shaped, soft, fleshy, cylindrical, wrinkled, dark brown head with strongly sclerotized mandibles, body covered with sparse, brownish setae of different lengths. The width of the head capsule in the successive instars increase in the geometrical progression (Singh, 1966). Spiracles are conspicuous and more or less elliptical. Thoracic spiracles larger than the abdominal spiracles except the 8th abdominal pairs which is the largest and placed dorsally. Middle segments are wider than the thoracic and the caudal segments. Pleural fold of each segment is prominent. The 8th and 9th abdominal tergites are highly chitinised and collectively form the anal plate bends which is provided with four setae posteriorly on either side, each arising from a small tubercle. The anal plate bends downward and extends slightly anteriorly on

the ventral side. The full grown larva measure 16.0-20.0 mm in length with a mean of 18.22±0.43 mm and 5.0-9.0 mm in width, with a mean of 7.11±0.45 mm. Head capsule varies from 4.0-5.0 mm in length with a mean of 4.72±0.12 mm and 3.5-4.0 mm in width, with a mean of 3.94±0.05 mm. Larval period lasts for 26.2 days in summer and 68.1 in winter (Dutt & Maiti, 1972).

Feeding behavior

Immediately after emergence, the neonate larva starts feeding on the tissues around the air chamber of the leaf sheath (Fig. 2); while feeding the larvae moves across in a horizontal or in slight oblique direction and bores into the inner leaf sheaths. The third, fourth and fifth instars are voracious feeders and riddle the pseudostem by cutting sometimes holes on the outer surface for better aeration of the tunnels, thereby cause heavy damage to the plantations. The movement of the apodous larvae inside the tunnel is facilitated by the rhythmic movements of the body and by the propulsive action of the anal plate which becomes well chitinised from the third instar onwards.

Pupation

The pupation takes place inside the adjoining leaf sheaths of the pseudostem in a cocoon formed by plant fibres. The fifth instar larvae before entering into prepupal stage makes the cocoon by winding short pieces of fibrous materials of the leaf sheath around its body, thus completely enclosing itself within the cocoon, where they transforms into pupae after passing through prepupal stage (Fig. 5). The cocoon dark brown, elongate, cylindrical and is formed along the long axis of the leaf sheath. Cocoon measures 21-34 mm in length with a mean of 28.80±0.76 mm and 9-12 mm in width, with a mean of 10.90±0.22 mm.

Pupa (Fig. 6)

Pupa is exarate, pale yellow; head and the base of the rostrum with few prominent setae, having a pair of setae each near the middle and apical region of the rostrum. Rostrum reaches upto the first coxa ventrally. Prothorax anteriorly bears two pairs of chitinised setae on the raised papillated structures. Wing pads hard lying in between the distal ends of the meso and metathoracic legs on the ventral side. Legs sharply bent and applied to the ventral side. Abdomen ten segmented and bears sparse setae on either side. Size of pupa varies between 15.0-20.0 mm with a mean of 17.67±0.62 mm in length and 5.0-6.5 mm with a mean of 5.58±0.18 mm in breadth. Pupal period including pre emergence resting period of adult lasted for 20-24 days in summer and 37-44 days in winter. Pre emergence resting period ranges from 4-6 days (Dutt & Maiti, 1972). Pupa ultimately transform into adult which emerges out from the cocoon through an oval emergence hole made by the adult itself with its mouth parts at anterior end of the cocoon or sometimes at the middle of the cocoon (Fig. 7). Emergence hole varied between 5.0-6.0 mm in length with a mean of 5.35±0.10 mm and 4.5-5.0 mm in width with a mean of 4.95±0.03 mm. Even after transforming into adult, the beetle remains in the cocoon for about 5-8 days, with an average of 6.4±0.16 days, attains maturity and then finally emerges out. In Kerala total life cycle is completed in about 42 days and adult longevity is about 90-120 days (Visalakshi et al., 1989).

Adult description (Fig. 8a & 8b)

Adults robust, reddish brown and black, measuring 18.35±0.11 mm in length ranging between 17.5-19.0 mm and 6.15±0.47 mm in breadth, ranging between

5.0-6.0 mm. Snout varies from 3.0-5.0 mm in length with a mean of 3.80±0.13 mm and 0.48-0.56 mm in width with a mean of 0.50±0.01 mm. The weevil has a long life span of 90-120 days (Visalakshi et al., 1989). Black and reddish brown adults were recorded from the splitted pseudostems of the damaged banana plants and colour difference represents a phenomenon of non sex limited variation in conspecific sympatric phena of the pest (Justin et al., 2008).

MANAGEMENT:

Measures to restrain the damage caused by weevil vary widely depending upon the type of banana production systems practised. Large plantations resort to regular application of chemical insecticides to control the weevil. Resource-limited marginal farmers cultivating banana as a subsistence crop are unable to undertake chemical pesticide interventions on a regular basis. In this situation, cultural control strategies assume greater significance due to their ease of application and their compatibility with other methods of control (Padmanaban & Sathiamoorthy, 2001). Control of the weevil is an elusive and complex problem as the life cycle of the pest may be completed within the pseudostem. Application of organochlorine insecticides is no longer carried out due to the possible development of insecticide resistant weevil strains and environmental concerns. Currently stem injection of a systemic organophosphorus compound (e.g. monocrotophos) is extensively used in controlling the pest. As well as other insecticide application methods may be used, such as swabbing along with surfactants, swabbing with mud slurry containing the candidate insecticide, spraying and fumigation of the spaces between the leaf sheaths in the pseudostem. Fumigation of banana plants using Celphos (aluminium phosphide tablets), especially during the vegetative phase is phytotoxic and should be discouraged (Padmanaban & Sathiamoorthy, 2001). Field sanitation, use of healthy suckers, eradication of infested stools is important for the management of weevil. Dried old leaves should be removed for early detection of weevil infestation and to increase the efficacy of chemical application. Suckers should be pruned periodically and infested pseudostems should be removed from the field and destroyed (Tiwary, 1971). Banana stumps remaining in the field after harvest should be destroyed as they act as weevil refugia and breeding sites. The disc-on stump and longitudinal split pseudostem traps can be efficiently used to monitor and reduce the weevil population, among which the disc-on stump is effective due to the higher exudation of the plant fluids (Padmanabhan & Sathiamoorthy, 2001). Clean cultivation, use of healthy suckers, eradication of infested stools, steeping of rhizomes and spraying the plants with 0.05 per cent dieldrin is recommended for the control of the weevil.

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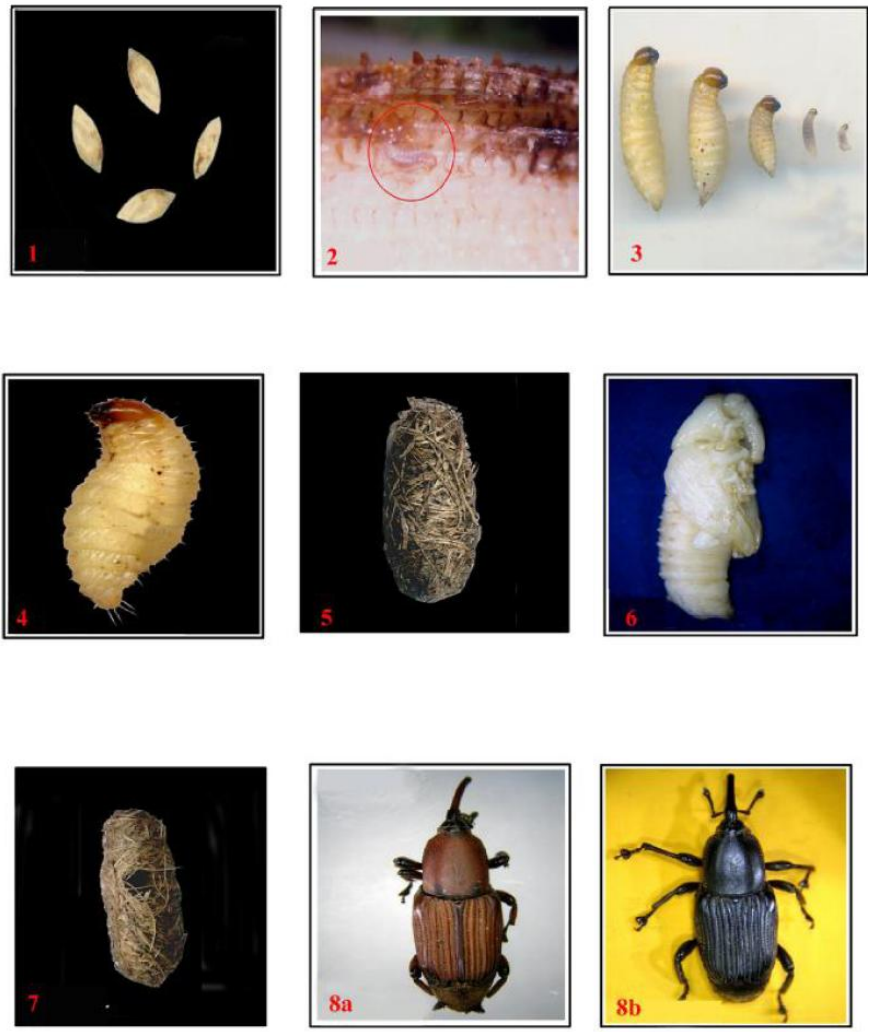

Figures 1-8. 1. Eggs; 2. Neonate larva in the air chamber; 3. Larval instars; 4. Final instar larva; 5. Pupal cocoon; 6. Pupa; 7. Cocoon with emergence hole; 8a-b. Adult.

AN INTRODUCTION TO SPHECID WASPS OF HORAND FORESTS-IRAN (HYMENOPTERA)

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[Ghazi-Soltani, G., Khaghaninia, S. & Shahim, K. 2010. An introduction to sphecid wasps of Horand forests-Iran (Hymenoptera). Munis Entomology & Zoology, 5 (2): 636-641**]**

ABSTRACT: A survey was carried out on Sphecid fauna of Horand forests, in East Azarbaijan province during 2008-2009. Twelve species belonged to two family and ten genera were identified which totally are as new records for studied area.

KEY WORDS: Fauna, Horand forests, Sphecidae, Hymenoptera, Iran.

Horand forests are located in northern west of Arasbaran forests, a registered biosphere in world heritages by UNESCO since 1976 in East Azarbaijan province, Iran. This biosphere reserve situated in the northern Horand city with UTM (Universal Transfer Mercator) coordinate system, X from 690477.57 to 709176.87 E; Y from 4304419.14 to 4317039.59 N and varying latitude from 1354 m to 1478 m. This area has rich grasslands with various species of Astraceae and Juncaceae, rangelands, forests particularly with oak and hazelnut and also rivers and springs.

Species in this family, Sphecidae, are solitary hunting wasps. Female wasp construct nest in soil or build mud cells for her young. The vast majority practice mass provisioning, providing all the prey items prior to laying the egg. She paralyses host arthropod, usually caterpillars or spiders, by her sting. The sting is a modified ovipositor which injects venom paralyses but not kill the host. She keeps the hosts in the nest and lay egg on hosts' body. Larva hatches and feeds externally on prey. Larvae are usually legless and grub-like.

The traditional classification of Sphecid wasps changed with the advent of cladistics. Both conservative definition of the Sphecidae where all the sphecid wasps are treated in a single large family and the more refined one, where the sphecid subfamilies were each elevated to family rank have recently been shown to be paraphyletic (Brothers, 1999; Melo, 1999). Prentice, Brothers, and Melo independently subdivided the extant Apoidea into five monophyletic families: Heterogynaidae, Ampulicidae, Sphecidae, Apidae, and Crabronidae (Pulawski, 2009).

Sphecids can be distinguished by the posterior margin of the pronotum which is a straight line and terminates laterally into a rounded lobe that does not reach the tegula. They differ from the bees in that the body hairs are unbranched and a cleaning brush on the inner side of hind basitarsus is absent (Bohart & Menke, 1976).

MATERIAL AND METHODS

Studied specimens were collected twice a month, during 2008- 2009. Wasps were caught using common handy entomological net and malaise trap in twenty two localities (Fig. 1). The collected specimens were placed in ordinary paper envelopes after killing them in cyanid bottle in order to bring them in laboratory. The collection thus brought was placed in a desiccator (having water at its

bottom) for about 24 h in order to soak and soften them. Thereafter, they were pinned using 0, 1 and 2 mounted pins and their wings and legs set on appropriate setting boards to facilitate morphological studies. For identification, the materials were examined under a Nikon (SMZ 1000) binocular microscope manufactured by Japan.

RESULTS

Present study has richly yielded 12 species belonged to two family and seven genera that all of them are as new records for studied region. A brief key for verified genera prepared as follow:

Identification key for the genera

1. Gaster with cylindrical petiol composed of sternum only and jugal lobe of hind wing large containing an anal vain.....**2**
-. Gaster variable, jugal lobe of hind wing very small.....**4**

2. Tarsi with plantulae[1] (Fig. 2).....*Sceliphron*
-. Tarsi without plantulae.....**3**

3. Apex of sternum I (petiol) meeting and often overlapping base of II (Fig. 3).....
.....*Ammophila*
-. Apex of sternum I not reaching base of II (Fig. 4).....*Podalonia*

4. Midtibia with two apical spurs.....**5**
-. Midtibia with one apical spur.....**6**

5. Hind jugal lobe much more than half length of anal area.....*Astata*
-. Hind jugal lobe less than half length of anal area.....*Harpactus*

6. Hind oceli deformed or greatly reduced.....*Bembix*
-. Hind oceli normal 7

7. Forewing with one submarginal cell (Fig. 5).....**8**
-. Forewing with three submarginal cells.....**9**

8. Orbital foveae absent.....*Ectemnius*
-. Orbital foveae distinct (Fig. 6).....*Lestica*

9. Apex of hind femur simple.....*Philanthus*
-. Apex of hind femur truncate, flattened and kidney shaped (Fig. 7).....*Cerceris*

Family sphecidae

***Sceliphron destillatorium* (Illiger, 1807)**
Material examined: (2♀♀)
This wasp is native to southern and central europe. It builds a mud nest on walls, rocks or trees, which it fills with paralysed spiders as food for its larvae. The adults feed at flowers. Yellow scape, tegula and petiol and black propodeum distinguish it from related species.

[1] - Small oval pads on underside of tarsomers

***Ammophila sabulosa* (Linnaeus, 1758)**
Material examined: (1♀, 1♂)
Four last segments of the abdomen metallic blue, face and parts of thorax with silver pubescent, legs black. According to Bohart & Menke, this wasp is distributed in Europe and Asia.

***Podalonia hirsuta* (Scopoli, 1763)**
Material examined: (2♀♀)
The color of the body varies according to the region. The base of the abdomen of a typic female is red whereas the abdomen of the other form is entirely black that gives a subspecies value to it. This form belongs to subspecies *Podalonia hirsuta* mervensis Rad (De Beamont, 1967).

Family Crabronidae

***Lestica clypeata* Schreber, 1759**
Material examined: (1♀, 3♂♂)
The female is black with yellow bands on the abdomen, pygidial area is gutter like and clypeus is deeply emarginated on each side. The male differs from all similar wasps by its peculiar shaped head that is tapered back against its neck, and through greatly enlarged basitarsus (Fig. 8).
Europe and Middle East are distributional region of this species (Bohart & Menke, 1976).

***Ectemnius lapidarius* (Panzer, 1799)**
Material examined: (2♀♀)
Mesonotum with long erect hairs, clypeus with golden hairs, third antennal segment at least three times as long as broad, oceli form an obtuse triangle, gasteral sternites black.

***Astata kashmirensis* Nurse, 1909**
Material examined: (1♀, 4♂♂)
Abdomen black except second abdominal segment which is red. Males with Holoptic eyes.

***Philanthus triangulum* (Fabricius, 1775)**
Material examined: (2♀♀, 4♂♂)
Male 11-13mm, female 15mm. Found mainly in sandy localities. Female digs nest in sand and stocks it with Honey Bees which it catches

***Cerceris arenaria* (Linnaeus, 1758)**
Material examined: (2♂♂)
Each abdominal segment with a yellow band (Fig. 9), anterior margin of clypeus with a protruded plate.

***Cerceris rybyensis* (Linnaeus, 1771)**
Material examined: (2♂♂)
First abdominal segment black, second segment with a yellow band at base, third segment yellow with a triangular black spot at base, forth segment black with two separate yellow spots on each side. It is distributed in Paleartic Region.

***Cerceris quadricincta* (Panzer, 1799)**
Material examined: (3♀♀)
It is distributed in Paleartic Region.

***Harpactus laevis* (Latreille, 1792)**
Material examined: (2♀♀)
Thorax partially red, abdomen black with creamy bands on some tergits.

***Bembix bicolor* Radoszkowski, 1877**
Material examined: (2♂♂)
Iran, Middle East to Afghanistan and Mongolia are distributional region of this species (Bohart and Menke 1976).

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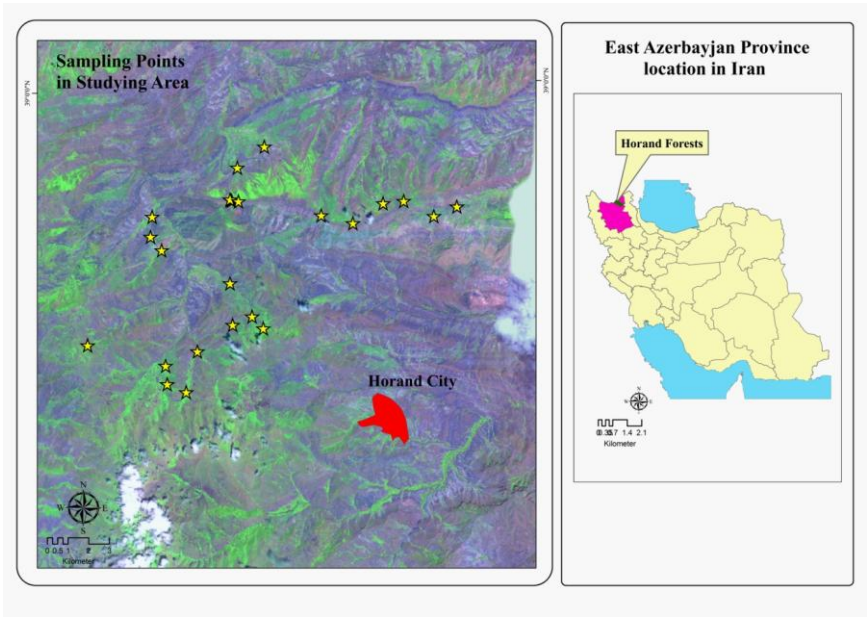

Figure 1. Location of sampling points on satellite image (SPOT) of Horand forests.

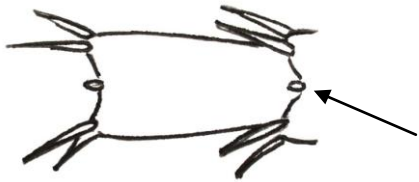

Figure 2. The plantulae position in *Sceliphron* tarsi.

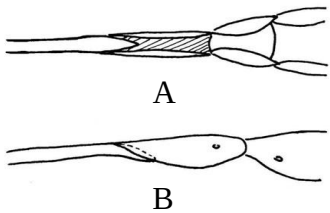

Figure 3. Petiol in *Ammophila*: A, Ventral view; B, Lateral view.

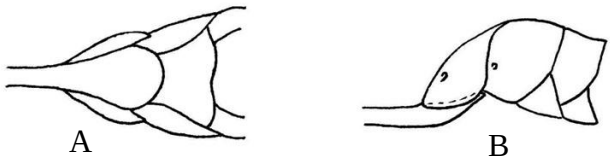

Figure 4. Petiol in *Podalonia*: A, Ventral view; B, Lateral view.

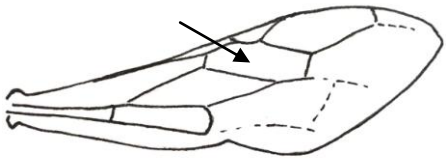

Figure 5. Submarginal cell in *Lestica*.

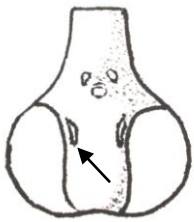

Figure 6. Orbital foveae in *Lestica*.

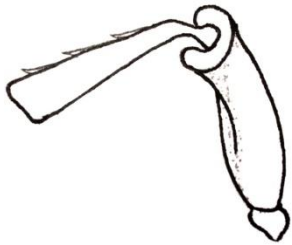

Figure 7. Apex of hind femur in *Cerceris*.

Figure 8. Basitarsus in *Lestica*.

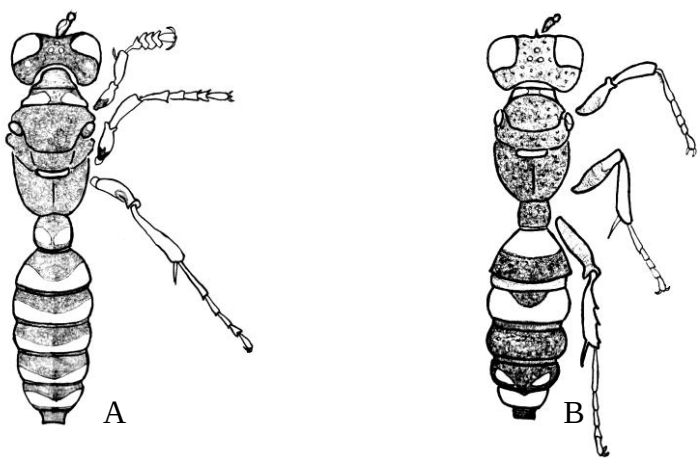

Figure 9. Body pattern at dorsal view in: A, *Cerceris arenaria*; B, *C. rybyensis*.

A COW DUNG INVESTIGATION ON STAPHYLINIDAE (COLEOPTERA) WITH A NEW RECORD FROM TURKEY

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[Özgen, I. & Anlaş, S. 2010. A cow dung investigation on Staphylinidae (Coleoptera), with a new record from Turkey. Munis Entomology & Zoology, 5 (2): 642-645**]**

ABSTRACT: In this study, Staphylinidae species were collected from cow dung located in Eastern and Southeastern Turkey in 2009. A total of 20 species in 11 genera belonging to four subfamilies have been recorded. Amongst them, *Philonthus lepidus* (Gravenhorst, 1802) is the first record for Turkish fauna.

KEYWORDS: Coleoptera, Staphylinidae, cow dung, fauna, new record, Turkey.

The family Staphylinidae contains more than 50.000 species worldwide in 32 subfamilies (Newton, 2007). According to Anlaş (2009), 1600 species and subspecies in 250 genera belonging to 22 subfamilies which are connected with Staphylinidae family from Turkey have been reported. The species of Staphylinidae are distributed worldwide in almost all types of ecosystems, most often in decaying animal or plant matter, under stones or bark, on flowers, under seaweed, in fungi and leaf litter. Many species of Staphylinidae is known dung-inhabiting beetles. But the fimicolous Staphylinidae are poorly studied in Turkey.

The aim of this study is to evaluate the Staphylinidae fauna of cow dung at five locations in Eastern and Southeastern Turkey.

MATERIAL AND METHOD

Collections were made at five sites in Bingöl, Elazığ, Mardin and Siirt provinces. Samples were collected randomly by a handle shovel, placed into a plastic jars and transported to the laboratory, where the insects were separated from the dung. At each interval, a total of 10 samples were taken at each locality. In each locality, dung was put into 120 ml plastic jars. The weight of dung put into each jar was approximately 50 gr.

Material were identified by S. Anlaş and is deposited in the private collection of the first and second author.

Classification and nomenclature of the Staphylinidae suggested by Herman (2001) and Löbl & Smetana (2004) have been followed in this study.

RESULT

In this study, 21 species of 12 genera belonging to four subfamilies of Staphylinidae are reported for Turkish fauna. Amongst them, *Philonthus lepidus* (Gravenhorst, 1802) is the first record for Turkish fauna.

Subfamily Tachyporinae MacLeay, 1825

***Tachinus scapularis* Stephens, 1832**
Material examined: Mardin: Central province, Sultanşehmuz village, 2 exs., 19.08.2009.
Distribution in Turkey: Isparta (Anlaş, 2009).

Subfamily Aleocharinae Fleming, 1821

***Aleochora tristis* (Gravenhorst, 1806)**
Material examined:, Mardin: Central province, Sultanşehmuz village, 1 ex., 19.08.2009; 1 ex., 04.10.2009. Siirt: near Botan Çayı, 3 exs., 28.05.2009.
Distribution in Turkey: Artvin, Bingöl, Bitlis, Bursa, Erzurum, Gaziantep, Hatay, Izmir, Kahramanmaraş, Konya, Malatya, Manisa, Mardin, Mersin, Osmaniye (Anlaş, 2009; Kesdek et al. 2009; Tezcan & Anlaş, 2009).

Subfamily Oxytelinae Fleming, 1821

***Anotylus inustus* (Gravenhorst, 1806)**
Material examined: Mardin: Central province, Sultanşehmuz village, 4 exs., 28.05.2009; 8 exs., 06.09.2009; 3 exs., 19.08.2009; 7 exs., 21.08.2009.
Distribution in Turkey: Artvin, Bursa, Erzurum, Istanbul, Izmir, Kilis, Konya, Mersin, Muğla (Anlaş, 2009; Anlaş & Rose 2009a; Kesdek et al. 2009; Tezcan & Anlaş, 2009).

***Anotylus rugosus* (Fabricius, 1775)**
Material examined: Bingöl: Central province, Şehit village, 6 exs., 07.10.2009.
Distribution in Turkey: Adana, Ankara, Mersin (Anlaş, 2009).

***Anotylus sculpturatus* (Gravenhorst, 1806)**
Material examined: Elazığ: Central province, Yurtbaşı, 1 ex., 05.09.2009. Mardin: Central province, Sultanşehmuz village,.2 exs., 19.08.2009; 3 exs., 21.08.2009. Siirt: Central province, 4 exs., 28.05.2009.
Distribution in Turkey: Antalya, Istanbul, Mersin (Anlaş, 2009; Anlaş & Rose 2009a).

***Oxytelus sculptus* Gravenhorst, 1806**
Material examined: Mardin: Central province, Sultanşehmuz village, 1 ex., 28.05.2009.
Distribution in Turkey: Adana, Ankara, Mersin, Sakarya (Anlaş, 2009).

***Platystethus nitens* (C. R. Sahlberg, 1832)**
Material examined: Mardin: Central province, Sultanşehmuz village, 3 exs., 28.05.2009; 1 ex., 06.09.2009.
Distribution in Turkey: Ankara, Antalya, Kilis (Anlaş, 2009; Anlaş & Rose 2009a).

Subfamily Staphylininae Latreille, 1802

***Creophilus maxillosus* (Linnaeus, 1758)**
Material examined: Mardin: Central province, Sultanşehmuz village, 1 ex., 06.09.2009.
Distribution in Turkey: Antalya (Anlaş, 2009; Anlaş & Rose 2009a).

***Leptacinus intermedius* Donisthorpe, 1936**
Material examined: Mardin: Central province, Sultanşehmuz village, 1 ex., 19.08.2009; 2 exs., 21.08.2009.
Distribution in Turkey: Adana, Istanbul, Konya, Osmaniye (Anlaş, 2009).

***Ontholestus murinus* (Linnaeus, 1758)**
Material examined: Bingöl: Central province, Şehit village, 1 ex., 07.10.2009.
Distribution in Turkey: Erzurum, Gaziantep, Izmir, Kütahya, Manisa (Anlaş, 2009; Anlaş & Rose 2009b; Kesdek et al. 2009).

***Philonthus carbonarius* (Gravenhorst, 1802)**
Material examined: Elazığ: Central province, Yurtbaşı, 2 exs., 05.09.2009. Bingöl: Central province, Şehit village, 1 ex., 08.10.2009.
Distribution in Turkey: Antalya, Ardahan, Erzurum, Kars, Manisa (Anlaş, 2009; Anlaş & Rose 2009b; Kesdek et al. 2009).

***Philonthus concinnus* (Gravenhorst, 1802)**
Material examined: Bingöl: Central province, Şehit village, 1 ex., 07.10.2009. Mardin: Central province, Sultanşehmuz village;2 exs., 28.05.2009; 2 exs., 19.08.2009; 3 exs., 21.08.2009; 1 ex., 06.09.2009.
Distribution in Turkey: Adana, Ankara, Antalya, Ardahan, Bolu, Erzincan, Erzurum, Iğdır, Kayseri, Konya, Manisa, Mersin, Tunceli (Anlaş, 2009; Anlaş & Rose 2009b; Kesdek et al. 2009).

***Philonthus corruscus* (Gravenhorst, 1802)**
Material examined: Mardin: Central province, Sultanşehmuz village, 3 exs., 06.09.2009.
Distribution in Turkey: Adana, Ankara, Izmir, Mersin (Anlaş, 2009).

***Philonthus intermedius* (Lacordaire, 1835)**
Material examined: Mardin: Central province, Sultanşehmuz village, 3 exs., 19.08.2009; 1 ex., 21.08.2009; 4 exs., 06.09.2009; 1 ex., 07.10.2009.
Distribution in Turkey: Ankara, Antalya, Denizli, Izmir, Kahramanmaraş, Mersin (Anlaş, 2009; Anlaş & Rose 2009b).

***Philonthus lepidus* (Gravenhorst, 1802)**
Material examined: Bingöl: Central province, Şehit village, 2 exs., 07-08.10.2009.
Remarks: According to Smetana (2004), this species was not known from Turkey. The species is reported from Turkey for the first time.

***Philonthus nitidicollis* (Lacordaire, 1835)**
Material examined: Bingöl: Central province, Şehit village, 4 exs., 07-08.10.2009. Siirt: Central province,1 ex., 28.05.2009.
Distribution in Turkey: Adana, Ankara, Antalya, Gaziantep, Izmir, Konya (Anlaş, 2009; Anlaş & Rose 2009b).

***Philonthus politus* (Linnaeus, 1758)**
Material examined: Mardin: Central province, Sultanşehmuz village, 3 exs., 19.08.2009; 1 ex., 21.08.2009.
Distribution in Turkey: Mersin (Anlaş, 2009).

***Quedius cinctus* (Paykull 1790)**
Material examined: Siirt: near Botan Çayı, 3 exs., 04.10.2009.
Distribution in Turkey: Antalya, Bolu, Istanbul, Izmir, Karaman, Mersin, Rize (Anlaş, 2009; Anlaş & Rose 2009b).

***Quedius curtipennis* Bernhauer, 1908**
Material examined: Mardin: Central province, Sultanşehmuz village, 1 ex., 28.05.2009.
Distribution in Turkey: Bolu, Giresun, Izmir, Manisa (Anlaş, 2009).

***Staphylinus erythropterus* Linnaeus, 1758**
Material examined: Siirt: near Botan Çayı, 1 ex., 04.10.2009.
Distribution in Turkey: The exact locality of this species has not been cited by previous studies (Anlaş, 2009).

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THE EFFECTS OF IMIDACLOPRID, INDOXACARB AND DELTAMETHRIN ON SOME BIOLOGICAL AND DEMOGRAPHIC PARAMETERS OF *HABROBRACON HEBETOR* SAY (HYMENOPTERA: BRACONIDAE) IN ADULT STAGE TREATMENT

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[Sarmadi, S., Nouri-Ganbalani, G., Rafiee-Dastjerdi, H., Hassanpour, M. & Pour Abad, R. F. 2010. The effects of imidacloprid, indoxacarb and deltamethrin on some biological and demographic parameters of *Habrobracon hebetor* Say (Hymymenoptera: Braconidae) in adult stage treatment. Munis Entomology & Zoology, 5 (2): 646-651**]**

ABSTRACT: The effect of field recommended doses of imidacloprid, indoxacarb, and deltamethrin (290, 125, and 83 ppm based on active ingredient, respectively) were studied on some biological and demographic parameters of adult *Habrobracon hebetor* Say. The experiments were conducted at 26±1°C, 60±5% RH, and a photoperiod of 12 L:12 D h. Thirty, one-day-old females were treated using paper disc method for 24 h. Distilled water plus Triton X-100 was used in control treatment. Females survived in each treatment were transferred individually to 6 cm Petri dishes. One adult male was added to each Petri dish for mating. Three last instar larvae of *Anagasta kuehniella* (Zeller) were offered to each female daily as host. The number of eggs produced per female per day were counted until all of the females died. Stable population growth parameters were estimated using Carey's (1993) procedure. Gross and net reproductive rates in control and imidacloprid, indoxacarb, and deltamethrin treatment were 206.31±13.38 and 73.46±5.5; 186.82±21.39 and 46.81±6.52; 164.71±14.47 and 51.75±5.22; 102.39±9.84 and 19.95±2.56, respectively. Mean generation time and doubling time in control and insecticidal treatments were 21.22± 0.2 and 3.43±0.04; 22.49±0.32 and 4.07±0.13; 21.87±0.31 and 3.85±0.06; 22.41±0.36 and 5.21±0.2, respectively. Intrinsic rate of increase and finite rate of increase were estimated 0.2023±0.0025 and 1.2242±0.0031; 0.1706±0.0054 and 1.186±0.0064; 0.1802±0.0027 and 1.9746±0.0033; 0.1332±0.0052 and 1.1425±0.0059, respectively. Deltamethrin had the most adverse effect on stable population parameters of this wasp ($P<0.05$). There was no significant difference between indoxacarb and imidacloprid in this regard.

KEY WORDS: Insecticides, *Habrobracon hebetor,* biology, demographic parameters.

Most insecticides have harmful effects on non-target organisms including natural enemies (Croft, 1990). Biocontrol agents are commonly susceptible to insecticide applications. In recent years, integrated pest management systems attempt to use natural enemies in combination with lower doses of insecticides for pest control. Integrating the application of biocontrol agents and insecticides for pest management requires knowledge about impact and selectivity of the insecticides on natural enemies (Croft, 1990; Dent, 1995; Banks & Stark, 1998). Several natural enemies can be used for biological control of lepidopteran pests. Among these, *Habrobracon* spp. are used as effective parasitoids of different pests specially in stored products (Navaei et al., 2002).

Habrobracon hebetor Say is an ectoparasitoid and has been studied as a biocontrol agent of various lepidopteran pests in several countries (Gerling, 1971; Youm & Gilstrap, 1993; Magro & parra, 2001). In recent years, the mass rearing program of *H. hebetor* has been initiated in Iran and it has been used to control *Helicoverpa armigera* (Hübner) and *Ostrinia nubilalis* (Hübner) specially in Moghan region of Ardabil province in Iran (Navaei et al., 2002). Limited information are available on lethal and sublethal effects of commonly used insecticides in cotton fields on this biocontrol agent (Rafiee-Dastjerdi et al., 2008, 2009a, 2009b).

Estimation of lethal and sublethal effects of pesticides on a natural enemy is necessary to recognize their effects of it (Walthal & Stark, 1996; Stapel et al., 2000; Stark & Banks, 2003). Demographic toxicology is usually considered to be the best way to evaluate total effects of pesticides on a target insect. So, stable population parameters have been recommended to evaluate the overall effects of pesticides, because it is based on both survivorship and fecundity parameters (Stark & Wennergren, 1995). This study was carried out to evaluate the sublethal effects of three commonly used insecticides against *H. armigera* in cotton fields of Moghan region including imidacloprid, indoxacarb, and deltamethrin on its natural enemy, *H. hebetor*, and to determine the possibility of integrating the application of this species with insecticides in IPM program of this key pest.

MATERIALS AND METHODS

Insects

Habrobracon hebetor was obtained in adult stage from the insectarium of Plant Protection Bureau of Bilehsavar in Ardabil province in Iran. The colony of *H. hebetor* was reared on 5th instar larvae of *Anagasta kuehniella* Zeller reared on wheat flour in semi-clear plastic boxes (40×25×15 cm) in the laboratory. Fifth instar larvae of *A. kuehniella* were used for both rearing the colony of wasp and applying experiments. Bioassay and rearing conditions were 26 ± 1 ˚C, 60 ± 5 % RH and a photoperiod of 12: 12 h (L: D).

Insecticides

Insecticides tested were imidacloprid (Confidor® 350 SC), indoxacarb (Avaunt® 150 SC) and deltamethrin (Decis® 2.5 EC).

Bioassay

Whatman filter papers (90 mm in diameter) were dipped in aqueous solutions of field recommended doses of imidacloprid, indoxacarb, and deltamethrin (290, 125, and 83 ppm based on active ingredient, respectively). Triton X-100 was used as the surfactant at a concentration of 555 ppm in the experiment. The control was treated with distilled water plus Triton X-100. Treated paper discs were transferred to 90 mm Petri dishes. After the emergence of adult wasps, 60 females and 60 males were let to mate for 24 h in glass tubes. Then, mated adult females were transferred into Petri dishes including treated paper discs. After 24 h, randomly selected 30 alive females were transferred individually to plastic Petri dishes (60 mm in diameter) and three last instar host larvae were offered to each female daily for oviposition in new Petri dishes. The survival of each female wasp and its fecundity was recorded daily. Females were moved to new Petri dishes every 24 h to determine daily and lifetime fecundity (the number of eggs laid by a female daily and over her lifetime).

Data analysis

The biological data were submitted to analysis of variance and the means were compared by the Tukey test, using SPSS 14.0 software program (SPSS, 2004). The demographic parameters and their corresponding standard errors were estimated by the Jackknife technique (Meyer, 1986; Sokal & Rohlf, 1981), and the means were compared by the Tukey test, using SPSS 14.0 software program (SPSS, 2004).

RESULTS

Number of eggs laid by *H. hebetor* was significantly affected by insecticides (Table 1). In control, it was approximately 1.3, 1.8 and 2.5 times more than indoxacarb, imidacloprid and deltamethrin, respectively, which indicate harmful effects of insecticides on the fecundity of the wasp. The mean of female longevity in control treatment had no significant difference with that of indoxacarb and deltamethrin, but imidacloprid had the lowest female's longevity ($F=5.26$; $df=3,12$; $P<0.01$). Difference in sex ratio (male/male+female) of *H. hebetor* offspring was not significant between insecticides.

Effects of field recommended doses of imidacloprid, indoxacarb, and deltamethrin on *H. hebetor* life table parameters are shown in Table 2. Gross reproductive rate (GRR) in deltamethrin was significantly lower than other insecticides as well as control treatments ($F=8.68$; $df=3,12$; $P<0.01$). Control had the highest GRR; however there were no significant differences between GRR obtained in imidacloprid and indoxacarb treatments with that in the control. Both the net reproductive rate (R_o) and intrinsic rate of increase (r_m) in control were significantly higher than insecticide treatments ($F=18.29$; $df=3,12$; $P<0.01$ and $F=47.44$; $df=3,12$; $P<0.01$, respectively). No significant difference was observed between R_o estimated for indoxacarb and imidacloprid treatments, but difference between these two compounds and deltamethrin was significant. Similar result was obtained for r_m parameter. Finite rate of increase (λ), which is an indicator of population increase in each day compared with previous day, also was adversely affected by insecticides compared to the control treatment ($F=47.96$; $df=3,12$; $P<0.01$). Treatment of deltamethrin resulted in the lowest value of λ. There was no significant difference in mean generation time (T) between insecticide treatments. But, the values of T obtained for imidacloprid and deltamethrin were significantly higher than that of the control ($F=3.77$; $DF=3,12$; $P<0.05$). Doubling time (DT) of the population was also affected adversely by insecticide treatments ($F=37.36$; $DF=3,12$; $P<0.01$); it was lowest in control and highest in deltamethrin treatment.

DISCUSSION

The present study demonstrated that the insecticides significantly and adversely affected fertility, longevity and life table parameters of *H. hebetor*. However, the sex ratio of offspring was not significantly affected by the insecticides. Galavan et al. (2005) reported that indoxacarb caused a simultaneous reduction in adult fertility and also the survivorship of the first instar and adult of *Harmonia axyridis* (Pallas) in laboratory. Studebaker & Kring (2001) reported that imidacloprid and indoxacarb insecticides affected the survival of the third instar and adult of *Orius insidiosus* (Say). Rezaei et al. (2007) reported that imidacloprid had no significant effect on the fecundity of *Chrysoperla carnea* (Stephens). In the present study, there were no significant

difference in the biological parameters obtained for indoxacarb and control treatments. Difference between the present and above-mentioned studies indicates an insecticide can show different effects on different organisms. Grosch & Hoffman (1973) suggested that the reduction in fertility of *H. hebetor* treated with some pesticides could be related to decreased food uptake, change in physiology or cytotoxic destruction of eggs. The similar effects might have appeared for imidacloprid and deltamethrin insecticides on *H. hebetor* in the present study.

In all treatments, net reproductive rates (R_o) were very lower than gross reproductive rates (GRR) that indicates the survivorship (l_x) has been strongly affected by insecticides. Intrinsic rate of increase (r_m) is the most important parameter for evaluation of population development, because of inclusion of age, survival rate (l_x) and female offspring's (m_x) effects in its calculation (Carey, 1993). Higher intrinsic rate of increase (r_m) in control in comparison with the insecticide treatments indicated the adverse effects of insecticides on this parameter. The lower mean generation time (T) is an advantage for parasitoids compared with their hosts, because they can produce more generations in a given time. It would be harmful effect on parasitoid, if an insecticide causes increase its generation time. There was no significant difference in mean generation time between insecticide treatments but the generation time values obtained for imidacloprid and deltamethrin were significantly higher than the control. It indicates that the wasp will need longer time to increase her population as R_o times when it is exposed to field recommended doses of these two insecticides.

Saber et al. (2005) showed that fenitrothion and deltamethrin had no significant effects on biological parameters such as adult longevity and offspring sex ratio of *Trissolcus* grandis (Thomson), but they adversely affected r_m and λ parameters. Rafiee-Dastjerdi et al. (2009a) studied the effects of sublethal dose of profenofos, spinosad, thiodicarb and field recommended dose of hexaflumuron on biological and demographic parameters of *H. hebetor* and reported that the r_m values obtained for the first three compounds and fertility in all insecticides tested were significantly different in comparison with the control. Similar results were obtained in the present study and it is possible that *H. hebetor* is sensitive to broad spectrum insecticides.

In the present study, deltamethrin showed significantly difference in some demographic parameters including r_m, λ and DT in comparison with other insecticides. Also, the fecundity of *H. hebetor* was lower when it was treated with this insecticide. On the other hand, indoxacarb had the lowest negative effects on the biological and demographic parameters of *H. hebetor*. Even though results obtained in small laboratory arenas may not be realized under natural conditions (Kareiva, 1990), these kinds of investigations under the laboratory conditions can be helpful in selecting insecticides for additional studies under more natural conditions and for application of suitable insecticides along with natural enemies in the pest management programs.

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Table 1. The means of biological parameters (±SE) of *Habrobracon hebetor* exposed to the field recommended doses of imidacloprid, indoxacarb, and deltamethrin in adult stage.

parameters	control	indoxacarb	imidacloprid	deltamethrin
fecundity (number)	466.1^{a†} (±54.99)	337.69^{ab} (±47.37)	252.43^{b} (±36.8)	180.63^{b} (±29.79)
hatched eggs (number)	463.93^{a} (±54.92)	320.83^{ab} (±45.12)	239.63^{b} (±35.83)	167.43^{b} (±28.69)
Female longevity (day)	29.33^{a} (±2.13)	25.86^{ab} (±2.06)	20.3^{b} (±1.47)	29.23^{a} (±2.39)
sex ratio (male/male+female)	0.51 (±0.05)	0.55 (±0.06)	0.45 (±0.05)	0.51 (±0.06)

†Values within the rows followed by different letters are significantly different.
^{ns} and ** indicating non significant and significantly different at P<0.01, respectively.

Table 2. The means of stable growth population parameters (±SE) of *Habrobracon hebetor* exposed to the field recommended doses of imidacloprid, indoxacarb, and deltamethrin in adult stage.

parameters	control	indoxacarb	imidacloprid	deltamethrin
GRR	206.31^{a†} (±13.38)	164.70^{a} (±14.47)	186.82^{a} (±21.39)	102.39^{b} (±9.84)
R_0	73.45^{a} (±5.5)	51.75^{b} (±5.22)	46.8^{b} (±6.52)	19.94^{c} (±2.56)
r_m	0.202 ^{a} (±0.003)	0.180 ^{b} (±0.003)	0.170 ^{b} (±0.005)	0.133 ^{c} (±0.005)
λ	1.224^{a} (±0.003)	1.197^{b} (±0.003)	1.186^{b} (±0.006)	1.142^{c} (±0.006)
T	21.22^{b} (±0.2)	21.87^{ab} (±0.31)	22.49^{a} (±0.32)	22.4^{a} (±0.36)
DT	3.42^{c} (±0.04)	3.84^{bc} (±0.06)	4.06^{b} (±0.13)	5.21^{a} (±0.2)

†Values within the rows followed by different letters are significantly different.
* and ** indicating significantly different at P<0.05 and P<0.01, respectively.

BIONOMICS OF MYCOPHAGOUS COCCINELLID, *PSYLLOBORA BISOCTONOTATA* (MULSANT) (COLEOPTERA: COCCINELLIDAE)

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[Kumar, R., Mittal, V., Patankar, N. V. & Ramamurthy, V. V. 2010. Bionomics of mycophagous Coccinellid, *Psyllobora bisoctonotata* (Mulsant) (Coleoptera: Coccinellidae). Munis Entomology & Zoology, 5 (2): 652-657**]**

ABSTRACT: In India, *Psyllobora bisoctonotata* Mulsant feeds on powdery mildew in natural condition. Here, we report the biology of *P. bisocotonotata*. The natural presence of this beetle in Indian Agricultural Research Institute Campus, New Delhi, India has been documented during the year 2006-2007 on the leaves of *Morus alba* Linn. (Moraceae) and *Dalbergia sissoo* Roxb. (Leguminosae). The bionomics of *P. bisoctonotata* are discussed here.

KEY WORDS: *Psyllbora bisoctonotata*, mycophagous, *D. sissoo, M. alba*, bionomics.

Majority of the ladybird beetles belong to the tribe Psylloborini (Coleoptera: Coccinellidae) feed on the powdery mildews belonging to Erysiphales of Ascomycota worldwide (Ahmad et al., 2003; Krishnakumar & Maheswari, 2002 and 2004; Masatoshi et al., 2000; Sutherland, 2005; Sutherland & Parrella, 2006, 2008; Soylu et al., 2002; Prasad & Rai, 1988; Bhattacharya et al., 1994; Patankar et al., 2009). Relationships of fungi and beetles are very diverse, sometimes acquiring quite complicated form. An important aspect of relations of beetles and fungi are devices of the former favoring dispersal of the latter. The cosmopolitan genus *Psyllobora* Chevrolat is represented in natural and managed systems in temperate and subtropical regions worldwide, and may be utilized as a native biological control agent of powdery mildew (Cruz et al., 1989; Almeida & Milleo, 1998).

MATERIAL AND METHODS

P. bisoctonotata was studied for their bionomics at the Division of Entomology, Indian Agricultural Research Institute, New Delhi in the year 2006-2007. It was observed feeding on the powdery mildew *Phyllactinea corylea* (Pess.) infesting the leaves of *Dalbergia sissoo* Roxb. (Leguminosae) (Plate I - Figs. A, B) and *Morus alba* Linn. (Moraceae) (Plate I - Figs. C, D) in their grubs and adult stages. In the months of December and January (2006-2007), their populations were found to be abundant as the disease was also found in an epidemic proportion almost infecting every leaf and observed in their under surfaces (Plate I - Figs. A to D). The lady bird beetles were reared in the laboratory and observed for their feeding behaviour and bionomics (Table 1). In the field observations *P. bisoctonotata* was photographed using a Sony DSC R1 10.3 mega pixel and the measurement taken using camera Cannon PowerShot 5.0 mega pixel attached with microscope Leica ES2.

BIONOMICS

Adults: Body convex, oval, and cream or yellowish in colour basally, each marked with eight black spots, with males and females measures 2.88 × 2.11mm and 3.22 × 2.42mm, respectively. Seen distributed on all parts of the plants in certain parts when occupied only the leaves with powdery mildew especially on the lower surface. On an average adults were found to be between 5 and12 per plant with the later instars grubs being more abundant on the older/matured leaves which are often heavily infested with the fungi. The longevity of adults was noticed 26.00 days of male and 27.65 days of female on an average (Plate I – Figs. B, D; Plate II – Figs. E, O, P).

Eggs: The eggs were observed to be laid in batches with mean 5.54 on the under and upper surfaces of leaves of *M. alba* and *D. sissoo*. Small leaves with freshly powdery mildew infested leaves were preferred over others. Freshly laid eggs are elongate, oval, white, shining and firmly glued to each other and the eggs measured 0.81×0.40mm each, with a range of the hatching percentage was observed to be 100%. The eggs became blackish gray before hatching and the incubation period was 2.5 days on an average (Plate II– Figs. F, G).

Grubs: Under normal conditions the number of grubs found varied between 12 and 25 with a mean of 19. **I Instar -** Blackish grey with black dots and hairs on the whole body measured 0.99×0.38mm and its head capsule measured an average of 0.28×0.29mm. This instar was poor in feeding and with in 48 hours the first moulting was observed. Development period of first instar was 5 days on an average (Plate II – Figs. H, I). **II Instar -** Blackish grey with black dots and hairs on the whole body and grubs were more elongate flattened and measured 1.46×044mm with their head capsule measuring 0.28×0.29mm. Development period of second instar was 5.50 days on an average (Plate II - Fig. J). **III Instar -** As the growth of the grubs continued with the third instars their colour become much darker with their head shield becoming more prominent; these measured between 3.384×0.759 with their head capsule of the size of 0.98×0.99mm. Development period of third instar was 7.50 days on an average (Plate II - Fig. K). **IV Instar -** The third instar moulted into the fourth instar, which was almost similar to the third but 4.71×1.08mm in its size and 1.15×1.20mm as regards head capsule, and lasting for about 72 hrs. Development period of fourth instar was 10.0 days on an average (Plate II, Figs. L, M).

Pupa: As and when these grubs were fully grown these moulted into pupae which were blackish grey with dark spots and hairs all over the body, and two yellow spots on the fourth segment of abdomen dorsally. Pupae measured 2.99×1.77mm and pupal period lasted for about 16.50 days on an average (Plate II, Fig. N).

DISCUSSION

It was observed that both adults and grubs feed on the powdery mildews and many other saprophytic fungi found on the phyllosphere namely *Alternaria* sp, *Cladosorium* sp. and *Curvularia* sp. (Patankar et al., 2009). It was observed that all these fungi are equally fed. The first instar caused very small specks and had a very poor feeding capacity while all the other instars upto the 4th were actively feeding (Plate II - Figs. I to M). Maximum feeding rates were observed in the 3rd and 4th instars as these fed large parches of the powdery mildew infestations.

Before pupation there was cessation of feeding and the pupa was found to be exarate type, found attached with leaf surfaces. As far as feeding potential is concerned, the instars can be ranked as follows: third, fourth, adults, second and first with third instar being the most voracious and with terrific feeding rates. Adults were seen on all parts of the plants while the grubs were more aggregated on the leaves affected with powdery mildew. They were found on the lower surface of the leaves during the period of bright sun. Population of adults ranged from 5-12 per plant. The later instars and adults were also more prevalent on older and heavy infested leaves. In view of their feeding behaviour and potential the *Psyllobora bisoctonotata* is being universally exploited for the biological control these of destructive fungi (Cruz et al., 1989; Almeida & Milleo, 1998).

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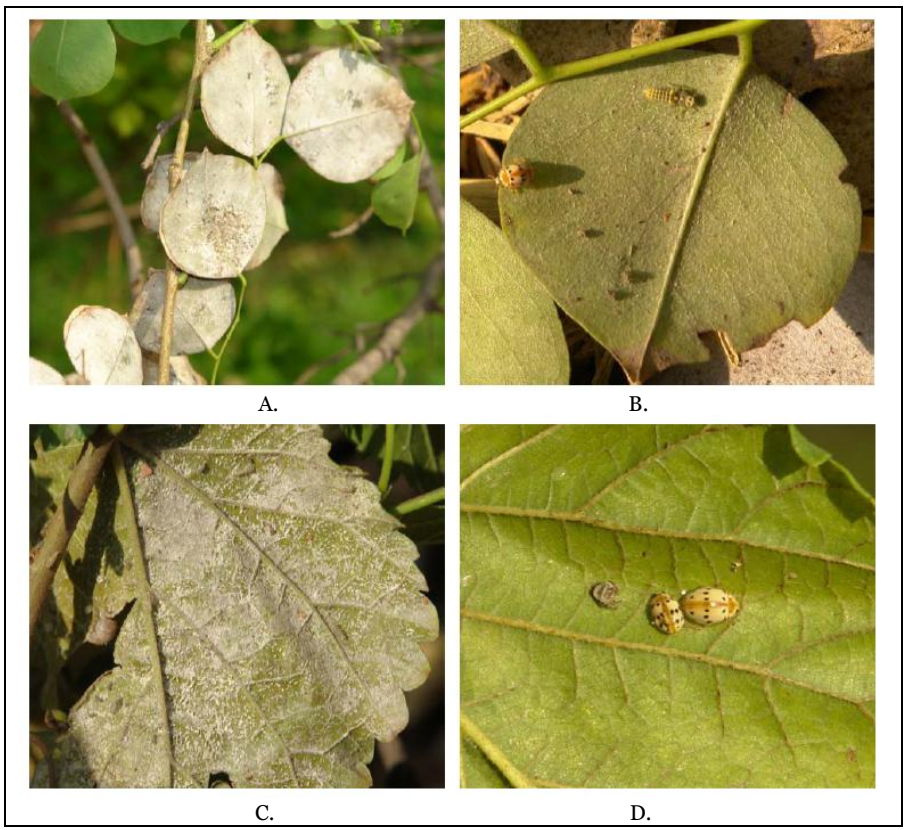

Plate I. *Psyllobora bisoctonotata* Mulsant: A. Fungal infested leaves of *D. sissoo,* B. Grubs and adult feeding on fungus, C. Fungal infested leaves of *M alba* and grubs feeding on fungus, D. Adults on leaf of *M. alba.*

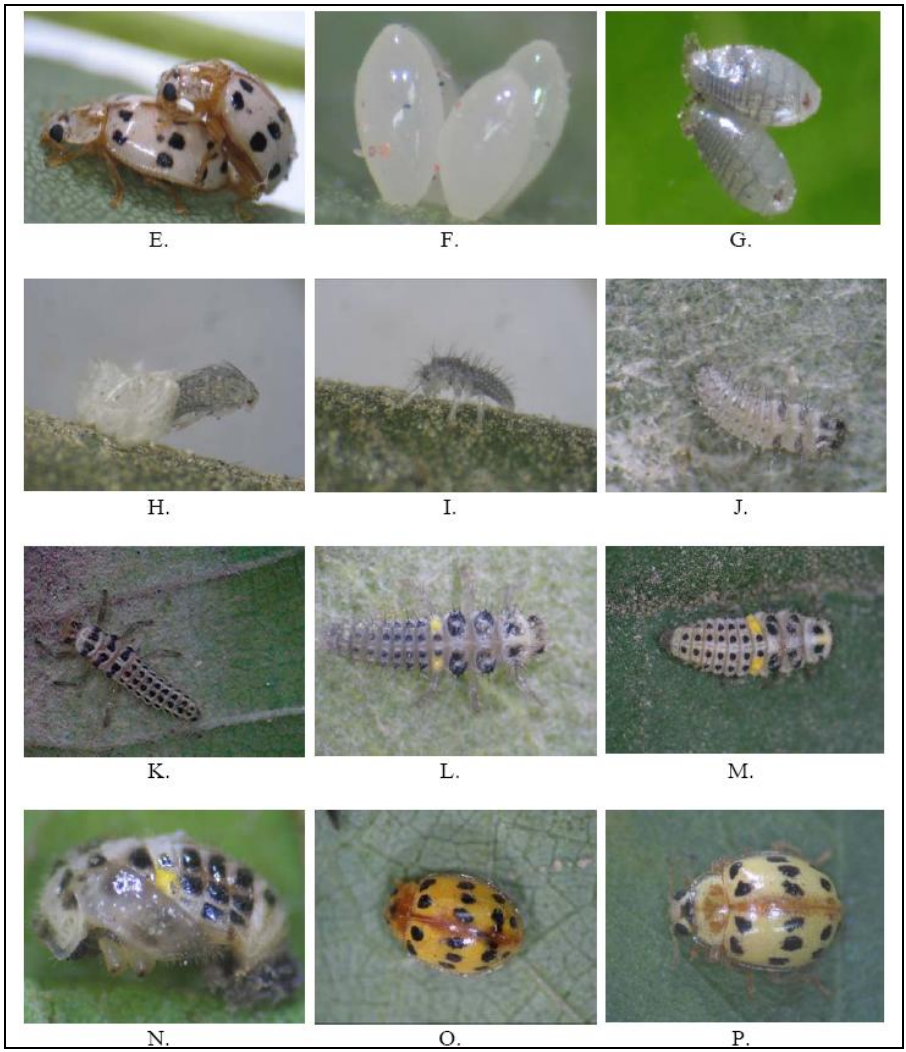

Plate II. *Psyllobora bisoctonotata* Mulsant: E. Mating, F. Eggs, G. Mature eggs, H. First instar emerging out, I. First instar feeds on fungus, J. Second instar, K. Third instar, L. Fourth instar, M. Prepupal stage, N. Pupa, O. Male, P. Female.

Table 1. Measurements and Development period of *Psyllobora bisoctonotata* Mulsant

MEASUREMENTS						
Life stages	**Length (Mean) (mm)**	**Breadth (Mean) (mm)**	**Length head capsule (Mean) (mm)**	**Breadth head capsule (Mean) (mm)**	**Development period (days)**	
					Eggs /leaf	5.54 ± 2.71
					Hatching %	100
Eggs (n=100)	0.81 ± 0.03	0.40 ± 0.02			**Incubation period (n= 35)**	2.50 ± 1.29
Ist instar (n= 30)	0.99 ± 0.07	0.38 ± 0.02	0.28 ± 0.01	0.29 ± 5.64	**I instar (n=51)**	5.00 ± 1.00
IInd instar (n= 24)	1.46 ± 0.11	0.44 ± 0.03	0.28 ± 0.01	0.29 ± 0.01	**II instar (n=35)**	5.50 ± 1.29
IIIrd instar (n=100)	3.38 ± 0.39	0.75 ± 0.00	0.98 ± 0.12	0.99 ± 0.13	**III instar (n=31)**	7.50 ± 0.70
IVth instar (n=100)	4.71 ± 0.52	1.08 ± 0.16	1.15 ± 0.10	1.20 ± 0.10	**IV instar (n=50)**	10.00 ± 1.58
Pupae (n=48)	2.99 ± 0.14	1.77 ± 0.10			**Pupal period (n=38)**	16.50 ± 3.02
Adults ♂(n=90)	2.88 ± 0.16	2.11 ± 0.12			**Adults ♂ (longevity) (n=76)**	26.00 ± 2.73
Adults ♀(n=80)	3.22 ± 0.17	2.42 ± 0.11			Adult ♀ **(longevity) (n = 61)**	27.65 ± 1.50

SPECIES OF THE FLOWER BUGS GENUS *ANTHOCORIS* FALLEN, 1814 FROM MASHHAD REGION, NORTH–EAST OF IRAN (HETEROPTERA: ANTHOCORIDAE)

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[Hasanzadeh Awal, M. & Modarres Awal, M. 2010. Species of the flower bugs genus *Anthocoris* Fallen, 1814 from Mashhad region, North–East of Iran (Heteroptera: Anthocoridae). Munis Entomology & Zoology, 5 (2): 658-660**]**

ABSTRACT: In the faunistic studies, carried out during 2006-2007, three species of *Anthocoris* Fall. belonging to subfamily Anthocorinae and tribe Anthocorini (Het.: Anthocoridae) were collected from Mashhad region. The *Anthocoris* species which are the predators of some injourius arthropod species such as aphids, psylls, thrips, caterpillars and mites were identified as follow: *Anthocoris nemoralis* F., *A. pilosus* (Jak.) and *A. guentheri* Peric. Furthermore, the identification key to these species was given.

KEY WORDS: *Anthocoris*, Iran, fauna, Mashhad.

The family Anthocoridae is constituted by small predaceous insects and contains 400 to 600 species. They are commonly known as flower bugs or pirate bugs. These insects feed on different species of arthropods including aphids, psylls, thrips, caterpillars and mites (Nasser & Abdurahiman, 2004). These predators usually found on flowers (Borror et al., 1989). At least 33 species and subspecies of this family have been reported from Iran. In which about 11 species and 2 subspecies belong to genus *Anthocoris* (Linnavuori & Hosseini, 1996; Linnavuori & Modarres Awal, 1998; Ostovan, 2000).

MATERIAL AND METHODS

In this study, sampling procedure conducted weekly during 2006-2007. Light traps, sweeping net and white trays were used for sampling. Sampling was randomized and carried out in 7 differ-ent locations of Mashhad region (Ghasem Abad, Kheir abad, Band-e-Golestan, Torogh, Golma-kan, Ferdowsi University campus and education research farm of Agriculture College of Fer-dowsi University of Mashhad). All materials were transferred to the laboratory in killing jar and then pinned as well as labeled. Species were identified using morphological characters and identification keys and then sent to Dr. Linnavuori in FIN-21220 Raisio 22, Somersoja- Finland for identification and confirmation.

RESULTS AND DISCUSSION

In this study three species of genus *Anthocoris* (Het.: Anthocoridae) including *Anthocoris nemoralis* F., *A. pilosus* (Jak.) and *A. guentheri* Peric., were identified in Mashhad region from Iran. Species and identification key of those were presented below.

Anthocoridae Fieber, 1836
Anthocorinae Fieber, 1837

Anthocoris nemoralis (Fabricius, 1794)
Body is 3.3-4.0 mm. and black. Hair covering on upper surface of body is pale, short and appressed. Cuneus and posterior half of embolium are shiny (Fig. 1 a).
Material examined: **Mashhad (Ghasem Abad):** 9 specimens (♂), May-July 2006. On fruit trees and grasses.

Anthocoris pilosus (Jakovlev, 1877)
Body is 4.0-4.5 mm. and black. Hemielytra is totally shiny. Hair covering on upper surface of body is long, erect and pale (fig. 1 b). Conical process of paramere is taper (Fig. 2 a).
Material examined: Mashhad (Ghasem Abad: 3 specimens (♂), April, August 2006; **Chenaran (Golmakan):** 1 specimen (♂), June 2006; **Mashhad**: 3 specimens (♂), May-July 2006. On alfalfa, sunflower and grasses.

Anthocoris guentheri Pericart, 2007
Body is oblong, hairless, 3.5 times longer than the width of the base of pronotum and yellow to brown with black or reddish areas. Head is red. Eyes are reddish to red and antennae are relatively strong. Pronotum with a more or less wide black longitudinal stripe and the lateral parts turning brown to yellow, reddish yellow or red. In one of the specimens (♀), pronotum is entirely red and only have a little basal black stripe along the scutellum. Hemielytra are yellowish brown except the cuneus. Coxae and legs are brownish yellow and abdomen is blackish to red (Fig. 1 c). From above view, parameres of males seen scythe-shaped, without tooth on their internal edge and their apex is a little upraised(Fig. 2 b). The general habitat of *Anthocoris guentheri* is rather near to that of the transpalaearctic species *A. confuses* (Reuter, 1884; Pericart, 1972).
Material examined: Mashhad: 4 specimens (2♂ and 2♀), May 2006. On ash.

Identification key

1. Body hairless; antenna relatively strong, the first and second segments yellowish brown, their apex frequently darker and joints black; external part of exocorium and whole cuneus shiny; pronotum with a more or less wide black longitudinal stripe; parameres without tooth.....*Anthocoris guentheri* Pericart
-. Hair covering exists on the body.....**2**

2. Head and pronotum black; antenna blackish, second segment pale; hair covering on upper surface short and pale; exocorium and cuneus shiny.....
.....*Anrhocoris nemoralis* Fabricius
-. Head and antenna black; hair covering on upper surface long, Erect and pale; Hemielytra totally shiny and yellow to white, apical part of corium and cuneus blackish.....*Anthocoris pilosus* (Jakovlev)

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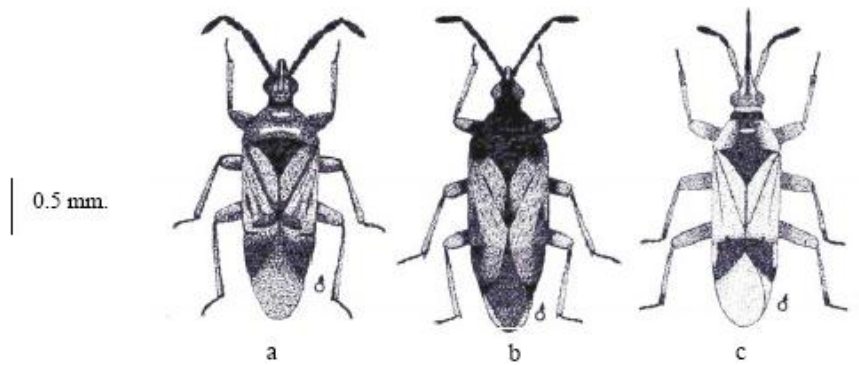

Fig. 1. *Anthocoris* spp.: a- *A. nemoralis* F., b- *A. pilosus* (Jak.), c- *A. guentheri* Peric.

Fig. 2. Paramere of *Anthocoris* spp.: a- *A. pilosus* (Jak.), b- *A. guentheri* Peric.

SCOLIID WASPS (HYMENOPTERA: VESPOIDEA) OF JALDAPARA WILDLIFE SANCTUARY, WEST BENGAL, INDIA

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[Bhattacharjee, S., Saha, S. & Raychaudhuri, D. 2010. Scoliid wasps (Hymenoptera: Vespoidea) of Jaldapara Wildlife Sanctuary, West Bengal, India. Munis Entomology & Zoology, 5 (2): 661-669**]**

ABSTRACT: Five scoliid wasp species are reported for the first time from Jaldapara Wildlife Sanctuary, West Bengal, India. Necessary diagnosis of the recorded taxa is furnished. Keys to their tribes, genera and species are also provided.

KEY WORDS: Scoliidae, Jaldapara Wildlife Sanctuary, Scoliinae, *Campsomeriella*, *Phalerimeris*, *Megascolia*, *Scolia*.

Family Scoliidae, one of the rare groups of wasps is known by 300 extant species only (Resh & Carde, 2004). This represents 1.21 % of the global vespoid fauna. Even though Indian scoliids has a history of 235 years, very few have worked on the group. It was Fabricius (1775) who first dealt with the Indian scoliids and Bingham (1897) was the first to provide a consolidated account of Scoliidae of the Indian subcontinent. This was followed by Betrem's (1928) monograph on Indo-Australian Scoliidae. Later contributors are Gupta (1997 a, b), Gupta & Jonathan (2003), Jonathan & Gupta (1999 a, b; 2003), Girish Kumar (2009 a, b; 2010). Till date, Indian fauna is known by 79 species which includes 30 species of West Bengal. However, none of these works ever included study on the protected areas of Northeast India, more so of West Bengal.

During our study on the vespoids of Jaldapara Wildlife Sanctuary, Jalpaiguri, West Bengal during 2001-04, we have recorded 5 scoliid wasps namely *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius), *Campsomeriella* (*Annulimeris*) *annulata annulata* (Fabricius), *Phalerimeris phalerata phalerata* (Saussure), *Megascolia* (*Regiscolia*) *azurea christiana* (Betrem & Guiglia) and *Scolia* (*Discolia*) *affinis* Guérin.

Taxonomy of the mentioned species are provided hereunder.

MATERIALS AND METHODS

Scoliid wasps were collected between 8 am- 12 noon from different beats of JWLS by sweep net. Collection and preservation of the samples were done following Alfred and Ramakrishna (2004). The wasps were studied and illustrated under stereo microscope Zeiss (SV6). All scales of measurement are in 1 mm if not

otherwise stated. The materials are in the deposition of Entomology Laboratory, Department of Zoology, University of Calcutta.

Abbreviations used: TL=Total Length; WL=Wing Length (Fore wing/hind wing).

TAXONOMY

Key to Tribes

1. Fore wing with 2 recurrent nervures (Fig.3), 2nd one running from subdiscoidal to cubital vein; 1st abdominal segment without any mid basal tubercle, 2nd and 3rd segments often with subapical row of setae bearing punctures; volsella divided into basal and apical part by a transverse suture.....Campsomerini Betrem
- Fore wing with 1 recurrent nervure (Fig. 23), 2nd recurrent nervure when present coalescing with the 1st recurrent nervure before reaching cubital vein; 1st abdominal segment often with a basomedial tubercle, 2nd and 3rd segments never with subapical row of setae bearing punctures; volsella not divided into basal and apical part.....Scoliini Latreille

Tribe Campsomerini
Key to Genera

1. Upper plate of metapleuron impunctate, sometimes with fine, sparse punctures above; transition between its vertical and dorsal areas straight, marked with an entirely or partly distinct carina below base of hind wing.....
.....*Campsomeriella* Betrem
-. Upper plate of metapleuron punctate above: transition between its vertical and dorsal areas gradual or straight, usually straight anteriorly and gradual posteriorly..... *Phalerimeris* Betrem

Genus *Campsomeriella*
Key to Species

1. Wings black brown with a violaceous tint; abdomen not petiolate (Fig. 1); vestiture on legs, propodeum, margins of abdominal segments black; spurs of hind tibia black or testaceous; lateral carina of propodeum short, not extending upto spiracle.....*Campsomeriella (Campsomeriella) collaris collaris* (Fabricius)
-. Wings clear, hyaline; abdomen subpetiolate (Fig. 9); vestiture dense creamy white; spurs on hind tibia white; lateral carina of propodeum long, extending somewhat beyond spiracle.....
.....*Campsomeriella (Annulimeris) annulata annulata* (Fabricius)

Campsomeriella (*Campsomeriella*) *collaris collaris* (Fabricius)

(Figs. 1-4)

1775. *Tiphia collaris* Fabricius, Syst. Ent.,:354.
1895. *Colpa parvula* Lepelitier, Hist. nat. Ins.: Hym., 3: 584.
1967. *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius); Betrem, Ent. Ber., Amst., 27: 29. (*Campsomeriella* raised to generic rank and *collaris* placed in subgenus *Campsomeriella*, section *Campsomeriella*).
1978. *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius); Krombein, Smithsonian Contr. Zool., 283: 18-19.

Diagnosis (Female): Measurements: TL: 22; WL: 19/ 13. Black; vestiture on back of head, pronotum, scutum dense silky fuscous white, on legs, propodeum, margins of abdominal segments metallic black; punctures on head sparse, more

dense on thorax, sparse on abdomen; frons transverse, convex, rugosely punctate, with a midlongitudinal sulcation ending between antennal bases, frontal lamina convex, round; antennae downwardly placed, slightly above clypeal margin; scrobe depressed; clypeus convex, apical margin curved, carinate and transversely striate, laterally lamellate; mandibles broad, sickle shaped, surface strongly grooved, apical margin with brown stiff bristles; pronotum broad, band like; scutum subquadrate; scutellum broad, transverse; metanotum narrow, transverse, band like; propodeum apically broadly emarginate, medially subtuberculate; abdomen elongate, broad, margins ciliate, apical segment with dense, stiff setae; wings blackish brown with violaceous tint; with 2 submarginal cells, 2nd receiving 2 recurrent nervures at base; discoidal cell subpentagonal, jugal lobe of hind wing elongate, crossing anal cell.

Material Examined: 1 female, 27.iv.02, Bendaki; Jalpaiguri; West Bengal; coll. Samrat Bhattacharjee.

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal), Nepal, Sri Lanka (Jonathan & Gupta, 2003; Girish Kumar, 2009a, 2010).

Campsomeriella (Annulimeris) annulata annulata (Fabricius)

(Figs. 5- 10)

1793. *Tiphia annulata* Fabricius, Ent. Syst., 2: 225.
1845. *Campsomeris servillei* Lepelitier, Hist. nat. Ins., Hym., 3: 501.
1901. *Elis aglaea* Cameron, Proc. zool. Soc. London, 2:19.
1967. *Campsomeriella* (*Campsomeriella*) *annulata* (Fabricius); Betrem, Ent. Ber., 27: 25-29. (*Campsomeriella* raised to generic rank and *annulata* placed in subgenus *Annulimeris*).
1979. *Campsomeriella* (*Campsomeriella*) *annulata annulata* (Fabricius); Krombein, Cat. Hym. North Mexico, 2: 1317.

Diagnosis (Male): Measurements: TL: 19; WL: 12/ 9. Metallic black, clypeus except a diamond spot in the middle and a vertical line above it, a transverse band medially on pronotum, tegula, 2 transverse spots on scutellum, a spot on metanotum, a broad, transverse band on the apical margin of abdominal segments 1-5, not so pronounced on the 5th segment, apical half of femur and whole of outer surface of tibia yellow; vestiture dense creamy white; pubescence silvery; body densely punctate, these sparse on abdomen; head oval, transverse, frons transverse, medially rising and then descending down on clypeus, with a faint midlongitudinal sulcation; clypeus convex, pentagonal, apical margin arched, lamellate; mandibles elongate, narrow; thorax broad, elongate, slightly convex; pronotum anteriorly margined; scutum quadrate, very slightly convex, scutellum transverse, rectangular; metanotum narrow, transverse, sides expanded; propodeum broad, apically shallowly truncate, truncate surface rather obliquely sloping; orifice round; abdomen subpetiolate, excluding petiole parallel sided; petiole apically sloping; 1st segment with an anterior collar; wings clear, hyaline, upper margin and apical area pubescent; with 2 submarginal cells, 2nd receiving 2 recurrent nervures about middle of base; discoidal cell subquadrate; jugal lobe of hind wing crossing anal vein; male genitalia as in figure 10.

Material Examined: 1 male, 08.xi.01, Jaldapara; Jalpaiguri; West Bengal; coll. Sumana Saha.

Distribution: China, India (Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal) (Jonathan & Gupta, 2003; Girish Kumar, 2010).

Phalerimeris phalerata phalerata (Saussure)

(Figs. 11- 14)

1858. *Elis* (*Campsomeris*) *phalerata* Saussure, Ann. Soc. ent. France, (3) 6: 233.
1897. *Elis* (*Dielis*) *iris* Lepelitier; Bingham, Fauna British India, Hym., 1: 94.
1911. *Campsomeris albopilosa* Rohwer, Proc. U.S. Natn. Mus., 39: 480.
1972. *Campsomeris (Phalerimeris) phalerata* (Saussure); Tsuneki, Etizenia, 62: 15-16.
1974. *Phalerimeris phalerata phalerata* (Saussure), Bradley, Revue Suisse Zool., 81: 460.

Diagnosis (Female): Measurements: TL: 13; WL: 11/ 8. Black, apical margin of 1st, 2nd and 3rd abdominal segments yellow, the same on 2nd segment medially broad; vestiture dense on the front, disc of scutum and vertex brownish, these on the back of head, pronotum, metanotum, abdomen and legs metallic yellowish brown; punctures coarse, these on frons and vertex and abdomen sparse, on pronotum at the sides, scutum, scutellum, metanotum and propodeum dense; frons convex with a midlongitudinal sulcation (frontal fissure) reaching above frontal area; scrobe depressed, divergent; frontal lamina raised, broad, narrowly covering base of antenna; eyes convex, medially inwardly incised; clypeus flat, transverse, laterally lamellate with silky golden pubescence, basal margin straight, apical margin broad, carinate, transversely striate; mandibles long, sickle shaped, crossing each other to reach almost the base, apical margin setose; pronotum broad, band like; scutum subquadrate; tegula convex, polished, laterally expanded, apical margin convex; scutellum transverse, bowl-like; metanotum narrow, transverse, below level of scutellum; propodeum small, apically shallowly truncate, median area apically narrowed; abdomen elongate, sides nearly parallel, slightly narrowing, apical segment truncate, wings flavohyaline, with a broad subapical fuscous spot; upper margin including 2nd submarginal cell with small hairs; with 2 submarginal cells, 2nd one receiving both recurrent nervures; discoidal cell subrectangular, sides oblique.

Material Examined: 1 female, 08.xi.01, Jaldapara; Jalpaiguri; West Bengal; coll. Samrat Bhattacharjee.

Distribution: China, India (Arunachal Pradesh, Assam, Himachal Pradesh, Jharkhand, Meghalaya, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal) Indonesia, Malaysia, Myanmar, Nepal, Taiwan, Thailand (Jonathan & Gupta, 2003; Girish Kumar, 2010).

Tribe Scoliini

Key to genera

1. Body large (19-50 mm); distance from eyes to hind margin of head in female equal to about twice the diameter of the upper lobe of an eye; fore wing with 3 submarginal cells; 1st abdominal segment with a strong basomedian tubercle, pointed in male..... *Megascolia* Betrem

-. Body small to moderate (5-25 mm); distance from eyes to hind margin of head in female slightly more than the diameter of the upper eye lobe; fore wing with 2 submarginal cells; 1st abdominal segment sometimes with a small to moderate basomedian tubercle.....*Scolia* Fabricius

Megascolia (Regiscolia) azurea christiana (Betrem & Guiglia)

(Figs. 15-19)

1892. *Scolia* (*Triscolia*) *rubiginosa* Fabricius; Magretti, Ann. Mus. civico Stor. nat. Geneva, 32: 236.
1958. *Megascolia* (*Regiscolia*) *azurea christiana* Betrem & Guiglia, Ann. Mus. civico Stor. nat. Genova, 70: 96.
1964. *Megascolia* (*Regiscolia*) *azurea christiana* (Betrem & Guiglia); Betrem & Bradley, Zool. Meded., 39: 444.

Diagnosis (Male): Measurements: TL: 26; WL: 20/ 14. Black, with a metallic coppery tint, dorsal half of face, 2 broad, oval marks on 3rd abdominal segment, the same on the 4th segment (not so pronounced) orange; vestiture dense, on body metallic black, on 1st and 2nd abdominal segments black and succeeding segments orange brown; punctures on head coarse, sparse, dense on sides of pronotum, sparse on scutum, with a gradual increase in density towards propodeum, on abdomen irregular, basal margins with small dense punctures; head round, dorsally broadly convex; frons broad, transverse, medially strongly ridged, frontal lamina strongly ridged, curved; supraclypeal area longitudinally carinate, coarsely punctate; clypeus flat, transverse, medially weakly raised, margins lamellate, apical margin finely, transversely striate in the middle, surface with punctures and large depressions; scrobe depressed; mandibles broad, sickle shaped, surface with thin sulcation running from middle of base; malar space very narrow; thorax long, broad, slightly convex; pronotum anteriorly recurved, sides sloped; scutum subquadrate; scutellum broad, laterally sloped; metanotum broad, transverse, bandlike, laterally expanded; propodeum apically roundly truncate, shallow, dorsomedian area broadly convergent below; abdomen long, posteriorly broadly narrowing; 2nd segment broad, wings dark brown, with coppery effulgence; with 3 submarginal cells, 2nd receiving only 1 recurrent nervure about middle at base; jugal lobe of hind wing broad, crossing anal cell; discoidal cell subquadrate, apex pointed; claws simple; male genitalia as in figure 19.

Material Examined: 1 male, 01.v.03, Hollong; Jalpaiguri; West Bengal; coll. Dinendra Raychaudhuri.

Distribution: Bangladesh, India (Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Orissa, Sikkim, Tripura, Uttarakhand, West Bengal), Myanmar, Nepal (Jonathan & Gupta, 2003; Girish Kumar, 2009b, 2010).

Scolia (*Discolia*) *affinis* Guérin

(Figs. 20-24)

1838. *Scolia affinis* Guérin, Voy. Coq.: 254.
1855. *Scolia* (*Lacosi*) *jurinei* Saussure, Mem. Soc. Phys. Hist. nat. Geneva, 14: 45.
1864. *Scolia* (*Discolia*) *aureipennis* Lepelitier; Saussure and Sichel, Cat. Spec. Gen. Scolia: 109.
1978. *Scolia* (*Discolia*) *affinis* Guérin; Krombein, Smithsonian Contr. Zool., 283: 31-33.

Diagnosis (Male): Measurements: TL: 23; WL: 15/10. Black, with a beautiful metallic reflection all over, flagellum orange brown; vestiture at the back of head, sides of pronotum, abdomen, legs dense black; punctures on vertex small, scattered on frons, pronotum dense, comparatively lesser on scutum and abdomen; head oval, convex; frons broad, convex, midlongitudinally sulcate, sulcation between the antennae well marked; antennae downwardly placed, narrowly separated from clypeus; clypeus transverse, medially raised, apical margin lamellate, curved, reflexed; mandibles long, sickle shaped, surface

grooved, margin with stiff brown hairs; thorax broad, elongate, convex; pronotum anteriorly slightly curved; scutum subquadrate; scutellum subquadrate, laterally sloping; metanotum transverse, band like; propodeum posteriorly narrowing, rather shallowly truncate towards apex, orifice round; abdomen elongate, convex, parallel sided; basal segment basomedially subtuberculate; except the apical segment which is rounded posteriorly; wings fuscous, with bluish metallic effulgence; 1st submarginal cell receiving 1 recurrent nervure about middle of base; jugal lobe in hind wing elongate, crossing anal cell; male genitalia as in figure 24.

Material Examined: 1 male, 02.vi.03, Sissamara; Jalpaiguri; West Bengal; coll. Samrat Bhattacharjee.

Distribution: Bangladesh, India (Arunachal Pradesh, Assam, Bihar, Chattisgarh, Delhi, Himachal Pradesh, Jharkhand, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Orissa, Pondicherry, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal), Nepal, Pakistan (Jonathan & Gupta, 2003; Girish Kumar, 2010).

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The authors wish to thank UGC for funding the project [No. F3:136/2001 (SR II) dated: 28.3.01 & 20.04.01]; Department of Forests, Govt. of West Bengal; Head of Department of Zoology, University of Calcutta; Principal, Scottish Church College; Dr.Till Osten (Staatliches Museum, Naturkunde, Germany) for their manifold assistance during the course of the study.

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Fig. 1

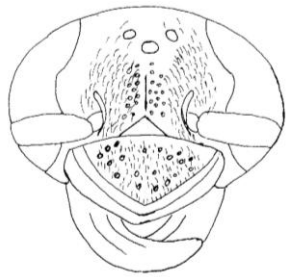


Fig. 2

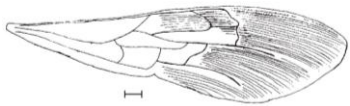


Fig. 3

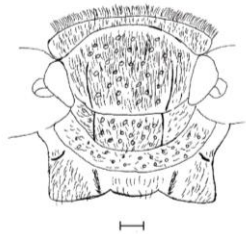


Fig. 4

Figures 1-4. *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius): 1. Photographic image, 2. Face: frontal view, 3. Fore wing: dorsal view, 4. Thorax: dorsal view.

Fig. 5

Fig. 6

Fig. 7

Fig. 8

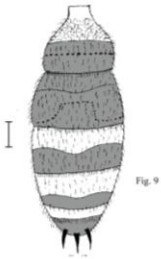


Fig. 9

Fig. 10

Figures 5-10. *Campsomeriella* (*Annulimeris*) *annulata annulata* (Fabricius): 5. Photographic image, 6. Face: frontal view, 7. Thorax: dorsal view, 8. Fore wing: dorsal view, 9. Abdomen: dorsal view, 10. Male genitalia: dorsal view.

Fig. 11

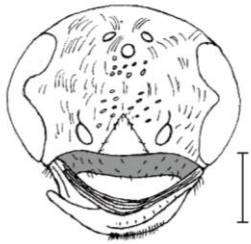


Fig. 12

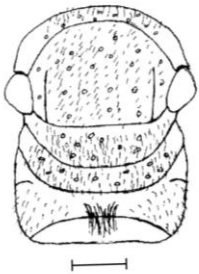


Fig. 13

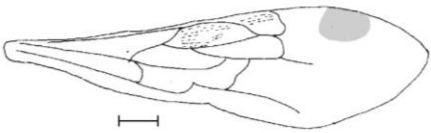


Fig. 14

Figures 11-14. *Phalerimeris phalerata phalerata* (Saussure): 11. Photographic image, 12. Face: frontal view, 13. Thorax: dorsal view, 14. Fore wing: dorsal view.

Fig. 15

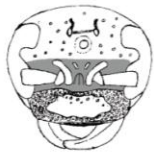
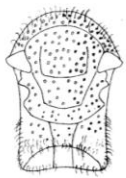


Fig. 16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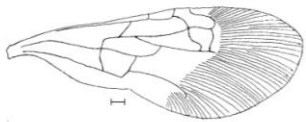
Fig. 18

Fig. 19

Figures 15-19. *Megascolia* (*Regiscolia*) *azurea christiana* (Betrem & Guiglia): 15. Photographic image, 16. Face: frontal view, 17. Thorax: dorsal view, 18. Fore wing: dorsal view, 19. Male genitalia: dorsal view.

Fig. 20

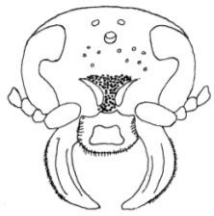
Fig. 21

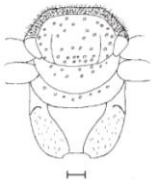
Fig. 22

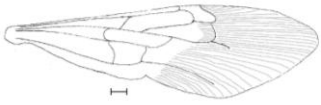
Fig. 23

Fig. 24

Figures 20-24. *Scolia* (*Discolia*) *affinis* Guérin: 20. Photographic image, 21. Face frontal: view, 22. Thorax: dorsal view, 23. Fore wing: dorsal view, 24. Male genitalia: dorsal view.

GENETIC VARIABILITY OF GEOGRAPHICAL POPULATIONS OF THE BOLLWORM, *HELICOVERPA ARMIGERA* HÜBNER (LEPIDOPTERA: NOCTUIDAE), IN WEST AND NORTHWEST OF IRAN

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[Khiaban, N. G. M. Z., Hejazi, M. S., Irani-Nejad, K. H., Mohammadi, S. A. & Khaghaninia, S. 2010. Genetic variability of geographical populations of the bollworm, *Helicoverpa armigera* Hübner (Lepidoptera: Noctuidae), in west and northwest of Iran. Munis Entomology & Zoology, 5 (2): 670-676**]**

ABSTRACT: Old World or African bollworm, *Helicoverpa armigera* Hübner (Lep.: Noctuidae) is one of the key pests causing severe yield losses, infesting several crops such as cereals, pulses, cotton, vegetables and fruit crops as well as wild hosts. It is expected that the recognition of intraspecific variation, its nature and scope, may aid our understanding of the pest and also to predict its spatial and temporal occurrence, to devise effective management strategies, and also to characterize pod borer population responses to control measures. The purpose of this study is to estimate the relative importance of generic and environmental effects on characters of pod borer in Iran. Specimens were collected from several provinces in Iran from tomato. The genomic DNA from *H. armigera* larvae collected during summer 2006-2007 from five different places were subjected to polymerase chain reaction (PCR) using 10 different SSR primers. The highest numbers of 14 markers were produced by the primer HaSSR1, followed by 9 markers by HaSSR6 with high degree of polymorphism 75–100%. The primers HaSSR6, HaSSR4, HaC87 and HaD47 were found to be highly informative to differentiate populations with a polymorphism information content value of 100 percent. Ten tested SSR primers produced 46 bands in geographical populations. Within population genetic diversity based on Nie s gene index ranged from 0.188 to 0.250 Molecular variance analysis showed significant within and between population variance. The between and within geographical variance accounted for 13.88 and 86.12 percent of total molecular variance, respectively. Cluster analysis based on molecular data in geographical assigned the studied pod borer moth populations into two groups. In this grouping, group one consisted of Golestan population. The maximum and minimum genetic distances were observed between Gorgan- Mughan (0.21853) and Kermanshah- Shahindej (0.05789). Significant correction was not found between genetic and geographic matrices revealed by Mantel test.

KEY WORDS: Pod borer, *Helicoverpa armigera*, SSR, Molecular markers, Biodiversity, Geographic population.

Old World or African bollworm, *Helicoverpa armigera* Hübner (Lepidoptera: Noctuidae) is one of the key pests causing severe yield losses, infesting several crops such as cereals, pulses, cotton, vegetables and fruit crops as well as wild hosts (Zaluki et al., 1986,1994; Fitt, 1989). The bollworm is a polyphagous pest of worldwide occurrence inflicting annual crop damage in India worth US $1 billion

(Sharma, 2001). Ecological and Physiological features like high fecundity, multi-voltinism, ability to migrate long distances and diapauses during unfavorable conditions contribute for it's severity in different situations.

Understanding the genetic variation among the *H. armigera* populations occurring on host plants and different geographical conditions has become essential to understand the variation in their susceptibility to different insecticides and suitable management. This species is migratory on all continents, and a key pest on all of them (Feng et al., 2005). It reported in the main agriculture area of Iran too. This pest is primarily controlled by using chemicals that has many unfavorable side effects such as weather, air, food and environmental pollutions. Observations on the pest behavior show interspecific variation in damage caused to several crops in different geographic locations. It is expected that the recognition of intraspecific variation.

Its nature and scope, may aid our understanding of the pest and also to predict its spatial and temporal occurrence, to devise effective management strategies, and also to characterize pod borer population responses to control measures. The purpose of this study is to estimate the relative importance of generic and environmental effects on the morphological characters of pod borer in Iran.

The genetic variation among geographic populations of *H. armigera* collected from the South Indian cotton ecosystem was analyzed using RAPD markers and 12 populations were classified into two distinct groups (Fakrudin et al., 2004). In the present study the genetic variability of *H. armigera* occurring on five different geographical regions were analyzed using simple sequence repeat (SSR) markers. The characteristics of SSR markers such as coverage of multiple loci, co-dominance and high polymorphism suit them better in the task of measuring genetic structure in *H. armigera* (Scott et al., 2003) than the RAPD markers used in the previous studies. The use of SSR markers for *H. armigera* was previously hampered by non-availability of the DNA sequence information. Recently, many SSR markers specific for *H. armigera* have been identified (Tan et al., 2001; Ji et al., 2003; Scott et al., 2004; Ji et al., 2005).

MATERIALS AND METHODS

Specimens were collected from several provinces in Iran on tomato. From the provinces of Kermanshah: City of Ravansar. From the province of Ardabil: City of Mogan (MT). From the province of East Azarbyjan: City of Shabestar (SBT). From the province of West Azarbyjan: City of Shahindeg (SHT). From the province of Golestan: City of Gorgan (GT) (Table 1).

Larvae of *H.armigera* were collected during summer 2006-2007 from Tomato. from first generation of each population 15 individuals of each sex were collected for preliminary analysis. larvaes were randomly selected for the isolation of genomic DNA and stored at –70° C.

DNA extraction

The larvae were washed thoroughly in double distilled water and the genomic DNA was prepared from the 2th instar larvae using by modified protocol (Zimmerman et al., 2000). Briefly, the cleaned larvae were ground in liquid nitrogen and then 500 microlitre buffer containing 100 mM Tris-HCI (pH 8.0), 0.1 M sodium chloride, 20 mM EDTA, 0.1% of SDS and suspended in the same buffer. The suspension was incubated at 60° C for 3 hours and then equal volume of chloroform: isoamylalcohol (24:1) was added. The suspension was centrifuged

at 13000 g for 5 minutes at 4° C. The upper aqueous layer was transferred to a fresh micro centrifuge tube taking care not to disturb the middle protein interface. Then added 15 microllitre Nacl 5M and shacked by hand slowly. DNA was precipitated by adding equal volume of ice-cold isopropanol. The tube was kept for 20 min in -20 C. The precipitated DNA was spun at 13000 g for 5 minutes and the Supernatant was discarded and the DNA pellete was finally washed twice using ethanol 70% and dissolved in 200 µl TE (Tris EDTA, 100 mM). Extracted DNA was further purified free of RNA contaminants by addition of 10 µl/100 µl of RNase. The intact genomic DNA was visualized in a 1% agarose gel. Depending upon the concentration, the DNA samples were diluted with sterile water to get a working solution of 20–25 ng/µl.

PCR amplification

The genomic DNA from *H. armigera* larvae collected from five different places were subjected to polymerase chain reaction (PCR) using 10 different SSR primers (Tan et al., 2001; Ji et al., 2003) (Table 2) obtained from Sigma-Aldrich, (www.sigmaaldrich.com). PCR was carried out in 20 µl reaction mixture containing 50 ng DNA as the template. Genomic DNA 2.0 µl (25 ng), dNTPs 0.8 µl (2.5 mM), assay buffer 1 µl (10X), SSR forward primer 2 µl (20 µM), SSR reverse primer 2 µl (20 µM), Taq polymerase 0.15 µl (3 units), magnesium chloride 0.15 µl (25mM), sterile distilled water 3.7 µl, were added and PCR was performed in a DNA thermal cycler programmed for 5 min at 94° C for initial denaturation. Following the initial denaturation the thermal cycler was programmed for 35 cycles of 1 min at 94° C for denaturation , 1 min for annealing depend on primers and 50 second at 72° C for extension and additional cycle of 10 min at 72° C for final extension.

Electrophoresis of PCR products

PCR products were analyzed by electrophoresis in 6 percent polyacrylamide gel electrophoresis run at 70 W for 30 min in 1x TBE buffer. The banding pattern was visualized using the silver staining method (Panaud et al. 1996). The silver stained gel plates were allowed to dry and photographed. The molecular size of the amplified products was estimated using a 100 bp DNA marker (Fermentas Inc., www.fermentas.com.) The samples were analyzed all 12 primers to test the reproducibility of bands.

Scoring of bands and statistical analysis

Based on log molecular weight of the co-migrating 100 bp DNA marker (Fermentas Inc., USA) and their migration distances scatter plots were established and trend lines with best fit was fitted. Based on the mathematical expression of the trend lines the molecular weight of the fragment corresponding to their migration distances was calculated. The individual DNA bands were scored as present or absent (1/0) in the amplification profile of each sample. Only clear bands with good resolution were scored. The scored marker data matrix was analyzed using the standard procedure in NTSYS pc-2.0 package (Rohlf, 1998).

The percentage of polymorphism was calculated as the proportion of the polymorphic markers to the total number of markers. A dendrogram was constructed after cluster analysis of the similarity coefficients by the un-weighted pair-group method analysis, UPGMA (Sneath and Sockal, 1973) using NTSYS Pc-2.0.

RESULTS AND DISCUSSION

All ten primers listed produced score able markers in each DNA sample. Sample gels resulting from the HaSSR1, 2, 4, 9 and 10 primers across the populations collected from different places are presented in Figure 1.

A total of 46 markers from 10 primers were available for analysis across the different populations. The highest numbers of 14 markers were produced by the primer HaSSR1, followed by 8 markers by HaSSR9 with high degree of polymorphism 75–100%. Analysis of molecular of variance among and within populations showed significant variation (Table 3).

Fixation Index FST : 0.50542

Computed FST values for these comparisons were low to moderate, from 0.05789 to 0.2185 with a mean of 0.13797 (Table 4).

Generalized distances values were then utilized to cluster the data using the un-weighted pair-group method analysis of Sneath & Sokal (1973). Since test geographic populations were all associated with the same host (Tomato), population differences may have been mainly the result of geographic barriers that are defined as any terrain that prevents gene flow between populations (Mayr & Ashlock 1991). Sometimes distance alone can function as a barrier to genetic exchange among populations (Ruggiero et al., 2004). The Mantel test did not show correlations between geographic and genetic distances in test populations. The dendrogram (Figure 2) revealed the existence of two principle clusters and a single sub-cluster. The population occurring on GT stood out in a single cluster (A), while the population occurring in MT, SHT, KT and SBT grouped together in cluster B. The population occurring from Gorgan was found in a single sub-cluster.

The authors suggested that this difference might be due to the variation in environmental and ecological factors. Because Gorgan situated in near of Caspian sea and has the least elevation 13.3 M and maximium annually rainfall 599.6 mm. Scott et al. 2003 found genetic shifts in *H. armigera* collections over monthly intervals and collection in any month was genetically distinct from all previous monthly collection. The author suggested that this might be due to the migration of populations from different locations.

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Table 1. List and code of collecting sites of *Helicoverpa armigera* on tomato.

Province	**Population**	**code**
Ardabil	Mogan	MT
Golestan	Gorgan	GT
Kermanshah	Kermanshah	KT
East Azarbyjan	Shabestar	SBT
West Azarbyjan	Shahindej	SHT

Table 2. SSR markers utilized in the study, no. of markers generated for populations collected.

Primer	Sequence (5′ – 3′)	Repeat type	Number of markers generated	Polymorphism(%)
HaC14	TCCACACAGTTTGCATTATGA CGCCATAATCCTATTGATTC	(attt)5	5	80
HaD47	TCAAACACACATACTTGACTA TCCAGCAGTGGAATGCGA	(ca)5(tca)4	5	100
HaC87	ACGCGAGCACCAACTGTAA GAGACCAATAGCAGTAGTTC	(tc)5	3	100
HaSSR1	TAGGTGATTGTGGCTCAGTTTT CAAACCCATCAGCAAATGCAAC	(ttgc)2gat(tgy)4gat(tgy)35 (tga)2agc(tgy)8	14	75
HaSSR4	TGTTACTTGGGTTTCCTGAATA ACCACCGACACGTGCCGACTTC	(gyt)25	3	100
HaSSR5	GATAAGTTATTTCGGTTTAGTATT AAGTACCTAATCCGTTTTTATTC	[t(t)aa]6	4	50
HaSSR6	CATAGGAAGTGGTGAAGGGT CACATTCGTCTTTCATCGAC	(tttga)19	6	100
HaSSR7	ACGTCGATGAAAGACGAATGA AAGCTGGTCTGTGCTGCCAT	(taaa)2(taaat)4	4	66.67
HaSSR9	TAGTCTGGGAATTTTGTCTGGTGT CGTGCCATTGAAATAGTAAGCCAT	(t)n(g)n	8	66.67
HaSSR10	TAAGTATGCCCTCGACTGTCGT CACTTTCCAATTAGCCTCGATGCT	(gat)2tt(gat)2tt... .....(aata)5	6	83.3

Table 3. AMOVA of 5 tested geographic populations of *Helicoverpa armigera* using 10 SSR primers.

Source of variation	d.f.	Sum of squares	Variance components	Percentage of variation
Among Populations	**3**	**134.821**	**5.63265Va**	**50.54**
Within populations	**24**	**132.286**	**5.51190Vb**	**49.46**
Total	**27**	**267.107**	**11.14456**	

Fixation Index FST : 0.50542

Table 4: Population pair wise FST of 5 tested geographic population comparisons using 10 SSR primers.

	GT	MT	SHT	SBT	KT
GT	**0.00000**				
MT	**0.21853**	**0.00000**			
SHT	**0.16852**	**0.05827**	**0.00000**		
SBT	**0.13958**	**0.14425**	**0.11072**	**0.00000**	
KT	**0.15175**	**0.16703**	**0.05789**	**0.16315**	**0.00000**

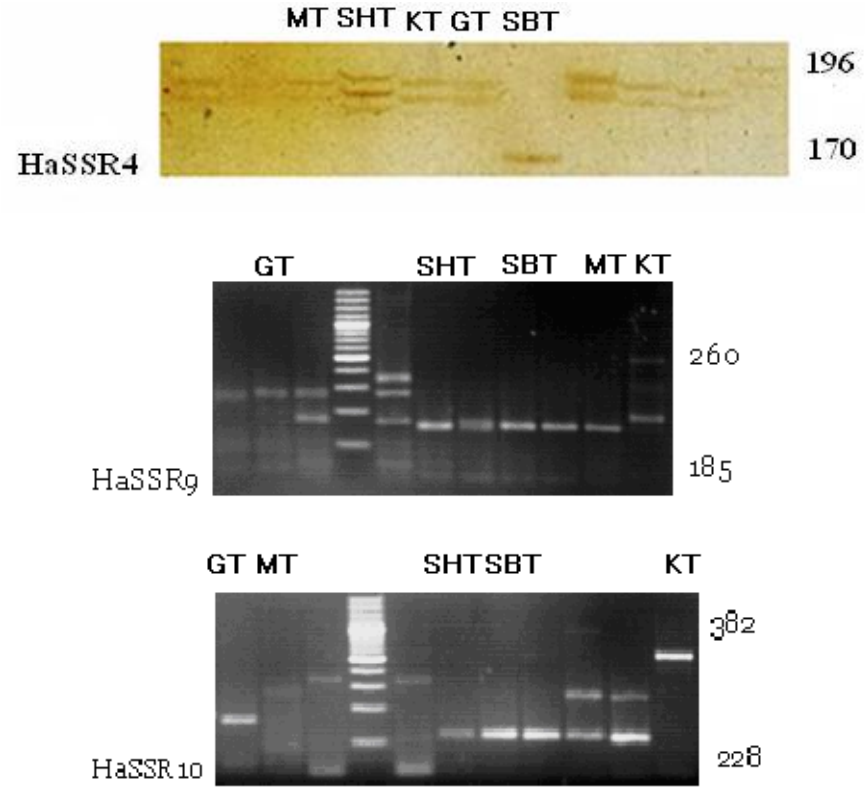

Figure 1. Simple sequence repeat (SSR) fragments from *Helicoverpa armigera* obtained from different geographical places.

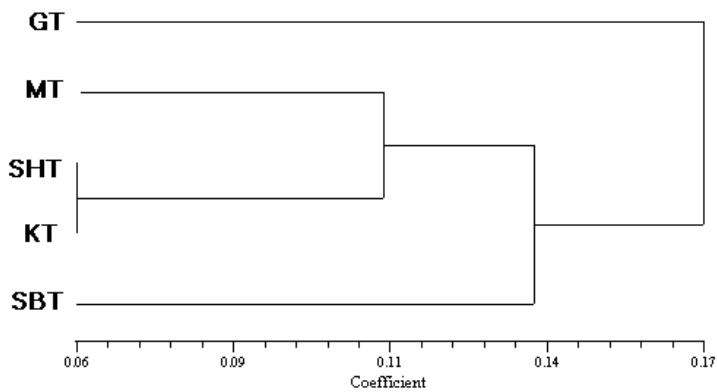

Figure 2. Dendrogram deduced from matrix of pairwise distances in SSR analysis between five populations of *Helicoverpa armigera* using the un-weighted pair-group method analysis, UPGMA.

HOST PLANTS-ASSOCIATED POPULATION VARIATIONS OF *BEMISIA TABACI* (GENN.) (HEMIPTERA: STERNORRHYNCHA: ALEYRODIDAE) CHARACTERIZED WITH RANDOM DNA MARKERS.

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ABSTRACT: Whitefly, *Bemisia tabaci* is an important sucking pest of field, horticultural and ornamental plants causing feeding injuries besides spreading disease by acting as a vector of Gemini viruses. The polyphagous nature of the pest makes it as a highly complex species. The influence of six host plants utilized by the species on the population differences at molecular level was attempted using Random Amplified Polymorphic DNA (RAPD) markers. Seven RAPD primers screened produced 232 DNA fragments 223 of these fragments were polymorphic. While the other nine fragments detected as common among the six tested populations. Total number of bands obtained from each primer ranged from 23- 44 with an average of 33.14 bands per primer. Phylogenetic relationships among the studied populations using this technique clearly separated these six populations into two main clusters with similarity matrix percentage of 88% and 64%. These results indicated that *B. tabaci* may have different genotypes on adaptations to certain host plant species in Egypt.

KEY WORDS: *Bemisia tabaci,* RAPD-PCR, Molecular, Host plants, Phylogenetic relationships.

The sweet potato whitefly, *Bemisia tabaci* (Genn.), is one of the most devastating pest insects of Agriculture and horticulture in the world. It is broadly polyphagous, feeding on an estimated 900 hosts (Jones, 2003; Ma et al., 2007). Not only does *B. tabaci* cause aesthetic damage to plants, but it is also an efficient vector of a great many plant viruses (Jones, 2003; Muniz et al., 2004; Brown, 2007). An important aspect of the biology of *B. tabaci* is the high genetic variability that exists among its populations (Brown, 1994; Brown et al., 1995; Iida et al., 2009). This variability is revealed by the existence of populations that differ in their ability to feed or reproduce on particular hosts and in their virus transmission characteristics (Bedford et al., 1992 and 1994, Burban et al., 1992; Simmons et al., 2009). It was raised to the rank of a new species (Bellows et al., 1994) and was named *Bemisia argentifolii* Bellows and Perring, which produces unique symptoms of "squash silver leaf". Recent research has tended to prove that *B. tabaci* corresponds to a species or biotypes complex in phylogenetic evolution. Its distinctive characteristics still have to be revealed by using methods different from the methods commonly used in taxonomy (Perring, 1996; Qiu et al., 2009) up to now; approximately 24 biotypes have been identified and characterized to different degrees. It was primarily divided in to B biotype, Q biotype and non B/Q biotype. The non B/Q biotypes includes more than 20 biotypes such as A, K, D, E, G, H, L, M, N. (Perring, 2001; Muniz & Nombela, 2001; Pascual & Callejas, 2004). These biotypes usually are recognized by the presence of specific phytotoxic reactions (Yokomi et al., 1990; Brown et al., 1992; Muniz et al., 2002) and

characterized by esterase markers (Costa & Brown, 1991; Costa et al., 1993; Wool et al., 1993; Brown et al., 1995; Lisha et al., 2003) and several DNA fingerprinting techniques (Guirao et al., 1997; Cervera et al., 2000; Lima et al., 2000; Mckenzie et al., 2001; Sartor et al., 2008, Sharma et al., 2008, Perumal et al., 2009; Qiu et al., 2009). Although much of the information is available on the biotype prevalence based on the locations and regions, molecular information on the genetic diversity of populations based on host plants is scarce.

This paper attempts to address our hypothesis that the population of the whitefly varies widely depending upon the host plants being utilized by the whitefly and are distinct within a narrow region or locality with poly-crop systems.

MATERIALS AND METHODS

1. Insect population samples: Whitefly pre-pupal instar were collected from the middle leaves of six host plants belonging to three families; Cucurbitaceae (Squash, *Cucurbita pepo ovifera* and Watermelon, *Citrullus vulgaris*); Solanaceae (Egg-plant, *Solanum melongena* and Tomato, *Solanum lycopersicum*) and Malvaceae (Cotton, *Gossypium barbadensa* and Okra *Hibiscus esculantus*) from Shalakan farm at Qalyubiya Governorate during 2009 and allowed for adult emergence using insect emergence cages at the laboratory. All individual populations were maintained continuously for three successive generations on the respective host plants which were grown in pots at rearing cages. The purity of individual populations was ensured by raising new population from the parental adults of an earlier generation after these were shifted from the old screen cages to new cages. The emerging adult females from the third generation were separated and preserved immediately at -20°C in Eppendorf tubes until DNA extraction.

2. Randomly Amplified Polymorphic DNA of the Polymerase Chain Reaction (RAPD-PCR):

2.1. DNA Extraction:
DNA was extracted from adult females of each population. Thirty adult females were crushed in 1.5 ml Eppendorf tubes to extract the genomic DNA filled with 200 µl of extraction buffer (200 mM Tris-Hcl pH 8.5, 250 mM Nacl, 25 mM EDTA, 0.5% SDS). After that, 100 µl of 3 M sodium acetate pH 5.2 was added and tubes were placed at -20° C for 10 min. Tubes were then centrifuged for 5 min at 10.000 rpm and the supernatant transferred to new Eppendorf tubes. An equal volume of isopropanol was added and the precipitated DNA was pelleted by centrifugation at 13.000 rpm for 20 min. After a wash with 70% ethanol, the pellet was dried and resuspended in 100 of TE buffer (10 mM Tris-Hcl, 1 mM EDTA pH 8.0)

2.2. Polymerase Chain Reaction (PCR):
All populations were tested against seven 10-mer random primers. All primers were synthesized by (Operon biotechnologies, Inc. Germany) with the following sequences:

OPA-09: 5'GGGTAACGCC'3
OPA-12: 5"TCGGCGATAG'3
OPA-15: 5'TTCCGAACCC'3
OPA-18: 5'AGGTGACCGT'3
OPA-19: 5'CAAACGTCGG'3
OPB-03: 5'CATCCCCCTG'3
OPB-07: 5'GGTGACGCAG'3

RAPD-PCR amplifications were performed in a total volume of 25µl. Each reaction contained 2.5 µl of 10X buffer, 2.5 µl dNTPs, 2.5 µl $mgcl_2$, 3 µl primer, 1µl taq polymerase, 2 µl genomic DNA with the volume adjusted to 25 µl with distilled water. Amplifications were carried out in Techne system, England using the following program, one cycle at 95° C for 5

min, followed by 40 cycles each at 94° C for 30 seconds, 37° C for 1 min, 72° C for 2 min and final extension at 72° C for 12 min.

PCR Products were separated in 1.2 % agarose gels at 100 volts. Gels were stained with ethidium bromide and products were visualized by UV light and photographed using a Bio-Rad gel documentation system. Data analysis was obtained by Bio-Rad Quantity one software version 4.0.3.

RESULTS

1. RAPD-PCR Analysis:

To select genetically heritable markers, each individual whitefly population was sampled from the third grown generation for all the six host specific populations to identify only genetically inheritable bands/markers in the RAPD profiles. Fifteen 10-mer random primers were screened against each individual whitefly population out of them seven primers produced fragment bands. These primers are: A-09, A-12, A-15, A-18, A-19, B-03 and B-07 with the following sequences (5'GGGTAACGCC'3), (5'TCGGCGATAG'3), (5'TTCCGAACCC'3), (5'AGGTGACCGT'3), (5'CAAACGTCGG'3), (5'CATCCCCCTG'3) and (5'GGTGACGCAG'3) for the seven primers, respectively. Those amplified distinct polymorphic bands were used for studying genetic variability among different host specific populations. These seven primers amplified a total number of 218 DNA fragments 209 of these fragments were polymorphic (Figure 1). While the other nine fragments were detected as common among the six tested populations. The total number of bands generated from each primer ranged from 23 (OPA15) to 44 (OPA18) with an average on 36.33 bands per primer. The size of bands was ranged from 27 bp to 3277 bp. The total numbers of bands amplified by these seven primers for each population were 36, 30, 47, 36, 33 and 36 bands for *B. tabaci* populations on eggplant, tomato, cotton, watermelon, squash and okra, respectively. The comparative analysis of these RAPD profiles from different whitefly types resulted in identification of a number of 42 polymorphic markers holding specificity for the studies hosts populations. These genetic differences were visualized as host specific polymorphic bands and amplified from particular host specific whitefly represented host specific molecular markers for respective whitefly genotype. The highest number of these host specific markers (17 bands) was produced by OPB-03 primer, while the smallest number of these markers was one band produced by OPA-15 primer for tomato population. The total numbers of host specific markers per each whitefly genotype were 12, 7, 4, 5, 4 and 10 for populations from eggplant, tomato, cotton, watermelon, squash and okra, respectively. (Table1). The number of common bands of each two hosts-associated populations of *B. tabaci* amplified by seven random primers was ranged between 24 bands for populations on watermelon and cotton to two bands for populations on eggplant and okra (Table 2).

1.1. Primer OPA-09:

The total number of PCR products generated by this primer was 29 bands ranged from 4 to 7 bands with molecular weight (MW) ranged from 60 to 1148 bp and relative migration (Rm) ranged from 0.86 to 0.37 µm. The lowest number of bands (4 bands) was detected in Tomato *B. tabaci* population, while the highest number (7 bands) was found in okra population. No PCR fragments found in cotton *B. tabaci* population. No common bands were found among the sixpopulations.

1.2. Primer OPA-12:

The total of PCR fragments amplified by this primer were 30 fragments ranged from 2 to 7 bands with MW ranged from 27 to 923 bp and with Rm ranged from 0.86 to 0.32µm among the tested populations. The lowest number of bands (2 bands) was found in population of *B. tabaci* on squash. While the highest number (7 bands) was detected in three *B. tabaci* populations (eggplant, cotton and watermelon). Two common bands with MW of 121 and 27 bp were distinguished for the six tested populations.

1.3. Primer OPA-15:

This primer generated the lowest number of PCR fragments (23) with MW ranged from 244 to 3277 bp and with Rm ranged from 0.34 to 0.83µm. The lowest number of bands (2 bands) was found in three *B. tabaci* populations (eggplant, Tomato and cotton). While the

highest number (9 bands) was detected in watermelon *B. tabaci* population. Two common bands with MW of 1020 and 870 bp were distinguished for the six tested populations.

1.4. Primer OPA-18:
This primer generated the highest number of PCR fragments (44) bands with MW ranged from 636 to 78 bp and with Rm ranged from 0.52 to 0.91µm. The lowest number of bands (4 bands) was found in okra *B. tabaci* population. While the highest number (10 bands) was detected in eggplant *B. tabaci* population. The two bands with MW of 644 and 376 bp were considered as common bands for the six tested populations.

1.5. Primer OPA-19:
The total number of PCR fragments amplified by this primer was 30 bands with MW ranged from 1060 to 88 bp and with Rm ranged from 0.27 to 0.78µm for five populations only, while the squash *B. tabaci* population showed no bands with this primer. The lowest number of bands (4 bands) was found in eggplant population. While the highest number (7 bands) was detected in three *B. tabaci* populations (cotton, watermelon and okra). The band with MW of 88 bp was considered as a common band for the five populations.

1.6. Primer OPB-03:
The total number of PCR fragments amplified by this primer was 39 bands with MW ranged from 1877 to 97 bp and with Rm ranged from 0.26 to 0.85µm. The lowest number of bands (4 bands) was found in Tomato *B. tabaci* population. While the highest number (9 bands) was detected in cotton population. No common bands were distinguished among the six tested populations.

1.7. Primer OPB-07:
The total number of PCR fragments amplified by this primer was 37 bands with MW ranged from 627 to 64 bp and with Rm ranged from 0.48 to 0.89µm. The lowest number of bands (5 bands) was found in Tomato *B. tabaci* population. While the highest number (8 bands) was detected in squash population. Two common bands with MW of 627 and 401 bp were distinguished among the six tested populations.

2. Phylogenetic relationships among the studied *B. tabaci* populations:
Genetic similarities and genetic relatedness amongst the six host-associated populations of *B. tabaci* were based on data obtained of seven random primers as molecular markers of RAPD-PCR. These data were subjected to using SPSS computer program to support the existence of high level of genetic relatedness amongst the investigated whitefly types. This genetic relatedness was not clear amongst the plant family populations (Fig. 2). While, relatedness dendrogram was indicated two main clusters with similarity matrix percentage of 54%. The first cluster was divided into two sub-clusters; the first one included squash and watermelon with similarity matrix percentage of 88%; the second sub-cluster included okra and tomato *B. tabaci* populations with similarity matrix percentage of 74%. While the second cluster was included cotton and eggplant *B. tabaci* populations with similarity matrix percentage of 64%. From this similarity dendrogram it could be concluded that the relationship among plant families and *B. tabaci* populations was not clear except in plants belonging to family Cucurbitaceae that showed a high similarity matrix. While this similarity matrix was not so in the plants belonging to the other two families requires further biological studies. Also there was host specificity amongst under study *B. tabaci* populations based on molecular markers amplified by these seven random primers.

DISCUSSION

Random amplified polymorphic DNA polymerase chain reaction (RADP-PCR) is a relatively simple, inexpensive and rapid technique, revealing polymorphisms which are useful as genetic and taxonomic markers (Welsh & McClelland, 1990). RAPD has been applied to study of insects (Haymer, 1994) and to differentiate whiteflies, including the identification of different biotypes of *B. tabaci* (Guirao et al., 1997; De Barro & Driver, 1997; Cervera et al., 2000; Moya et al., 2001).

Sharma et al. (2008) detected genetic variability due to host plants in *B. tabaci* populations that collected from six different host plants using RAPD-PCR. They mentioned that the whitefly types holding specificity for some host plants were studied and cited that the sequence information on these RAPD-DNA markers can be used to design more efficient, specific molecular markers with specificity to different host plants.

Perumal et al. (2009) found differences among *B. tabaci* populations collected from four different host plants at the same ecosystem were found at the same point of time but collected from various locations of Tamil Nadu using RAPD-PCR. They reported that there were at least two different biotypes of this insect pest based on these four host plants. While, Frohlich et al. (1999) stated that *B. tabaci* populations and their respective host plants occur in the same geographical region at the same point of time the identified genetic diversity appears to be a rare example of the evolutionary transition leading to sympatric speciation.

In this respect, Sharma et al. (2008) found three groups of host specific populations of *B. tabaci* on six host plants grown in the same locality and in the same time based on RAPD-PCR using nine random primers. While many studies of geographic distributions of *B. tabaci* genetic groups around the globe. This level of genetic diversity had identified at least 33 different biotypes (Perring, 2001; Simon et al., 2003; Zang et al., 2006). The global phylogenies of geographic groups of *B. tabaci* suggested that *B. tabaci* was a cryptic species complex. The overall analysis suggested that there were at least 24 species making up the complex. (Boykin et al., 2007; Dinsdale et al., 2010).

This study confirms that there exists population isolations based on host plants among the whitefly, *B. tabaci* population. Therefore, this point needs further molecular analysis to understand the physiological and evolutionary relationships, which may through some lights for taxonomical perspectives and pest management decisions. Also these results need further biological studies such as the ability to transmit plant viruses (Brown, 2007), the rate of female fecundity (Iida et al., 2009; Jing et al., 2010) and the ability to accelerate pesticides resistance (Horowitz et al., 2005).

CONCLUSION

From the above results it could be concluded that genetic variability assessment in *B. tabaci* populations originating from different host plants at Qalyubiya Governorate, Egypt indicates that the population is diversified based on the host species. Clustering pattern observed in the dendrogram showed that at least two distinct biotypes exist among the populations collected within the narrow region of Egypt. These differences may be influencing the virus vectoring capabilities of the whitefly population and also their susceptibility to insecticides, which needs further studies.

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Table 1. RPD molecular markers (bp) associated with host specificity in *B. tabaci*.

primer	Eggplant	Tomato	Cotton	Watermelon	Squash	Okra
A-09	799	411		387		1148
	464			343		628
	188			157		
A-12	369	55				157
A-15		414				
A-18	548	532				
	92					
A-19	657		780			356
B-03	459	483	883	415	798	687
	216		483	118	508	562
	124				137	437
	97					278
						145
B-07	321	359	99		64	147
		205				
Total	12	7	4	5	4	10

Table 2. The number of common bands between each two hosts-associated populations of *B. tabaci* amplified by seven random primers.

	Eggplant	Tomato	Cotton	Watermelon	Squash
Eggplant					
Tomato	8				
Cotton	12	5			
Watermelon	2	9	12		
Squash	5	10	13	24	
Okra	8	11	15	12	15

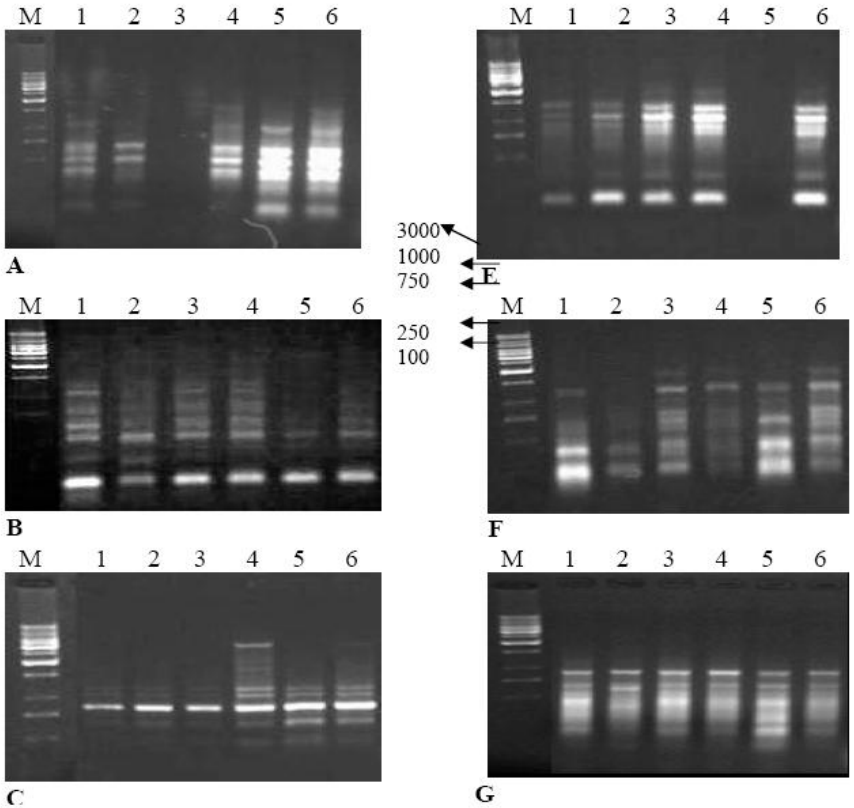

Figure 1. RAPD-PCR banding patterns of six *B. tabaci* host-associated populations by using seven random primers. **A**, Primer A9; **B**, Primer A12; **C**, Primer A15; **D**, Primer A18; **E**, Primer A19; **F**, Primer B3; **G**, Primer B7. **M**, DNA marker; **bp,** base pair **1**, eggplant; **2**, tomato; **3**, cotton; **4**, watermelon; **5**, squash; **6**, okra.

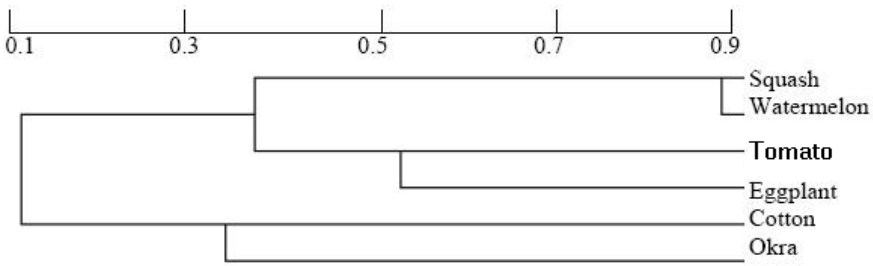

Figure 2. Phylogenetic relationships among different six host-associated populations of *B. tabaci* based on seven primers of RAPD-PCR.

PRELIMINARY STUDY ON PENTATOMIDS IN WEST AZERBAIJAN PROVINCE OF IRAN(HETEROPTERA)

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[Golestan, N. N., Safaralizadeh, M. H. & Sarafrazi, A. 2010. Preliminary study on Pentatomids in West Azerbaijan province of Iran(Heteroptera). Munis Entomology & Zoology, 5 (2): 686-691**]**

ABSTRACT: Pentatomids as well as lygaeids are the third largest families of true bugs which include 760 genera and about 4000 species. A faunistic study was carried out during 2002-2003 in west Azerbaijan province and specimens were collected from 13 regions of the province. Totally 22 genera and 35 species of Pentatominae and Podopinae subfamilies were collected and identified mainly focusing on male genitalia and some other morphological characters. One species and one genus are recorded from Iran for the first time.

KEY WORDS: Heteroptera, Pentatomidae, faunistic, true bugs, West Azerbaijan province, Iran.

Among the 8 subfamilies of Pentatomidae, the Pentatominae and Asopinae are the most important pests and biological control agents respectively. Other subfamilies are plant feeders and their foods are various plant species. Economically, injurious species of Pentatominae subfamily are the most notable secondary pests which will outbreak in the near future because of irregular use of chemical poisons and less recognition of the pest.

MATERIALS AND METHODS

West Azarbaijan has located in the northwestern part of Iran. It covers an area of 39,487 km². The climate of west Azarbaijan is largely influenced by the rainy winds of the Atlantic Ocean and Mediterranean. Cold northern winds affect the province during winter and cause heavy snow.

This province encompassing vast and fertile plains, high mountains, enjoying moderate and healthy weather, rivers with high volume of water, vineyards, orchards, luxuriant forest and rangelands, mountain outskirt with wonderful flora, magnificent wildlife and beautiful shores around the lake with different recreational facilities, which all together form one of the most beautiful and spectacular region in Iran.

Sampling performed by the ways of common sampling, including net working, light trap and collecting by observation (Borror et al., 1989), and also the specimens mostly collected from intact regions including pastures and plains and also fields and gardens.

The most important part of the body which used for identification is the male genital organ which has sclerotic structure. Methods of Slater (1950), Kelton (1959), Ashlock (1967) were used for extraction of the organ (Tuxen, 1970).

After that genital organs of male (pygophore and parameres) and female (spermtheca and genital plates) were sand out and supplied constant preparation.

Then for specimens identification was used from various identification keys especially Palearctic region (Bei-Beinko, 1964; Lodos et al.1998; Stichel, 1961) and also other researches in the world (China & Miller, 1989; Borror et al., 1989) and Iran (Modarres Awal, 1981; Safavi, 1959, 1973, 1974, 1976). Finally important genital organs in identification were drawn. All material is collected by authors and preserved in the Museum of Plant Pests & Diseases Research Institute, Tehran, Iran.

RESULTS

Podopinae

***Ventocoris trigonus* Kryn.** *
Urmia (Shohada): 2 females, 1350m., 12.VII.2002, Mountain foots, On *Ficus* sp.

***Ventocoris oblongus* (Hv.)** *
Mianduab (Ghotar): 2 females, 1370m., 8. VII. 2003, Under *Astragalus* sp.

***Ventocoris fischeri* (H.-S.)** *
Mianduab (Ghotar): 1 male, 1 female, 1370m., 8. VII. 2003, **Mahabad (Ghezeldagh):** 2 males, 14. XI. 2001, Under *Astragalus* sp., On *Cichorium* sp.

***Tholagmus flavolineatus* (F.)** *
Urmia (Kaboudan isl.): 3males, 1 female, 1280m., 17. & 18. VI. 2003. In valley, On Umbelliferous plants.

***Graphosoma semipunctatum* (F.)** *
Piranshahr (Kowpar): 3males, 2 females, 1540m., 16. & 17. VII. 2002, -**Sardasht (Biuran):** 4 males, 2 females, 1750m., 19.VII. 2002, **Urmia (Joulbar):** 2 males, 2 females, 1405m., 26.VII. 2002, **Chaldoran (Kenedy):** 3males, 4 females, 1950m., 27. VII. 2002, -**Maku (Handavar):** 2males, 1female, 30. VII. 2002, **-Khoy (Badalan):** 5male, 4 female, 1550m., 3. & 4. VIII. 2002, **Urmia (Kaboudan isle):** 2males, 2females, 1280m., 17. & 18. VI. 2003, -**Mahabad (Mangour-e-Sharghi):** 2males, 4females, 1800m., 24. VI. 2003, **-Bukan (Khorasaneh):** 1male, 2females, 1500m., 29. VI. & 1. VII. 2003, -**Shahindezh**: 2males, 3females, 1260m., 5. & 6. VII. 2003, -**Mianduab**: 3males, 3females, Barough, 1670m., 9. VII. 2003, **-Salmas (Patevir):** 2males, 2females, 1350m., 21. VII. 2003. Cosmopolitan in all regions of Province and attack Umbelliferous plants.

***Graphosoma stali* Hv.** *
Piranshahr (Kowpar): 3males, 1female, 1540m., 16. & 17. VII. 2002, -**Bukan (Ashigolan):** 2males, 2females, 1550m., 28. VI. 2003, -**Mianduab (Ghotar):** 6males, 2females, 1370 m., 8. VII. 2003, -**Salmas (Tazehshahr):** 1male, 2females, 1350m., 1. VIII. 2003. On Umbelliferous plants.

***Graphosoma lineatus* (L.)** *
Piranshahr (Kowpar): 4males, 2females, 1540m., 16. & 17. VII. 2002, -**Sardasht**: 3males, 2females, Biuran, 1750m., 19. VII. 2002, -**Urmia (Joulbar):** 2males, 2females, 1405m., 26. VII. 2002, **Chaldoran (Kenedy):** 2males, 2females, 1950m., 27. VII. 2002, -**Maku (Handavar):** 2males, 3females, 30. VII. 2002, **-Khoy (Badalan):** 3males, 2females, 1550m., 3. & 4. VIII. 2002, **Urmia (Nooshinshahr):** 2males, 2females, 1370m., 10. VII. 2002, -**Mahabad (Kanibazar):** 1male, 2females, 1550m., 25. & 26. VI. 2003, **Bukan (Khorasaneh):** 1male, 2females, 1500m., 29. VI. & 1. VII. 2003, -**Shahindezh**: 3males, 2females, 1260m., 5. & 6. VII. 2003, -**Miandoab (Ghotar):** 4males, 3females, 1370m., 8. VII. 2003, - **Salmas (Aghesmail):** 2males, 3females, 1380m., 22. VII. 2003, Cosmopolitan in all regions of Province, On Umbelliferous plants.

***Graphosoma melanoxanthum* Hv.**
Urmia (Dayacheh): 1280m., 1938, Leg. Kritshenko**.** (Safavi, 1959) **-Piranshahr (Mashegan):** 5males, 4females, 1850m., 17. VII. 2003, **-Sardasht (Biuran-e-olya & sofla):** 3males, 2females, 1750m., 19. VII. 2002 & 13. VII. 2003. In mountain meadows, On *Heracleum* sp.

Pentatominae

***Mustha spinosula* (Lef.)** *
Urmia (Dareh-e-Shohada): 1male, 1350m., 12. VII. 2002, **Naghadeh (Soltanyaghoub):** 2males, 1390m., 20. VI. 2003. In hilly steppes, On *Crataegus* sp.

***Apodiphus amygdali* (Gm.)** *
Khoy (Markan): 2males, 1770m., 6. VIII. 2002, -**Piranshahr (Kowpar):** 1female, 1540m., 16. & 17. VII. 2002, -**Urmia (Nazlou):** 2females, 1360m., 2. VIII. 2002, -**Bukan (Ashigolan):** 2males, 1550m., 28. VI.2003, -**Shahindezh**: 1male, 1260m., 5. & 6. VII. 2003, -**Mahabad (Amed)**: 1male, 2females, 1600m., 23. VI. 2003. Common in gardens, Cosmopolitan in regions.

***Carenoplistus acutus* (Sgn.)**
Urmia (Daryacheh): 1280m., 1938, Leg. Kritshenko. (Safavi, 1959) -**Sardasht (Nalas):** 1male, 1050m., 11. VII. 2003. In deciduous forests and on *populus* sp.

***Sciocoris sulcatus* Feib.** *
Mahabad (Kanibazar): 1male, 1female, 1550m., 25. & 26. VI. 2003. In meadows, under stone and crucibles.

***Sciocoris cursitans* F.** *
Naghadeh (Hasanlou): 1female, 1350m., 21. VI. 2003. In meadows, under stone and crucibles.

***Aelia melonata* Feib.**
Maku: 1600m., 1962 & 1966, Leg. Brown. (Safavi, 1959) -**Urmia:** 1350m., 14. VII. 1976 Leg. Shayesteh et al. (1978) -**Khoy** (Badalan): 1male, 1female, 1550m., 3. & 4. VIII. 2002. In grasses.

***Aelia acuminata* (L.)** *
Khoy (Zavieh): 2males, 1female 1770m., 5. VII. 2002, -**Salmas (Tazehshahr):** 1males, 1350m., 1. VIII. 2003. In cereals field, on *Avena* spp. & *Triticum sativum*.

***Stagonomus amoenus* Brulle.** *
Piranshahr (Kowpar): 1male, 1540m., 16. & 17. VII. 2002.

***Eysarcoris inconspicuus* H.-S.** *
Miandoab (Barough): 2males, 3females, 1670m., 9. VII. 2003, -**Salmas (Aghesmail):** 1female, 1380m., 22. VII. 2003. In cereals field and meadows.

***Palomena prasina* (L.)** *
Urmia (Shohada): 1male, 1350m., 12. VII. 2002, -**Mahabad (Mangour-e-Sharghi):** 2males, 1female, 1800m., 24. VI. 2003, -**Bukan (Ashigolan**) 1female: 1550m., 28. VI. 2003. On nettle & raspberry, Crucibles in moist localities.

***Holcostethus inclusus* Dohrn.** *
Poldasht (Roud -e- Aras): 1male, 990m, 29. VII. 2002, -**Sardasht (Biuran):** 1male, 1female 1750m., 19. VII. 2002, -**Mahabad (Amed):** 2males, 1female 1600m., 23. VI. 2003.

***Holcostethus vernalis* Wolft.** *
Piranshahr (Kowpar): 2males, 1female 1540m., 16. & 17. VII. 2002, -**Bukan**: 1male, 1female, Ashigolan, 1550m., 28. VI. 2003, -**Miandoab (Ghotar):** 2males, 1370m., 8. VII. 2003, -**Urmia (Nazlou):** 2females, 1360m., 2. VIII. 2002, -**Salmas (Patevir):** 2males, 2females, 1350m., 21. VII. 2003. Cosmopolitan in relatively moist regions.

***Carpocoris purpureipennis* (Deg.)** *
Sardasht (Alvatan): 2males, 3females, 1800m., 21. & 22. VII. 2002, -**Miandoab (Ghotar):** 3males, 4females 1370m., 8. VII. 2003, -**Mahabad (Amed):** 3males, 2females 1600m., 23. VI. 2003, -**Urmia (Nooshinshahr):** 3males, 1female 1370m., 10. VII. 2002, -**Piranshahr (Tizkesh):** 4males, 2females 1500m., 16. VII. 2002, -**Naghadeh (Balaghchi):** 1male, 2females 1630m., 20. VI. 2003, -**Shahindezh (Pirmohammad):** 2males, 2females 2300m., 4. VII. 2003, -**Bukan (Hossienabad):** 3males, 2females 2050m., 2. VII. 2003, -**Maku (Handavar):** 3males, 4females 1600m., 30. VII. 2002, -**Khoy (Badalan):** 5males, 4females 1550m., 3. & 4. VIII. 2002. In field and meadows and pastures.

***Carpocoris mediterraneus* Tam.** *
Khoy (Zavieh): 1male, 1770m., 5. VII. 2002. The near of field.

***Carpocoris fuscispinus* Boh.** *
Khoy (Badalan): 3males, 2females, 1550m., 3. & 4. VIII. 2002. The near of field. On *Circium* sp. & *Verbascum* sp.

***Carpocoris pudicus* (Pd.)** *
Khoy (Badalan): 2males, 1female, 1550m., 3. & 4. VIII. 2002, -**Sardasht (Biuran):** 1male, 2females, 1750m., 19. VII. 2002, -**Piranshahr (Mashegan):** 2females 1850m., 17. VII. 2003. The near of fields.

***Dolycois baccarum* (L.)**
Urmia (Band): 1350m., 24. VI. 1976 Leg. Shayesteh et al. (1978)-**Khoy (Badalan):** 3males, 2females, 1550m., 3. & 4. VIII. 2002, -**Sardasht (Biuran):** 3male, 1750m., 19. VII. 2002, -**Piranshahr (Kowpar):** 5males, 2females, 1540m., 16. & 17. VII. 2002, -**Urmia (Joulbar):** 2males, 2females, 1405m., 26. VII. 2002, -**Chaldoran (Kenedy):** 2females, 1950m., 27. VII. 2002, -**Salmas (Patevir):** 3males, 2females 1350m., 21. VII. 2003, -**Bukan (Khorasaneh):** 2males, 1500m., 29. VI. & 1. VII. 2003, -**Shahindezh**: 1male, 2females, 1260m., 5. & 6. VII. 2003, -**Miandoab (Barough):** 3males, 1female, 1670m., 9. VII. 2003, -**Mahabad (Mangour-e-Sharghi):** 3males, 2females, 1800m., 24. VI. 2003. In fields and hilly meadows, cosmopolitan in all regions.

***Antheminia pusio* Kol** *
Maku (Handavar): 2males, 2female, 1600m., 30. VII. 2002, -**Poldasht (Aras):** 2males, 29. VII. 2002, -**Urmia (Kaboudan isle):** 1male, 2females, 1280m., 17 & 18. VI. 2003. In beside of river and lake.

***Codophila varia* F.** *
Maku (Handavar): 2females, 1600m., 30. VII. 2002, -**Khoy (Zavieh):** 2males, 1female, 1770m., 5. VII. 2002, -**Miandoab (Barough):** 2males, 1670m., 9. VII. 2003, -**Salmas (Aghesmail):** 1male, 1female, 1380m., 22. VII. 2003, -**Bukan (Khorasaneh):** 1male, 1500m., 29. VI. & 1. VII. 2003. In side of fields.

***Acrosternum millieri* (Ms. & Rey.)** *
Mahabad (Kanibazar): 2males, 1female, 1550m., 25. & 26. VI. 2003, In hilly steppes.

***Rhaphigaster nbeulosa* Poda** *
Khoy (Markan): 1female, 1770m., 6. VIII. 2002, -**Urmia (Nazlou):** 1male, 1360m., 2. VIII. 2002, -**Bukan (Ashigolan):** 1male, 1female, 1550m., 28. VI. 2003. In deciduous forest.

***Piezodorus lituratus* F.**
Khoy: 1750m., 1973, Leg. Hoberlandt (1995), -**Piranshahr (Mashegan):** 1female, 1850m., 17. VII. 2003, -**Salmas (Tazehshahr):** 1male, 1female, 1350m., 1. VIII. 2003. In foot of mountain, On *Vicia* sp. and *Rubus* sp.

***Eurydema ornata* L.** *
Maku (Handavar): 2males, 1female, 1600m., 30. VII. 2002, -**Khoy (Zavieh):** 3males, 2females, 1770m., 5. VII. 2002, -**Sardasht (Biuran):** 3males, 2females, 1750m., 19. VII. 2002, -**Urmia (Dareh-e-Shohada):** 4males, 1female, 1550m., 14. VI. 2003, -**Piranshahr (Kanibagh):** 2males, 4females, 1500m., 16. VII. 2003, -**Shahindezh**: 2males, 2females, 1260m., 5. & 6. VII. 2003, -**Mahabad (Mangour-e-Sharghi):** 4males, 2females, 1800m, 24. VI. 2003, -**Miandoab (Barough):** 1male, 3females, 1670m., 9. VII. 2003. In hilly meadows, On *Allysum murale*.

***Eurydema fieberi* Fieb.** *
Piranshahr (Kowpar): 3males, 1female, 1540m., 16. & 17. VII. 2002, -**Mahabad (Mangour-e-Sharghi):** 2males, 2females, 1800m., 24. VI. 2003, -**Bukan (Khorasaneh):** 2males, 1female, 1500m., 29. VI. & 1. VII. 2003. In hilly meadows and moist regions, On *Allysum* sp. and Brassicacea plants.

***Eurydema oleracea* L.** *
Mahabad (Amed): 2males, 1600m., 23. VI. 2003. In moist valleys, On *Sinapis* sp.

***Bagrada confusa* Hv.** **
Urmia (Kaboudan isle): 1males, 1280m., 17. & 18. VI. 2003. In steppe habitats, New Record of species for the fauna of Iran.

***Trochiscocoris hemipterus* Jak.** ***
Mahabad (Kanibazar): 2males, 1female, 1550m., 25. & 26. VI. 2003. In dry dales, On *Isatis* sp. New Record of genus for the fauna of Iran.

DISCUSSION

The sampling was performed in all part of the province uniformly because of there is various climates in this province. Among collected 36 species, 28* species and 2** species and 1** genus were reported for the first time in province (*) and Iran (**) respectively.

The species of *Graphosoma lineatum* and *G. melonoxanthum* are similar morphologically, but red or orange and shine yellow respectively. Also these two species are certainly distinguished via genital organs of male.

The most abundant genus of this family is *Carpocoris* which collected about 200 specimens belonging to four species. Among these species, *C. podicus* was easily distinguished but the others were distinguished to comparing morphological characters and genial organ of male. The genus and species *Trochiscocoris hemipterus* (Jak.) which collected from Bukan Township in the south province is the first time report from Iran. Outstanding character of *T. hemipterus* (Jak.) is loss of membran wing. In the male, parameres is similar to knife and there is two dorsal and ventral sharp processes in median part, apical corners of pygophores are swollen and distinct.

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* New Record of species for the fauna of Western Azerbaijan Province
** New Record of species for the fauna of Iran
*** New Record of genus for the fauna of Iran

Bagrada confusa Hv. which collected from Kaboudan isle in Lake Urmia, is the first time report from Iran, and a part of anterior parameres is narrow and strongly curved. Pygophore miss notches proximal to apical corners and the median process is bifid.

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SEASONAL ABUNDANCE OF *DIARETIELLA RAPAE* (M´INTOSH) (BRACONIDAE: APHIDIINAE) PARASITIZING *LIPAPHIS ERYSIMI* (KALTENBACH) (HEMIPTERA: APHIDIDAE) IN *BRASSICA JUNCEA* VARIETY PUSA BOLD

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ABSTRACT: The occurrence of *Diaretiella rapae* parasitizing *Lipaphis erysimi* in Mustard variety Pusa bold (*Brassica juncea*) was evaluated. Successful parasitism was 75.46% and 68.96% during 2006-07, 2007-08 respectively. Correlation coefficient of average per cent relative humidity with both aphid (r=-0.52) and parasitoid (r=-0.59) were negatively significant whereas day (r=0.65) and the night temperature (r=0.61) had significant positive correlations with the parasitoid population only. The best fitted polynomial regression equation indicated that 30-60% variability of the aphid population could be explained by the different weather parameters, while 11-50% variability of the parasitoid population could be explained by weather parameters.

KEY WORDS: *Brassica juncea, Diaretiella rapae,* Parasitism, *Lipaphis erysimi,* Seasonal abundance.

Mustard is the primary and most important oilseed crop in India. It is the major source of edible oil for human consumption. The mustard aphid *Lipaphis erysimi* (Kaltenbach) causes serious losses of yield in Mustard crops and reduces its marketable value. Increase in population beyond 9.45 aphids per plant, reduce the seed yield by 59.3 per cent with an economic injury level of 2.04 aphids/ plants with an index of 0.98 and infestation 37.4 per cent (Singh & Malik, 1998). Aphid parasitoids are very important control agents for aphid pest in a variety of agricultural and horticultural crops (Hagvar & Hofsvang, 1991). *D. rapae* is described as one of the most important factor for natural control of mustard aphid (Dhiman, 2007; Dogra et al., 2003; Pike et al., 1999). On the other hand, *D. rapae* females are more attracted by crucifer plants than by other types of plants (Sheehan & Shelton, 1989; Vaughn et al., 1996). Furthermore, parasites and prey prefer the same host plant possibly because aphids and *D. rapae* positively respond to the volatile compounds produced by the plants (Bundemberg, 1990) and honeydew emitted by aphids and used by its natural enemies as kairomones (Brown et al., 1970; Dicke & Sabelis, 1988).

The aims of this study were (i) to examine the seasonal occurrence of *Lipaphis erysimi* and the relationship between aphids and the parasitoids *Diaeretiella rapae* (M'Intosh) during the crop period (ii) to assess the effect of *Diaeretiella rapae* on population density of aphid and (iii) their relationship with different meteorological parameters.

MATERIALS AND METHODS

The present investigations were carried out at the research farm of Indian Agricultural Research Institute, New Delhi (28°4'N, 77°09'E and 228.16m above mean sea level) during two consecutive *rabi* seasons *viz*., 2006-07 and 2007-08. *Brassica juncea* variety Pusa bold was sown in 4 plots, sized 10×12 m. Sowing was done on 16th November 2006 and 20th November 2007. Standard agronomic practices were adopted for raising a good crop.

Sampling was done at weekly intervals from the time of appearance of the aphid on the crop till the harvest of the crop. The terminal 10 cm of the main shoot infested with aphids from 10 randomly selected plants from each plot were cut and placed in small plastic jars. These jars were covered with muslin cloth tied with rubber band, and kept under laboratory conditions of 26±5℃ and 65±5% RH. Data on total number of aphids in each jar was recorded on the day of collection by direct count. Subsequent observations on number of parasitoids emerged were noted daily for two weeks. The emerged parasitoids were counted, segregated and processed for further studies.

Data for six meteorological parameters *viz.,* maximum and minimum temperature; maximum and minimum relative humidity; rainfall and sunshine hours were collected from meteorological station, IARI Observatory. The daily recording of these parameters were averaged over standard week and estimated according to the procedure adopted by Das et al. (2006):

I. Day temperature (DT) = T_{max} - 0.4 (T_{max} – T_{min})

II. Night temperature (DT) = T_{min} + 0.4 (T_{max} – T_{min})

These data were utilized for computations of correlation and regression. Step wise multiple regression analysis were done using population parameters as dependent variables and meteorological data as independent variables.

RESULTS AND DISCUSSION

During the crop season of 2006-07 the aphid started appearing from the 9th week of crop age and mummified aphids due to the activity of parasitoid could be observed from the 11th week of crop age. The number of aphids per plant kept on increasing and the population peaked (156 aphids/plant) during the 11th week of crop age i.e. 5th standard week. The number of mummified aphids due to activity of *D. rapae* was observed from 11th week of crop age (i.e. 5th standard week) and increased gradually till 16th week of crop age. The population of parasites was calculated from the numbers which emerged in the laboratory. The population of aphids and parasitoids peaked during the 13th week of crop age when maximum temperature, minimum temperature, morning % relative humidity, afternoon % relative humidity and bright sun shine hrs were 24.61℃, 10.44℃, 89.86%, 57.29% and 7.11 hours respectively. The per cent parasitism was as high as 75.81 during 2006-07 (Table 1).

The aphids started appearing from the 9th week of crop age during the second crop season of 2007-08 but the mummified aphids were observed a week ahead of the last crop season i.e. from the 10th week of crop age (i.e. 5th standard week). The number of mummified aphids increased gradually and could be seen in the field up to 18th week of crop age. During the crop season of 2007-08 the population of aphids peaked during the 15th week and continued to remain at that level during 16th week of crop age (342 aphid/plant) i.e. peak population of aphids

was observed during both 10th and 11th standard weeks when maximum temperature, minimum temperature, morning % relative humidity, afternoon % relative humidity and bright sun shine hrs were 28.40 ^{O}C, 10.40 ^{O}C, 77.00%, 22.00% and 4.50 hours respectively (Table 1). On an average 1.8 to 66.50 aphid parasitoids emerged per week till 18th week of crop age. The maximum number of parasitoid emergence (165) was during the 16th week of crop age when maximum temperature, minimum temperature, morning % relative humidity, afternoon % relative humidity and bright sun shine hrs were 30.66°C, 14.80°C, 89.00%, 31.50% and 4.70 hours respectively (Table 1). This was slightly different from what was observed in the previous year with slightly lower per cent parasitism (68.92) compared to the previous year (Table 1).

Successful parasitism of the mustard aphid by *D. rapae* was very high during both the both years (Figure 1). These results agree well with the reports of Alam & Hafiz (1960), Bijaya et al.(2001), Bisht et al.(2001) and Devi et al.(2001) in which they reported the dominant role played by parasitoids in the regulation of the population of *Brassica* aphids.

Analysis of the linear association between direct and derived weather variables revealed that % relative humidity had a significant negative correlation with both aphid (r=-0.52) and parasitoid (r=-0.59) populations whereas day temperature (r=0.65) and night temperature (r=0.61) had a significant positive correlation with the parasitoid population only. However bright sun shine did not have any influence on both populations (Table 2).

In order to estimate the relation between direct and derived weather variables with populations of both aphid and parasitoid quantitatively, regression equations were constructed. The best fitted polynomial regression equation indicated 30-60% of variability of aphid population could be explained by weather parameters, *viz.,* day temperature (60%), night temperature (30%), average % relative humidity (30%) and bright sun shine (44%) while 11-50% variability of parasitoid population could be explained by weather parameters, *viz.,* day temperature (50%), night temperature (43%), average % relative humidity (46%) and bright sun shine (11%) (Table 2). The current findings are similar to those of Devi et al. (2001) and Bijaya et al. (2001).

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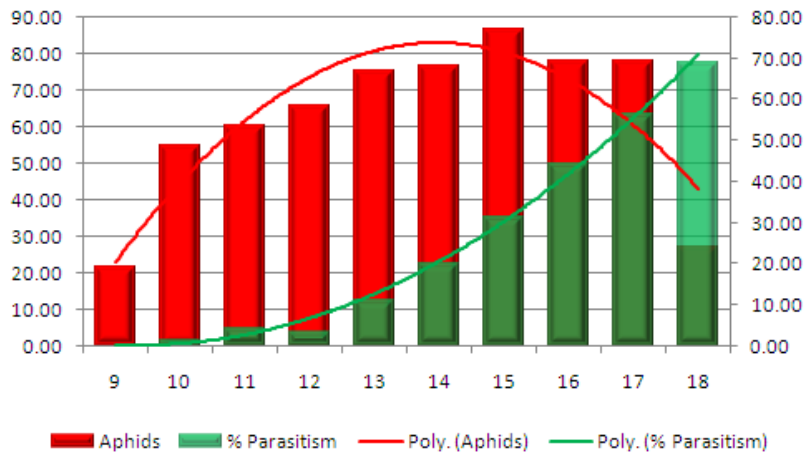

Figure 1. Percent parasitism with respect to aphid's population

Table 1. Parasitization of *L. erysimi* by *D. rapae* on *B. juncea* variety Pusa bold.

Crop season	Crop age (weeks)	*Average number aphid per sampling unit	Average number of parasitoids emerged	% Parasitism
2006-07	9	11.73	0.00	0.00
	10	31.08	0.00	0.00
	11	48.10	2.43	5.06
	12	26.98	1.65	6.12
	13	30.25	6.52	21.55
	14	16.70	6.17	36.95
	15	4.48	2.75	61.38
	16	3.43	2.60	75.80
2007-08	9	31.55	0.00	0.00
	10	78.28	1.80	2.30
	11	72.43	2.95	4.07
	12	104.23	2.70	2.59
	13	120.25	10.30	8.57
	14	136.48	24.70	18.10
	15	169.25	52.00	30.72
	16	153.00	66.50	43.46
	17	78.25	44.13	56.40
	18	27.25	18.78	68.92

*=Average based on 40 sampling unit

Table 2. Quantitative analysis of aphid and parasitoid populations corresponding to different weather parameters

Weather Parameters	Aphid			Parasitoids		
	(r)	Regression equation	R^2	(r)	Regression equation	R^2
Day temperature ^{O}C	0.07	$y = 0.001x^2 - 0.173x + 20.68$	0.60	0.65*	$y = 0.124x + 16.17$	0.50
Night temperature ^{O}C	0.02	$y = -0.001x^2 + 0.042x + 71.07$	0.30	0.61*	$y = 0.109x + 13.52$	0.43
Average % Relative Humidity	-0.52*	$y = -0.001x^2 + 0.042x + 71.07$	0.30	-0.59**	$y = -0.574x + 73.22$	0.46
Bright Sun Shine (Hrs)	-0.39	$y = 0.000x^2 - 0.049x + 7.220$	0.44	-0.13	$y = -0.001x^2 + 0.071x + 5.512$	0.11

r= Correlation coefficient; *= Correlation is significant at the 0.05 level (2 tailed); **= Correlation is significant at the 0.01 level (2 tailed)

ACTIVITY AND SOME PROPERTIES OF *HELICOVERPA ARMIGERA* HÜBNER AND *SPODOPTERA EXIGUA* HÜBNER (LEP.: NOCTUIDAE) MIDGUT PROTEASE

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ABSTRACT: In this study some properties of Cotton bollworm and Beet army worm midgut protease activity was investigated. Insects were reared on special artificial diets in controlled conditions. Different developmental stages including, larval stages, 5-6 inter-moult period, pre-pupa, male and female pupa and adult's protease activity measured using azocaseionolytic assay method. Optimum pH and temperature of protease activity determined by testing different pH and temperature gradients. Also protease stability in two different storage conditions (4 and -20 °C) for 15 weeks were studied. Results showed that the optimum temperature for protease activity was 35°C in both insects. Studying the effects of different pH values on protease activity in both insects showed that except pH 13, enzyme activities were not affected by acid or alkaline conditions. Specific protease activity in 4th larval stages of both studied insects was more than other developmental stages. Protease activity in male and female pupa and adults of *S. exigua* was not significantly different, but in *H. armigera* male pupa and female adults have significantly more protease activity than other related sexes.

KEY WORDS: Midgut protease, *Helicoverpa armigera*, *Spodoptera exigua*, Noctuidae, Lepidoptera.

Insects of noctuidae family are the most important insect pests in the world (Matthews, 1999). Cotton bollworm exists in Africa, Asia, Australia and Europe that attacks different crops such as cotton, chickpeas, tomatoes, tobacco, corn, sesame, hemp, sunflower, peanuts, okra and etc. (Fitt, 1989; Smith et al., 1992). Cotton bollworm is able to adapt to different cropping systems. High polyphagy and mobility, wide geographical distribution, migration, facultative diapause, high fecundity and potential to develop resistance against insecticides make this insect one of the most important pests of the agricultural crops (Fitt, 1989; Tuttle & Ferro, 1988). *Spodoptera exigua* is a noctuid species with a wide range of hosts and broad distribution that causes economic damage on several crops including maize, cotton, soybean, alfalfa and tomato (Sertkaya et al., 2004; Greenberg et al., 2001).

Recently studying and reaching useful information about digestive system of insects tended researchers to find new control methods that in addition with their safety to environment and biocontrol agents also are effective in IPM programs (Lawerence & Koundal, 2002). Knowledge about enzyme properties is first and main step in physiologically based control methods. Enzymes are affected by changes in pH. The most favorable pH value the point where the enzyme is most

active is known as the optimum pH. Extremely high or low pH values generally result in complete loss of activity for most enzymes. pH is also a factor in the stability of enzymes (Murray et al., 2004; Eisenthal & Danson, 2002). In any enzyme studies, it is essential to assay its activity at regular intervals under standard conditions to check that if it remains constant. It is a much better procedure however, to try to find conditions under which the stock enzyme solutions may be stored without appreciable loss of activity over the time involved (Eisenthal & Danson, 2002).

Different studies indicated that digestive protease and specially serine protease are main enzymes in midgut digestive complex of Lepidoptera (Chapman, 1985; Nation, 2002). In this study some properties of midgut protease activity of two important pests of crops were investigated. And we hope this will provide useful information about protease of these insects to use them in complementary studies for goal of finding new control method and managing these important pests.

MATERIAL AND METHODS

Insects

Insects used for assays prepared from a colony presents in plant protection department of Tabriz University. Cotton bollworms were reared on artificial diets based on cowpea (Shorey & Hall, 1965) in controlled condition of 26±2°C, 50±5% relative humidity and a photoperiod of 16:8 (L: D) h. Beet armyworms also were reared on artificial diet based on Mung bean (*Vigna radiate* L.) (Singh, 1977) in above mentioned controlled condition. Last larval stages (24 h old) of both insects were used for evaluating properties of total protease enzyme. For studying protease activity in different developmental stages 24 h old 4-6 instars, pre-pupa, 5-6 inter-moult, male and female pupa and adults were used.

Enzymes sampling

For preparing midgut enzyme samples, 4-6 larval stages dissected in cold glycine-NaOH pH 10 buffer under stereomicroscope and before dissection insects anaesthetized with laying them on ice. The midgut removed and transferred to 1.5 ml micro tubes containing 1 ml cold glycine-NaOH pH 10 buffer. After homogenizing the tubes left for 2 hours in 4°C, after then centrifuged in 10'000 rpm for 30 minutes in 4°C. The supernatants used as enzyme sources for assays. Whole body of pupa and adults were used for enzyme preparing and a suitable hand mortar used for this goal. Homogenizing and centrifuging processes carried out such as above mentioned order. Enzyme activity in 5-6th inter moult period also was studied.

Enzyme properties

Temperature gradients from 20-65°C with 5 degree intervals carried out for studying optimum temperature activity using water bath, activity measured after 60 minutes incubation in different temperatures. For studying enzyme activity in different pH values, pH gradients from 4-13 prepared using phosphate buffer, NaOH and HCl was used for adjusting pH values. Enzyme stability studied in two refrigerator (4°C) and freezer (-20°C) conditions for at least 3 months.

Enzyme assays

Total protease activity carried out using azocaseinolytic assay as follows: azocasein (at final concentration of 1% w/v) was incubated with the enzyme

fraction in Glycine-NaOH 200 mM buffer, pH 10, containing 5 mM $CaCl_2$, at 37°C for 60 min. The reaction was stopped by the addition of 300 µl of TCA (10% v/v) and the sample was centrifuged for 10 min at 10000 rpm. The supernatant (600 ml) was added to 600 ml 1M NaOH and the absorbance of the supernatant was read at 450 nm in a UV/Visible spectrophotometer (CECIL, CE 1021, England). One protease unit was defined as the amount of enzyme that increased the absorbance by 1.0 OD under the given assay condition.

Total protein concentrations of samples were determined by the Bradford protein assay using bovine serum albumin as a standard (Bradford, 1976). Specific activity of protease was calculated by dividing enzyme activity to protein concentration.

Data analysis

All experiments carried out in three replications and one-way ANOVA used for data analyzing. The differences were compared by Duncan's multiple range test ($\alpha = 0.05$).

RESULTS

Enzyme properties

Protease activity in temperature range from 30 -55°C without significant differences was more than other studied temperatures but the most and optimum temperature for Protease activity was 35 °C in both studied insects (Fig. 1). With increasing temperature more than 55°C enzyme activity dramatically decreased and the least activity was observed in 65°C.

Result of effects of different pH values on protease activity of Cotton bollworm and Beet armyworm showed that except pH 13, enzyme activities were not affected by acid or alkaline conditions (Fig. 2). In Beet armyworm three minor peaks in pH of 4, 9 and 12 was observed and the optimum (the most) enzyme activity in pH 12 was detected and about Cotton bollworm the optimum activity was detected in pH of 10, although the differences were not statistically significant.

Protease enzyme stability in two storage condition showed significant differences in both studied insects. Fig. 3 Shows that proteolytic activity of Cotton bollworm midgut protease in freezing condition (-20 °C) was stable after 15 weeks. Although with increasing storage times, enzyme activity decreased in non significant rate. But in other storage condition (4°C) protease activity for 13 weeks was stable although a decreasing trend could be observed. After 13 weeks, enzyme activity significantly decreased and the least enzyme activity was detected after 15 weeks (Fig. 3-A).

In *S. exigua* the same trend was observed (Fig. 3-B) in freezing storage condition (-20°C), enzyme activity without significant differences was stable in storage period. While a decreasing slop could be observed. But in 4°C, enzyme activity was not stable in storage period. After 2 weeks enzyme activity was started to decrease significantly with prompt slop to 5th week. After then the slop of decrease was not sharp and without significant differences enzyme activity decreased till 14th week. The least enzyme activity was detected after 14 weeks.

Enzyme activity in different developmental stages

Specific protease activity in developmental stages of Cotton bollworm and Beet armyworm has summarized in table 1. In both studied insects enzyme activity in larval stages was more than other developmental stages. Among larval

stages, with developing larval instars, specific enzyme activity decreased. The most enzyme activity measured in 4th larval instar in Cotton bollworm and Beet armyworm. Total protease activity in 5-6 inter-moult period was more than pre-pupa, pupa and adult stages in both insects. There were significant differences between male and female pupa and adults in *H. armigera*. Male pupa and female adults have more protease activity than other sexes. But about *S. exigua,* male and female pupa and adults haven't significant differences in protease activity (Table 2).

DISCUSSION

Using Azocasein as a substrate for total protease, optimum pH and temperature of *S. exigua* and *H. armigera* was determined. It is clear that raising the temperature will increase the rate of enzyme-catalyzed reactions, this will occur by increasing the kinetic energy and collision frequency of the reacting molecules. However, heat can also increase the kinetic energy of the enzyme to a point that exceeds the energy barrier for disrupting the maintain condition of the enzyme and its three-dimensional structure after that enzyme begins to denature, results in loss of its catalytic activity. In our study more than 60°C specific protease activity sharply decreases in both insects. But enzyme activity between 35-55°C was more than other studied temperatures in both insects. The optimal temperature for the action of each enzyme varies among different insects (Hori, 1973) and other studies with different enzyme systems confirm that. But the temperature in which enzyme starts to decrease its activity approximately was in same manner. For example, Incubation of *Prostephanus truncates* alpha-amylase for 15 min in different temperatures showed that more than 40°C amylolytic activity rapidly decreased (Mendiola-Olaya et al., 2000). And Hasan khan et al. (2003), showed that at higher temperatures (more than 60°C), there is a sharp decrease in the protease activity. In *Anticarsia gemmatalis* larvae, BApNA hydrolysis (trypsin activity) was temperature dependent and maximum activity was obtained at 50°C (Pereira et al., 2005). Also Blahovec et al. (2006) showed that larval stage peptidases of housefly are not so stable in high temperatures and after 50°C enzyme activity began to decrease sharply. Muyan et al. (2006) showed that optimal temperature for activity of protease digestive enzymes was 50°C. Also they showed that enzyme activity gradually increased with rising temperature to a peak at 50°C then rapidly declined as temperature increased. Cho et al., 2003 using azocasein as a substrate showed that the protease of *Aeromonas hydrophila* was active over the temperatures range of 50 to 65°C with an optimum activity at 60°C.

The optimum temperature of protease activity is positively or negatively in relation with pH values (Muyan et al., 2006). The rate of almost all enzyme-catalyzed reactions exhibits a significant dependence on specific pH. And all enzymes will have their optimum pH ranges (Murray et al., 2003). Most enzymes are stable in variety of pH conditions because of their special three-dimensional structure but a change in pH, will affect the state of amino-acid ionization that are one of maintenance factors of folded structure of enzyme (Murray et al., 2003; Eisenthal & Danson, 2002; Price & Stevens, 2000). Because of specific pH condition in each enzyme groups for maintaining this three-dimensional structure and catalytic activity of them, wide pH ranges should be a reason for activity of different protease enzymes in our study on *H. armigera* and *S. exigua*. Serine proteases including trypsin, chymotrypsin and elastases are more active in alkaline conditions while cysteine proteases optimum activity is in acidic

conditions (Nation, 2002), this wide range of pH could be related to occurrence and activity of these two important groups of proteases in Cotton bollworm and Beet army worm midgut. Protease of *A. hydrophila* was active over the pH range of 8 to 10, but exhibited its maximum activity at pH 9 (Cho et al., 2003).

The purified *Prostephanus truncates* alpha-amylase has the optimum pH values of 6, and in two extremes of studied pH values, enzyme activity decreased (Mendiola-Olaya et al., 2000). Other studies also showed that there is a distinct range of pH for enzyme activity in different insects (Pavasovic et al., 2004; Pereira et al., 2005; Hosseininaveh et al., 2009). In some cases more than one peaks of enzyme activity detected and researchers relates this with isozymes (Zeng & Cohen, 2000), also in different biological and physiological conditions, insects may not have same optimum pH ranges of enzyme activity (Abraham et al., 1992). Then we can see that different conditions will alter enzyme optimum conditions of activity, about our study the evaluated enzyme system was total protease (not purified special enzymes) which are complex of different groups of proteases, but biological, feeding, sampling and rearing condition were same for all experiments, we think the only reason for wide range of pH values is in relation with different protease groups in both insects midgut. Enzymatic studies on *H. armigera* midgut and other lepidopteran insects was indicated that alkaline pH is optimal and serine protease activity is dominant (Ozgur et al., 2009; Nation, 2002). Trypsin-like, chymotrypsin-like, leucine aminopeptidase-like, and minor elastase-like serine proteases were major serine proteases detected in the *H. armigera* midgut (Ozgur et al., 2009).

It is clear that each developmental stage of insects because of different habitats and feeding hosts could have different enzymatic activities especially in holometabolous insects. In this study protease activity of larval stages were more than other developmental stages. Lepidopteran larvae have a long midgut and food immediately pass from mouth to midgut, the digestive enzymes works on it and after digestion absorbance also occurs in midgut (Nation, 2002). In periods between two instar larvae enters an immobilized stage and its mouthparts loss their activity and larva is ready for moulting (our observations, data not available). In this period midgut is empty of food. Because the feeding and enzyme secretion occurs in same time (Nation, 2002; Chapman, 1985), we think low protease activity of inter-moult and pre-pupal stage is in relation with non-feeding behavior of them. Mendiola-Olaya *et al.* (2000) showed that alpha-amylase activity reached its highest value in the second larval instar of *P. truncates*, also enzyme activity in second larval stage was more than 3rd instar and only a little activity was detected in pupal stage, thay suggest that no digestive processes are taking place during pupal stage. In *Culex pipiens* proteolytic enzymes reached a peak towards the end of larval life, but then decreased a few days before pupation (Chapman, 1985). In different larval instars of *M. domestica* with developing larva to 3rd instar, amino peptidase, trypsin, chymotrypsin and elastase activity decreased (Blahovec et al., 2006). Thus high specific protease activity in larval stage and especially decreasing activity with developing insects may be depends on feeding behavior and developing stage of them.

But about differences in male and female pupa and adults in some studied cases there were significant differences between sexes and in some cases the activity was same, but in all cases a minor enzyme activity in pupal stages reported. For example in *Dysdercus* spp. digestives enzyme activity in adult females was more than males (Chapman, 1985) and also protease activity in females of *B. mori* and *Locusta migratoria* was more than males (Hori, 1973). In other study Hori, (1973) showed that amylase and protease activities of the

salivary gland were particularly the same for both sexes in *Lygus disponsi*, and also digestive amylase of *B. mori*, protease of stable fly were same in male and female insects. Another problem in comparing protease activity of developmental stages is that in pupa and adult insects whole body were used for enzyme assays, because of probability of activity of protease in hemolymph of this stages will not completely comparable with other developmental stages. Table 2 shows that in female adults protease activity was more than males, maybe it could be reasoned by egg and yolk formation process in females. But other digestive and protolytic systems should be studied to judge about that.

One of the important factors that in enzyme assays will affect severity of studies is enzyme stability in storage condition. Because of preparing enzyme sources and working on its properties and other assays will occur in long times, knowledge of enzyme stability in working and storage condition will be useful. In this study freezing condition (-20°C) kept protease stable in both insects for nearly long time. But another storage condition 4°C especially about *S. exigua* was not suitable and enzyme activity began to decrease after a short time of storage. It is recommendable that for storing this insect's digestive enzyme freezing condition works better than 4°C.

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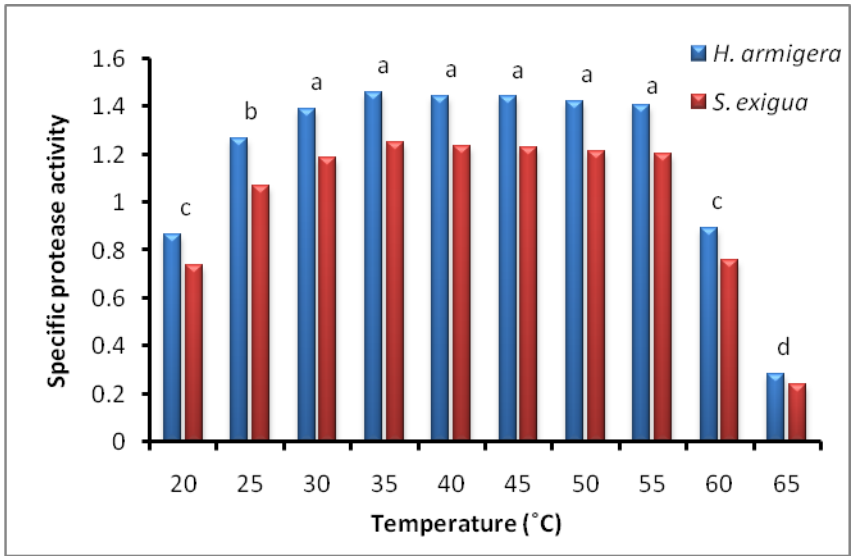

Figure 1. Cotton bollworm and Beet armyworm protease activity in different temperatures. a: The means with similar words have no significant difference (Duncan's multiple range test, α=0.05).

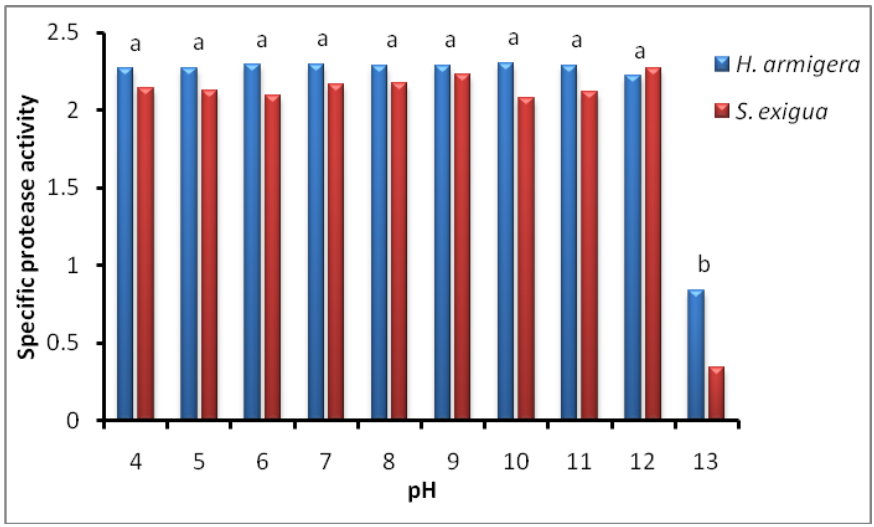

Figure 2. Protease activity in different pH values in Cotton bollworm and Beet armyworm. a: The means with similar words have no significant difference (Duncan's multiple range test, α=0.05).

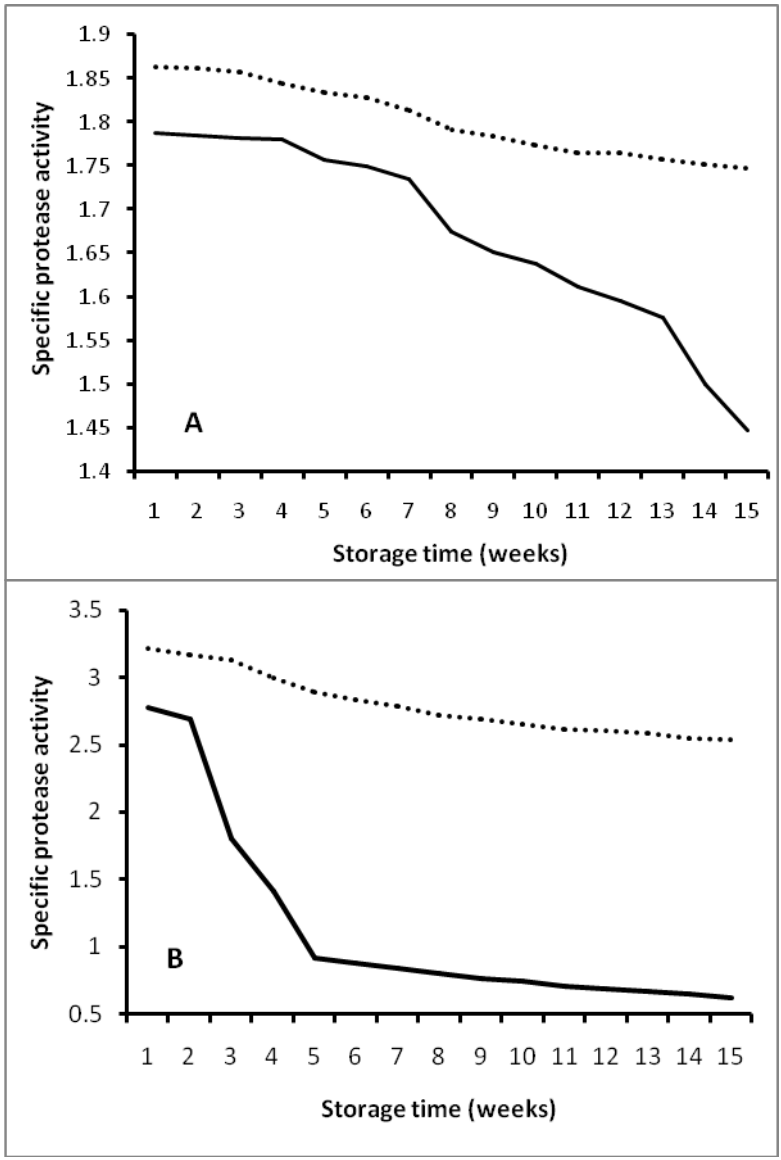

Figure 3. Stability of Cotton bollworm (A) and Beet armyworm (B) midgut protease activity in two storage conditions (..... -20°C and_____ 4°C).

Table 1. Total protease activity in different developmental stages of Cotton bollworm and Beet armyworm.

Developmental stages	Larval stage			5-6 Inter moult	Pre-pupa	Pupa	Adults
	4th	5th	6th				
H. armigera	8.764[a]	5.855[b]	1.903[c]	0.943[cd]	0.027[d]	0.033[d]	0.060[d]
S. exigua	16.948[a]	8.209[b]	6.043[c]	0.829[d]	0.049[d]	0.030[d]	0.037[d]

a: The means with similar words have no significant difference (Duncan's multiple range test, α=0.05).

Table 2. Protease activity in male and female pupa and adults of Cotton bollworm and Beet armyworm.

Insect	Sex	Pupa	Adult
H. armigera	Male	0.041[a]	0.022[b]
	Female	0.025[b]	0.099[a]
S. exigua	Male	0.034[A]	0.038[A]
	Female	0.025[A]	0.046[A]

a: The means with similar words have no significant difference (Duncan's multiple range test, α=0.05).

ISOZYMES ELECTROPHORETIC VARIATIONS AMONG HOSTS AND LOCALITIES FOR POPULATIONS OF *BEMISIA TABACI* (GENN.) IN EGYPT (HEMIPTERA: ALYRODIDAE)

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[Helmi, A. 2010. Isozymes electrophoretic variations among hosts and localities for populations of *Bemisia tabaci* (Genn.) in Egypt (Hemiptera: Alyrodidae). Munis Entomology & Zoology, 5 (2): 707-715**]**

ABSTRACT: Electrophoretic patterns of two isozymes (α naphthyl acetate Esterase and Malate dehydrogenase) were analyzed to determine variations among populations of *Bemisia tabaci* (Genn.) collected from nine different host plants at Qalyubiya Governorate and randomly from six Governorates in Egypt. The two analyzed isozymes successively showed polymorphic variations among the studied populations. Phylogenetic relationships among the studied populations were established according to the patterns of these two isozymes. Results concluded that *B. tabaci* species may be has different genotypes according to different localities and hosts in Egypt.

KEY WORDS: isozymes, electrophoresis, *Bemisia tabaci*, Phylogenetic relationship.

Bemisia tabaci (Genn.) has become a prominent pest in worldwide bases especially in tropical and sub-tropical agro-ecosystems (Brown, 1994, 2000). Millions of dollars have been lost as a result of direct feeding damage and plant diseases caused by whitefly-transmitted geminiviruses (Brown, 1992; Brown et al., 1991; Cohen et al., 1992; Costa & Brown, 1991; Costa et al., 1993; Yokomi et al., 1990). The existence of biotypes or host races of *B. tabaci* was proposed in the 1950s after the discovery that morphologically indistinguishable populations of *B. tabaci* exhibited measurably different biological traits with respect to host range, host-plant adaptability and plant virus transmission capabilities (Bird, 1957; Bird & Maramerosh, 1978; Costa & Russell, 1975). There has been a long-running debate as to whether *B. tabaci* is a single species or a complex of closely related taxa. Frohlich et al. (1999) concluded that *B. tabaci* was "species complex" although it was not clear from the study as to how this conclusion was reached. Since then, the term species complex has filtered into the *Bemisia* literature. The first comprehensive assessment of the species complex idea was undertaken by De Barro et al. (2005).

In the Hemiptera, host-based genetic structuring of populations has been observed in several species of aphids including *Sitobion avenae* (Sunnucks et al., 1997), *Aphis gossypii* (Vanlerberghe-Masutti & Chavigy, 1998) and *Acyrthosiphon pisum* (Simon et al., 2003) as well as in the Diaspidid scale *Aspidiotus cryptomeriae* (Miyanoshita & Tatsuki, 2001) and the Membracid leaf hopper, *Enchenopa binotata* (Rodriguez et al., 2004).

Electrophoresis techniques have been used extensively for genetic surveys of natural populations, so several authors used Electrophoretic patterns of isozymes especially esterases to determine host associated or/and geographical biotypes of *B. tabaci* (Wool et al., 1989; Costa & Brown, 1991; Burban et al., 1992& 1993; Liu et al., 1992; Brown et al., 1994; Homam, 2000; Lisha et al., 2003).

This work aims at detecting biochemical genetic variations in *B. tabaci* populations on different host plants and localities in Egypt.

MATERIALS AND METHODS

Samples Collecting: For detect variations among host plants associated populations of *B. tabaci* adults were aspirated off or/and collected in the field as pupae and brought to the laboratory, where the adults emerged from nine host plants (squash, cotton, sweet-potato, okra, egg-plant, pea, tomato, potato and watermelon) at Qalyubiya Governorate and allowed for adult emergence using insect emergence cages at the laboratory. All individual populations were maintained continuously for three successive generations on the respective host plants which were grown in pots at rearing cages. The purity of individual populations was ensured by raising new population from the parental adults of an earlier generation after these were shifted from the old screen cages to new cages. The emerging adult females from the third generation were separated and preserved immediately at -20°C in Eppendorf tubes until DNA extraction. While for detect variations among geographical associated populations of *B. tabaci* adults were aspirated off randomly from six different Governorates in Egypt (Qalyubiya, Kafr El-Sheikh, Sharqiya, Arish, Alexandria and Aswan). Samples were deep-frozen and stored at -20 °C until analysis.

Electrophoresis: Thirty adults of each population were homogenized in Eppendorf tubes containing 50 µl of extraction buffer (0.1 M Tris-Borate EDTA buffer pH 7.0 containing 10% sucrose) by aid of a handle plastic homogenizer. Tubes were centrifuged for 10 min at 10.000 rpm at 5°C. The supernatants were transferred to new eppendorf tubes and kept at deep- freeze until use for electrophoretic analysis. Vertical polyacrylamide gel 8% was used, the gels were completely covered with electrode buffer. The electrodes were connected to power supply and adjusted at 200 V for two hours. The gels were stained after electrophoresis according to its system, staining for esterases was in 100 mM Na-phosphate buffer, pH 6.0, using ±-^{2} naphthyl acetate as substrates in the ratio ±: ^{2}= 9:1, while staining for Malate dehydrogenase was in 50 mM Tris-HCl, pH 8.5, using Malic acid as a substrate with NAD, MTT and PMS. Gels were incubated at 37 °C in dark for complete staining, after that gels were fixed in a 1:5:5 mixure of acetic acid, ethanol and water for 24 hours and rinsed with distilled water two times, then photographed. All gels were scanned using Bio-Rad GelDoc2000 to calculate the pair-wise differences matrix and plot the dendrogram among different populations.

RESULTS

1. Host plant-associated *B. tabaci* populations:

1.1. α naphthyl acetate Esterases (Est):

Electrophoretic patterns of these isozymes showed highly polymorphism across the different nine host plant-associated populations Fig. (1). the maximum number of twelve enzymatic bands was detected. The least number of bands was 5 bands found in three *B. tabaci* populations (pea, tomato and okra), while the highest number of bands was 8 bands found in populations of sweet-potato and cotton. Six bands were detected in three *B. tabaci* populations (watermelon, egg-plant and squash). While population from potato showed 7 esterase bands. Bands number 5, 8, 10 and 12 were detected to be common bands for all nine populations. Both Est1 and Est4 were specific bands for four populations (sweet-

potato, cotton, okra and egg-plant). While Est2 was specific band for populations of sweet-potato and cotton only. Also Est3 was specific band for populations of potato only.

1.2. Malate dehydrogenase (Mdh):

Electrophoretic patterns of this isozyme showed less polymorphism across the different nine *B. tabaci* populations than those detected by ±-² naphthyl acetate Esterases Fig. (2). Only four polymorphic enzymatic bands with relative migration (Rm) ranged from 0.072 to 0.553. The highest number was three bands was detected in five *B. tabaci* populations (potato, sweet-potato, cotton, tomato and egg-plant). While two bands were detected in three populations (pea, okra and squash). Only one band was detected in *B. tabaci* watermelon population. Mdh3 with "Rf" value of 0.354 was established as a common band among the nine *B. tabaci* populations. Mdh4 was detected as a specific band for egg-plant population. While Mdh2 band was detected as a negative specific band for watermelon population.

2. Geographical-associated populations of *B. tabaci* in Egypt:

2.1. α naphthyl acetate Esterases:

Electrophoretic patterns of these two isozymes showed highly polymorphism across the different six Governorates populations, Fig. (3). the maximum bands number was eleven enzymatic bands, while the least number of bands was 4 bands was found in four Governorates *B. tabaci* populations (Aswan, Qalyubiya, Kafr-El-Sheikh and El-Wadi El-Gadid), while the highest number of bands was 7 bands was found in *B. tabaci* populations collected from Qena Governorate. Fife bands were detected in Alexandria *B. tabaci* population. Est9 band was common band for the all six populations. Both of Est6 and Est10 were specific bands for Alexandria population. While Est1 and Est11 were specific bands for Qena and Kafr-El-Sheikh populations, respectively. On other hand Est 2 was found in five populations and absent in El- Wadi El-Gadid population. Also Est 5 was found in all populations except in Aswan population. So Est2 and Est5 considered as negative specific bands for El-Wadi El-Gadid and Aswan populations, respectively.

2.2. Malate dehydrogenase (Mdh):

Electrophoretic patterns of this isozyme were not polymorphic across the different six *B. tabaci* populations Fig. (4). Only three enzymatic bands with relative migration (Rm) ranged from 0.072 to 0.394. The highest number was three bands were detected in three *B. tabaci* populations (Qalyubiya, Kafr-El-Sheikh and Alexandria). While only one band with relative migration of 0.394 was detected in the other three Governorates populations. Band Mdh3 was detected to be a common band among the six populations. While bands Mdh 1 and Mdh 2 with Rm 0.072 and 0.151 were found to be specific bands for *B. tabaci* populations of Qalyubiya, Kafr-El-Sheikh and Alexandria.

3. Phylogenetic relationship among different *B. tabaci* populations:

3.1. Host-plant associated populations:

The Phylogenetic relationship among the nine host-associated populations of *B. tabaci* was generated according to the two biochemical markers (Est & Mdh). The similarity matrix is tabulated in table (1) and the Phylogenetic dendrogram is illustrated in Fig. (5). Results of this dendrogram divided the populations into two groups, the first group contained two sub-groups with similarity percentage of 71%. The first sub-group included *B. tabaci* populations of watermelon and squash with similarity percentage of 93%, while the second sub-group divided

into two classes the first included *B. tabaci* populations of pea, tomato with similarity percentage of 93%, while the second class contained potato population only. The second group contained the other four *B. tabaci* populations. This group divided into two sub-groups with similarity matrix percentage of 84%, the first sub-group contained populations of okra and egg-plant with similarity matrix of 89%, while the second sub-group contained populations of sweet-potato and cotton with similarity matrix percentage of 91%.

3.2. Geographical-associated populations:

The Phylogenetic relationship among the six geographical-associated populations of *B. tabaci* was generated according to the two biochemical markers (Est & Mdh). The similarity matrix is tabulated in table (2) and the Phylogenetic dendrogram is illustrated in Fig. (4). Results of this dendrogram divided the populations into two clusters, the first cluster contained two sub-clusters with similarity matrix percentage of 80%. The first sub-cluster included *B. tabaci* populations of Qalyubiya and Kafr El-Sheikh with similarity percentage of 96%, while the second sub-cluster included *B. tabaci* population of Alexandria only. The second cluster contained the other three *B. tabaci* populations. This cluster divided into two sub-clusters with similarity matrix percentage of 44%, the first sub-cluster contained populations of Qena and El Wadi El- Gedid with similarity matrix of 80%, while the second sub-cluster contained population of Aswan only.

DISCUSSIONS

From these results could be concluded that *B. tabaci* species may be has different genotypes according to different localities and hosts in Egypt. These results in agreement with those obtained with Homam (2000) who detected variations among populations of *B. tabaci* collected from different hosts and localities in Egypt using esterases patterns. Also, Perumal et al., 2009 found differences among *B. tabaci* populations collected from four different host plants in various locations of Tamil Nadu using molecular analysis and reported that there are at least two different biotypes of this insect pest based on these four host plants.

The utility of general isozymes electrophoretic patterns in distinguishing among different *B. tabaci* host and/or geographical associated populations was demonstrated by Wool et al. 1989; Costa & Brown 1991; Liu et al., 1992; Burban et al., 1992, 1993; Brown et al., 1994; Legg et al., 1994; Bergh et al., 1995; Brown et al., 1995; Byrne et al., 1995; Guirao et al., 1997; Homam, 2000. Also, some authors used isozymes electrophoresis to distingish among different whitefly species Guirao et al., 1997; Prabhaker et al., 1987; Idriss et al., 1997; Oliveira et al., 1997; Helmi, 2003).

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Table 1. The similarity matrix of nine host-associated populations of B. tabaci based on banding patterns of two isozymes (Est & Mdh) at Qalyubiya Governorate.

Host plant	watermelon	potato	sweet-potato	cotton	pea	Tomato	okra	egg-plant	squash
watermelon									
potato	0.82								
sweet-potat	0.67	0.76							
cotton	0.67	0.76	0.91						
pea	0.71	0.82	0.67	0.78					
poinsettia	0.8	0.89	0.74	0.84	0.93				
okra	0.67	0.67	0.84	0.84	0.67	0.75			
egg-plant	0.71	0.7	0.86	0.76	0.59	0.67	0.89		
squash	0.93	0.89	0.74	0.74	0.8	0.88	0.75	0.78	1.0

Table 2. The similarity matrix of six geographical associated populations of B. tabaci based on two isozymes (Est & Mdh) in Egypt.

	Aswan	Qalyubiya	Kafr El-Sheikh	Alexandria	Qena	El Wadi El-Gadid
Aswan	1					
Qalyubiya	0.54					
Kafr El-Sheikh	0.4	0.86				
Alexandria	0.43	0.8	0.8			
Qena	0.5	0.7	0.5	0.5		
El Wadi El-Gadid	0.44	0.7	0.5	0.5	0.8	1

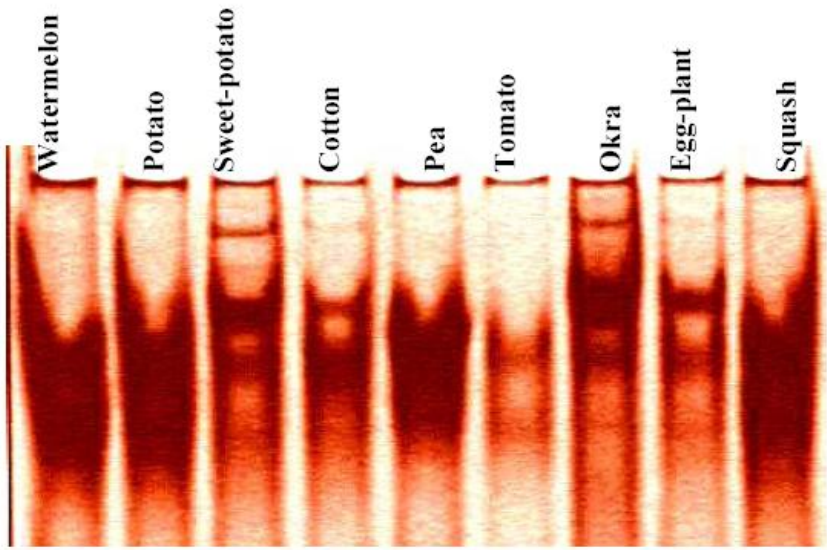

Figure 1. Polyacrylamide gel zymogram of esterase isozymes (Est) banding patterns in nine host plant-associated populations of *B. tabaci* detected with α naphthyl acetate substrates.

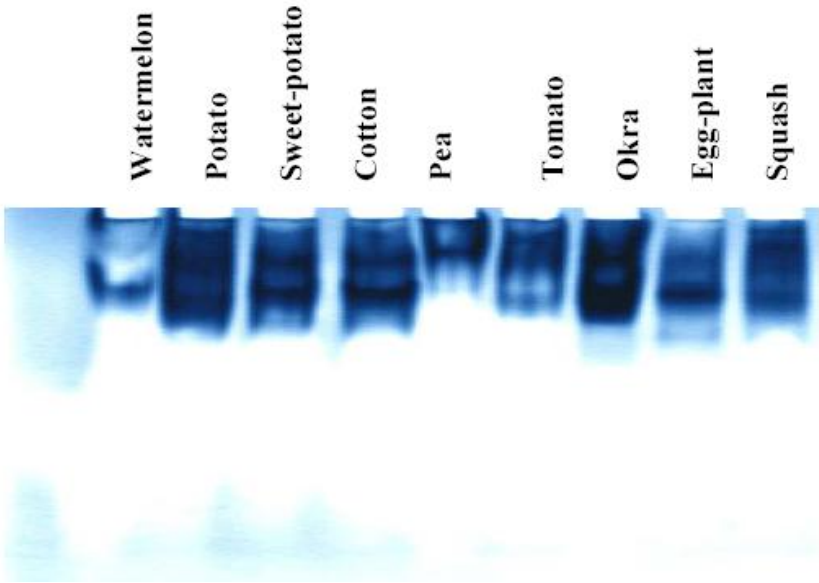

Figure 2. Polyacrylamide gel zymogram of Malate dehydrogenase (Mdh) banding patterns in nine host plant-associated populations of *B. tabaci* detected with Malic acid as a substrate.

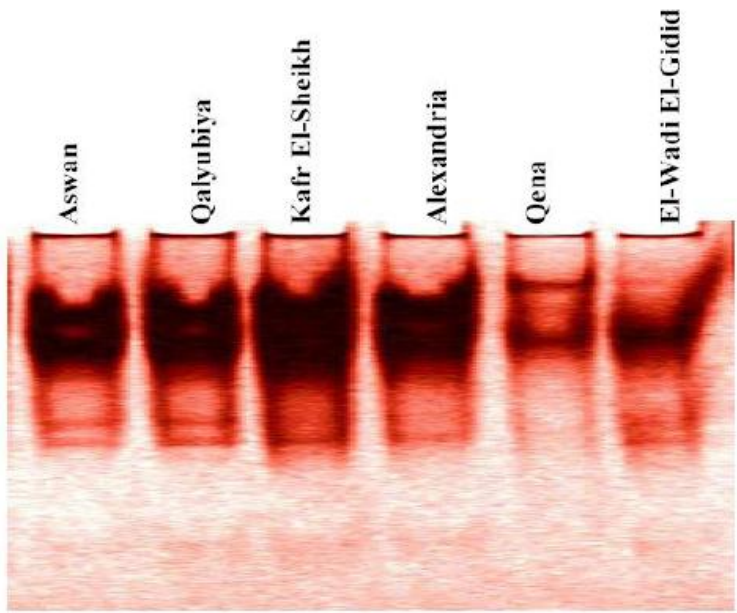

Figure 3. Poly-acrylamide gel zymogram of esterase isozymes (Est) banding patterns in six localities-associated populations of *B. tabaci* detected with α naphthyl acetate substrates.

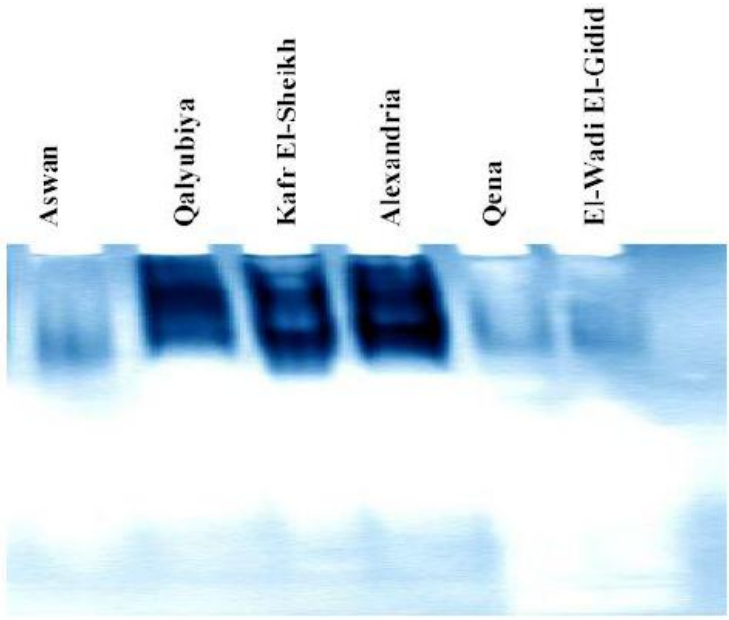

Figure 4. Polyacrylamide gel zymogram of Malate dehydrogenase (Mdh) banding patterns in six localities-associated populations of *B. tabaci* detected with Malic acid as a substrate.

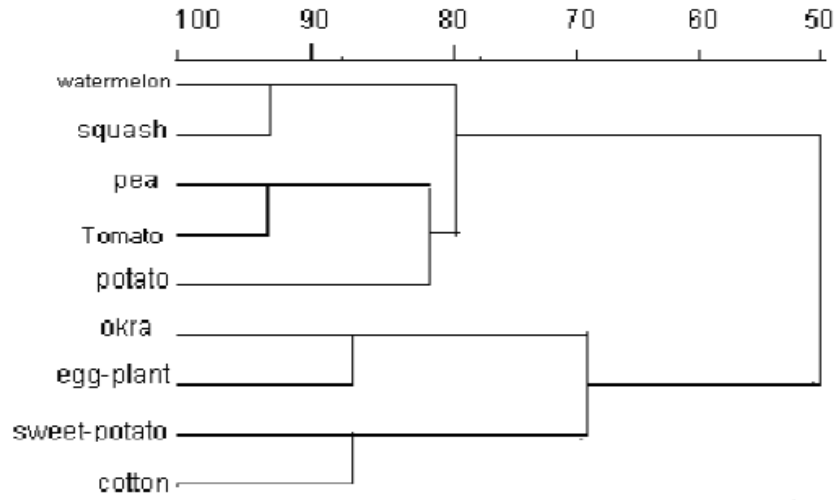

Figure 5. The similarity dendrogram of nine host-associated populations of *B. tabaci* based on two isozymes analysis (Est & Mdh).

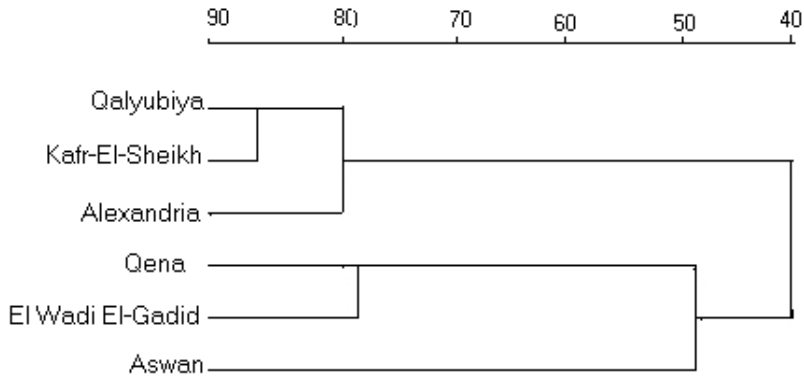

Figure 6. The similarity dendrogram of six geographical-associated populations of *B. tabaci* based on two isozymes analysis (Est & Mdh) in Egypt.

CHARACTERIZATION OF A-AMYLASE IN THE ALIMENTARY CANAL OF *NARANGA AENESCENS* MOORE (LEPIDOPTERA: NOCTUIDAE), THE RICE GREEN CATERPILLAR

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ABSTRACT: The α-amylases in whole gut of *Naranga aenescens* (Lepidoptera: Noctuidea) were isolated and characterized by using spectrophotometrically assays. The results showed the existence of the enzyme with a high activity in the gut so that the optimal pH and temperature were evaluated 10 and 30 °C, respectively. The activity of α-amylase was inhibited by NaCl and $CaCl_2$ and increased or remained no effect by other used compounds. Determination of the band on the Native-PAGE electrophoresis showed a single isozyme of α-amylase in the gut *N. aenescens*. Study on digestive enzymes of insects is one of the new and winning area to reach a safe and effective way to decrease the damages of the pest on agricultural products. Also, determination of different specific inhibitors are necessary to reach a real and reliant results.

KEY WORDS: α-amylases, Rice green caterpillar, gut.

The α-amylases (α-1,4-glucan-4-glucanohydrolases; EC3.2.1.1) are the hydrolytic enzymes that are found in microorganisms, plants and animals. These enzymes catalyse the hydrolysis of α-D-(1,4)-glucan linkage in starch and related carbohydrates (Strobl et al., 1998). They are the important enzymes involved in digestion and carbohydrate metabolism in insects (Daone et al., 1975; Buonocore et al., 1976; Horie & Watanabe, 1980). Amylases have been characterized from different origins in insect's body (Fisher & Stein, 1960; Takagi et al., 1971; Baker, 1983, 1987, 1991). α-Amylase converts starch to maltose, which is then hydrolyzed to glucose by an α-glucosidase. In insects, only α -amylases have been found that hydrolyse long α -1,4 glucan chains, such as native starch or glycogen (Terra et al., 1996).

The Green Semi Looper, *Naranga aenescens* Moore (Lepidoptera: Noctuiudae) is an important pest in rice fields and causes severe decrease in rice production (Alinia, 1993). The Green Semi Looper has three larval instar that all of them consume of rice leaves (Reissig et al., 1986). Pupation takes place on the top of the leaves and then fall on the rice field, where provides a suitable environment for pupal overwintering (Alinia, 1993). The *N. aenescens* has three generation that can be found from April to September (Alinia, 1993). First instar larvae feed on the margins of the young leaves and second as well as third instar larvae feed all of the leaves and causes severe damages (Alinia, 1993). Control strategies for *N. aenescens* rely on widely spraying by chemical insecticides especially organophosphorous ones (Alinia, 1993).

Because of living on a starch-rich diet, many insects depend on the effectiveness of their amylases for survival. In insects α-amylases are synthesized and secreted by midgut epithelial cells, along with other digestive enzymes (Baker, 1983; Terra & Ferreira, 2005). Amylases have been investigated in

Coleoptera, Hymenoptera, Diptera, Lepidoptera and Heteroptera by several researchers (Hori, 1970, 1971, 1972, 1975; Buonocore et al., 1976; Kanekatsu, 1978; Terra & Ferreira, 1983; Baker & Woo, 1985; Colepicolo-Neto et al., 1986; Santos & Terra, 1986; Baker, 1987, 1989, 1991; Terra et al., 1988; Ferreira & Terra, 1989; Schumaker et al., 1993; Ferreira et al., 1994). Amylases are one of the most important enzymes in digestive biochemistry of Lepidoptera because this order includes destructive herbivores. Also, high basic condition in alimentary tract of caterpillars cause the enzyme very specific and favorable in case of biochemistry of digestion. Hence, The aim of this study was extraction and characterization of a α-amylases from the alimentary canal of *N. aenescens* to reach a better understanding of the digestive physiology and to find a winning procedure to use amylase specific inhibitors for control of this pest on rice.

MATERIALS AND METHODS

Insect

Larvae in 3th instar were collected from the paddy fields around Amoul (Mazandaran province) and transferred to the laboratory of entomology at the University of Tehran.

Sample preparation and enzyme assays

Whole guts of third instar larvae were removed by dissection and homogenized in distilled water; the samples were put in the 1.5 ml centrifuge tubes and centrifuged at 15000 rpm for 15 min at 4 °C. Supernatant was separated from plate and kept at -20 °C for subsequent analysis.

α-amylase assay

α-Amylase activity was assayed using the dinitrosalicylic acid (DNS) procedure (Bernfeld, 1955), using 1 % soluble starch (Merck, Darmstadt, Germany) as the substrate.Ten microliter of the enzyme in addition to 50 microliter substrate (soluble starch) and 150 microliter universal buffer (0.02 M) containing succinate, glycine and 2-morpholinoethanesulfonic acid (pH 6.5) were incubated in 30 min in 35 °C (in Ben Mari). After addition of 100 microliter DNS and heating in the boiling water during 10 min, the reaction was stopped. Then, absorbance was read at 540 nm using a spectrophotometer. As a blank, instead of enzyme, distilled water was used. All assays were repeated at least three times.

Effect of PH and temperature on enzyme activity

The effects of temperature and pH on α-amylase activity were examined using enzymes from the larval whole gut. Optimal pH was determined using universal buffer with pH set at 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12. The effect of temperature on α-amylase activity was determined by incubating the reaction mixture at 10, 20, 25, 30, 35, 40, 45, 50 and 60 °C for 30 min followed by measurement of activity.

Effect of activators and inhibitors on enzyme activity

To test the effect of different ions on the enzyme activity, assays were performed in the presence of different concentrations of chloride salts of NaCl (5,10, 20 and 40 mmol/l), KCl (5,10, 20 and 40 mmol/l), $CaCl_2$ (5, 10, 20 and 40 mmol/l), $MgCl_2$(5, 10, 20 and 40 mmol/l), and ethylenediaminetetraacetic acid (EDTA; 0.5, 1, 2 and 4 mmol/l), sodium dodecylsulfate (SDS; 2, 4, 8 and 16 mmol/l) and urea (2, 4 and 8 mol/l). These compounds were added to the assay mixture, and activity was measured after 30 min. A control was also measured.

Electrophoresis

The amylase present in crude homogenates of Whole gut after SDS–polyacrylamide gel electro-phoresis (PAGE) was visualized using the procedure described by Laemmli (1970) and Campos et al. (1989), with minor modification. SDS–PAGE was performed in a 10 % (w/v) separating gel and a 5 % stacking gel, both with 0.05 % SDS. The electrode buffer was prepared based on the method of Laemmli (1970), but SDS was not used. The sample buffer contained 25 % stacking buffer (0.5 mol/ L Tris–HCl [pH 6.8]), 20 % glycerol, 2 % SDS, 0.005 % (w/v) bromophenol blue, but no mercaptoethanol, and it was not heated. Electro-phoresis was conducted at room temperature at 120 V until the blue dye reached the bottom of the slab gel. To prepare gels for α–amylase assay, the gel was rinsed with water and washed by shaking gently with 1 % (v/v) Triton X-100 in phosphate buffercontaining 2 mmol/l$CaCl_2$ and 10 mmol/l NaCl for 1.5 h. The gel Fig. 1.

Protein determination

According to the method of Bradford (1976), bovine serum albumin (Bio-Rad, München, Germany), used as a standard for measuring the concentration of protein.

Statistical analysis

A completely randomed design was used to set up the experiments. To comparison of means and show the variance, Tukey's studentisized test was considered at probability less than 5 % (p<0.05).

RESULTS

α-amylase activity

α-amylase activity was present in the gut of larvae. The activity of enzyme in the guts were 0.41 mOD/min.

Effect of PH and temperature on enzyme activity

The α-amylases extracted from guts of *N. aenescens* showed an optimal pH of 10 (Fig. 1). The enzyme activity from whole gut increased steadily from pH 6 to 10, and then decreased with increasing pH 11 (Fig. 1). Amylase was active over a broad range of temperatures. The optimal temperatures for α-amylase activity in gut was 30 °C (Fig. 2).

Effect of activators and inhibitors on enzyme activity

Tested Chemicals in this study had different results on the activity level of α-amylase in gut of larvae (Fig. 3). Activity level of α-amylase in whole gut of *N. aenescens* larvae decreased with increasing concentrations of NaCl and $MgCl_2$ (Fig. 3). However, enzyme activities in gut increased in the presence of remaining compounds.

Electrophoresis

Analysis of gut homogenates by electro-phoresis indicated a band in polyacrylamide gel (Fig. 4).

DISCUSSION

Amylases from different origins have been characterized (Fisher & Stein, 1960; Takagi et al., 1971; Baker, 1983, 1987, 1991). In the silkworm, *Bombyx mori*, Yokoyama (1959) reported the presence of two types of amylase activities in digestive fluid and haemolymph. In this study we measured α-amylase of *Naranga aenescens* larvae in whole gut and our results showed that this enzyme exists in a high level. There is a significant difference between activity of α-amylase in the midgut and the large amounts of the enzyme presents in the midgut (Zibaee et al., 2008). In fact complete breakdown of starch has observed in the midgut (Somadder & Shrivastava, 1980; Kfir et al., 2002).

Optimal pH for activity of α-amylase in this insect was 10. This result was similar to other Lepidopterans that their gut amylase acts in alkaline environment. In fact, high gut pH has been shown in such insects that feed on plant materials rich in tannins (Chapman,1998). In this order, optimal pH for midgut lumen of *Acherontia atropos* (Sphingidae) was 12, for midgut lumen of *Lasiocampa quercus* (Lasiocampidae) 10.8, for midgut lumen of *Manduca sext* (Sphingidae) 11.3 and for midgut lumen of *Lichnoptera felina* (Noctuidae) 10.8 (Dow, 1984). Zibaee et al. (2008) showed that optimal pH in *Chilo suppressalis* was 9 in both midgut and salivary glands. In other orders the results are different and show a correlation between enzyme pH and luminal pH in insect midgut (Terra et al., 1996a,b). Kazzazi et al. (2005) explained that the optimal pH for α-amylase activity of *Eurygaster integriceps* (Hemiptera: Scutelleridae) was 6.5 and Mehrabadi and Bandani (2009) agreed this result. Baker (1983) illustrated that amylase from midguts in larvae of *Sitophilus zeamais* and *Sitophilus granaries* are generally most active in the neutral to slightly acid pH condition.

Although the optimal temperature for α-amylase activity was 30 °C, the enzyme was active over a broad temperature range from 10 to 40 °C. The optimal α-amylase activity in *Chilo supprressalis*, was 35 °C and 40 °C in midgut and salivary gland, respectively (Zibaee et al., 2008). In coleopteran order, enzyme activity had shown 35 °C in *Cerambyx cerdo* L. (Cerambycidae) (Applebaum, 1985) and 25 °C in *Tenebrio molitor* L. (Tenebrionidae) (25 °C; Barbosa Pereira *et al.*,1999) while in Heteroptera, *Dolycoris baccarum* L. (Pentatomidae) it was 40 °C (Hori, 1969). In the current study, Mg^{2+} declined effect of α-amylase of *Naranga aenescens* larvae but K^+ acted as activator. Hori (1969, 1970, 1972) studied different activators on the salivary amylase activity of *Lygus disponsi* and found NaCl was one of the activators. Similarly, Agblor et al. (1994) reported that α-amylases from both *L. hesperus* and *L. lineolaris* were activated by NaCl. However, amylases in some insect species (e.g., *Callosobruchus chinensis* (Linaeus) (Coleoptera: Bruchidae) and *B. mori* (Linnaeus) (Lepidoptera: Bombycidae)) are inhibited by Cl^- (Terra et al., 1996a,b). Dojnov et al. (2008) reported concentrations of Ca^{2+} from 0.005 to 5 mM activated α-amylases crude extract of *Morimus funereus* larvae. In contrast, concentrations above 10 mM were inhibitory. This phenomenon has not been previously reported for other insect α-amylases, but it bears resemblance to that reported for pea leaf α-amylase (Ziegler, 1988). In this experiment, we got the result obtained by Dojnov et al. (2008) but results showed a slight increase in 20 mM. Chelating agent (EDTA), urea and SDS in present study, acted as activator and it was against the results have come from other authors' measurements that showed these three chemicals as inhibitor (Zeng & Cohen, 2000; Zibaee et al., 2008; Mehrabadi & Bandani, 2009). Also, EDTA and SDS showed inhibitory effect in extracellular α-

amylase from *Thermus* sp. But urea had no influence effect on amylase activity (Shaw et al., 1995).

Existence of a band in whole gut homogenates after Native-polyacrylamide gel electro-phoresis (PAGE) indicated that there is a single isozyme. Zibaee et al. (2008) clarified three bands in the midgut and two in the salivary glands. Doani (1967) reported different α-amylases isozymes in fruit fly *Drosophila melanogaster* Meigen (Diptera: Drosophilidae). In other cases, different researchers showed several isoforms of this enzyme in coleopteran order (Terra et al., 1977; Baker, 1991; Chen et al., 1992; Oliveira-Neto et al., 2003).

Study on digestive enzymes of insects especially pest ones is one of the new and winning area to reach a safe and effective way to decrease the damages of the pest to the agricultural products so that determination of different specific inhibitors are necessary to reach the real results by reliance.

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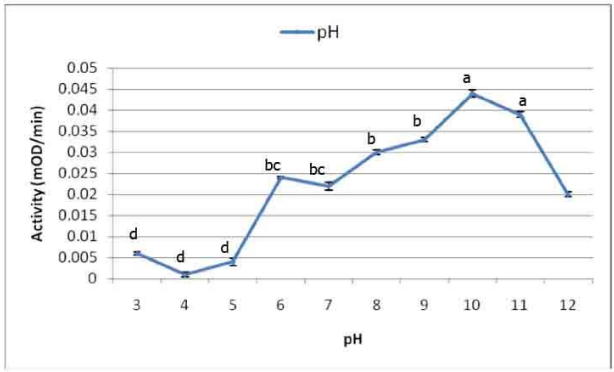


Figure 1. Effect of pH on the α-amylase activity of *Naranga aenescens* larvae.

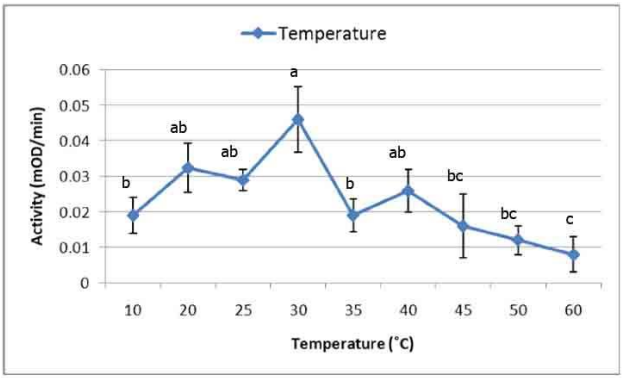
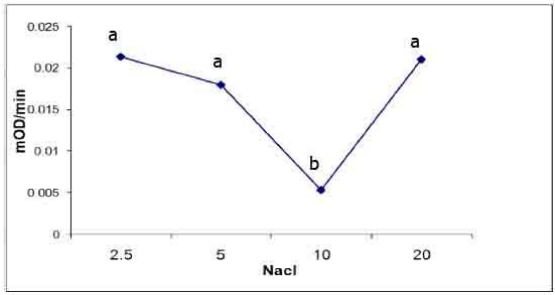


Figure 2. Effect of Temperature (˚C) on the α-amylase activity of *Naranga aenescens* larvae.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0.015
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a
b
a
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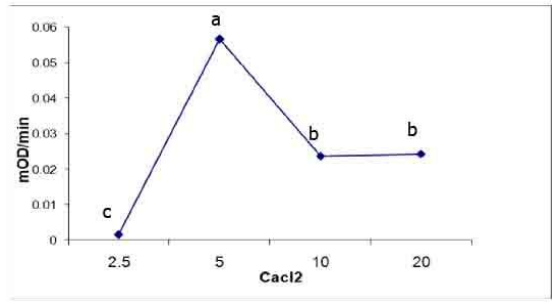
5
10
20
Nacl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0
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b
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5
10
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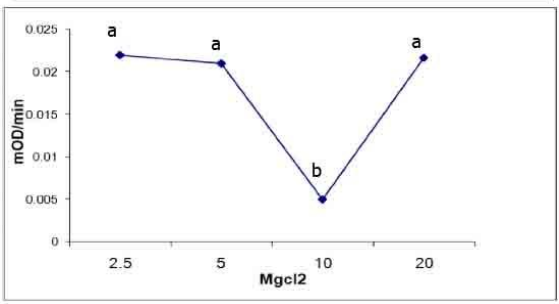
Cacl2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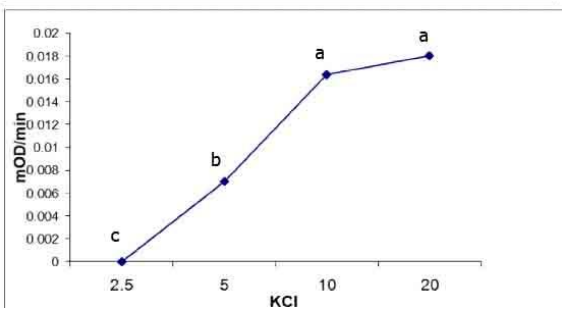
20
Mgcl2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0.016
0.014
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b
a
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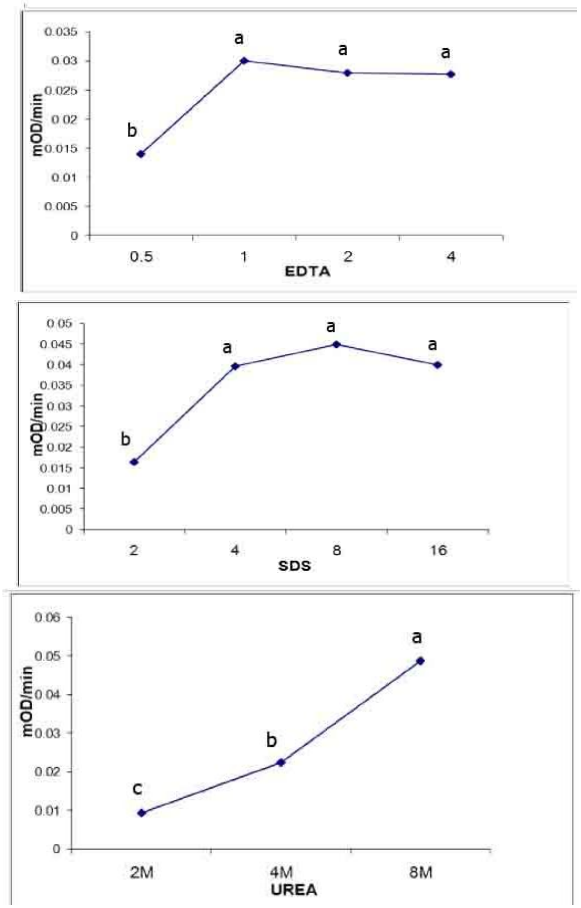

Figure 3. Effect of different compounds on the activity of α-amylase in *Naranga aenescens* larvae. The activity of enzyme in absence of any component was 0.038 ,OD/min.

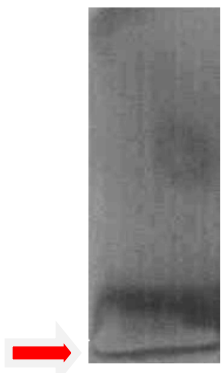

Figure 4. Native-PAGE gel electrophoresis of α-amylase in *Naranga aenescens* larvae.

POPULATION STRUCTURE AND SEASONAL ACTIVITY OF *OMMATISSUS LYBICUS* IN BAM REGION OF IRAN (HOMOPTERA: TROPIDUCHIDAE)

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ABSTRACT: The spatial distribution and population flactuation of two generations *Ommatissus lybicus* de Bergevin (Hom.: Tropiduchidae) were determined in the Bam region, Iran, in 2008. Spatial distribution pattern of *O. lybicus* was described at two generations using variance to mean ratios, Taylor's power law coefficients and Iwao's patchiness regression methods. The spatial distribution pattern of this pest was aggregated. At first generation, the collected data had better fit to Taylor's model for nymphs, adults and both of them (r^2=0.980, 0.839 and 0.968, respectively) in comparison with Iwao's model (r^2= 0.935, 0.836 and 0.787, respectively). Taylor's model explained the distribution data at second generation for nymphs, adults and both of them (r^2= 0.971, 0.966 and 0.843, respectively) better than Iwao's model (r^2= 0.910, 0.905 and 0.833, respectively). The nymphs were active from April to May and August to October, at first and second generations respectively. Adults of the first and second generations were active from May to June and September to November, respectively. By increasing temperature, *O. lybicus* had aestivation in the egg stage for 5 weeks. Spatial distribution coefficients can be used to develop a sampling program and to estimate the population dynamics of this pest accurately.

KEY WORDS: *Ommatissus lybicus*, spatial distribution, population dynamics, Iran, sampling program.

Ommatissus lybicus or Dubas bug was first recorded as a pest of date palm by Afshar (1938) in Iran. It is an important pest of date palms in Iran (Gharib, 1966). It is known as the "old world date bug " and as the "Dubas bug " (Howard, 2001). *O. lybicus* is a bivoltine species and over winters in the egg stage (Klein et al., 1985). It is active on leaflets and fruiting bunches at different stages of date palm tree growth (Bitaw & Ben Saad, 1990). *O. lybicus* causes direct damage to date palms by feeding and indirect damage due to the growth of mould on honeydew produced by this species (Howard et al., 2001). Methods for estimating population densities in arthropods are the cornerstone of basic research on agricultural ecosystems and the principal tool for establishing the implementation of pest management programs (Kogan & Herzog, 1980). Therefore reliable sampling program includes identification of the appropriate sampling time, sampling unit, determination of pattern of sampling and sample size (Pedigo & Buntin, 1994; Boeve & Weiss, 1998; Bins et al., 2000; Southwood & Henderson, 2000). A sampling program can be used in ecological investigations (Faleiro et al., 2002), study of population dynamics (Jarosik et al., 2003), detecting pest levels that justify control measures (Arnaldo & Torres, 2005) and assessing crop loss (Haughes, 1996). The most common methods used to describe the patterns of

dispersion of arthropod populations have been summarized by Southwood & Henderson (2000). Several estimates based on the dispersion coefficient, *K*, of the negative bionomial distribution and on the relationship between variance and mean are used as indices of aggregation (Ludwing & Reynold, 1988; Krebs, 1999; Southwood & Henderson, 2000).

Sampling plans based on these indices optimize the sampling effort and sampling precision (Kuno, 1991). Sequential sampling plans are used to more efficiently identify mean pest populations at or above the economic threshold. These plans have reduced the time required for sampling up to 50%, in relation to conventional sampling plans (Pedigo & Zeiss, 1996; Patrick et al., 2003). Although the objectives of sampling a finite population can differ, the development of a sampling procedure requires the knowledge about the spatial distribution of populations (Liu et al., 2002). The average aggregation levels of grape leafhopper *Empoasca vitis* (Goethe) were determined using the statistical coefficient of dispersion (CD) based on the variance to mean ratio (CD= s^2/m) (Decatne & Helden, 2006). Aggregated spatial distribution patterns were recorded for leafhopper *Empoasca kerri* Pruthi on bean leaf (Sardana et al., 1989; Rathore et al., 1998).

In spite of the importance of *O. lybicus*, neither an efficient sampling program has been developed nor has the spatial distribution been described. The objective of this study was to develop a sampling program for *O. lybicus* on date palm and note differences in spatial distribution and abundance of this pest (nymphs and adults) at two generations in Bam region, Iran. The results of this research can be used to optimize monitoring methods for establishing IPM strategies against this pest.

MATERIAL AND METHODS

EXPERIMENTAL PROTOCOL

The experiment was carried out in four date palm orchard in four area Bam, Iran, in 2008. Date palms were used in a randomized complete block design. Each orchard was divided into four blocks and each block consisted of four plots. During 2008, egg, nymph and adult leafhopper spatial distribution and population dynamics were determined at two generations.

SAMPLING PROGRAM

SAMPLING UNIT

For this study, one leaflet of a date palm was selected as a sample unit. Leaflets were selected randomly and visually inspected to note the number of egg, nymphs and adults of *O. lybicus* per leaflet.

PATTERN & TIMING OF SAMPLING

Sampling of date palm leaflets were performed randomly. The sampling was conducted weekly in 2008. All counts were performed in mid-afternoon. Sampling initiated on 25th March in 2008 and continued until end November.

SAMPLE SIZE

Primary sampling was taken in the equal number of different generations on 24th March 2008. Relative variation (*RV*) has been used to compare the efficiency of various sampling methods (Hillhouse & Pitre, 1974). The *RV* of these leaflet data was calculated as follows:

$$RV = (SE / m) 100$$

Where *SE* is the standard error of the mean and *m* is the mean of primary sampling data. The reliable sampling 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 (Pedigo & Buntin, 1994).

SPATIAL DISTRIBUTION PATTERN

The spatial distribution of *O. lybicus* was determined by three methods: the variance (S^2) to mean (m) ratio, Taylor's power law and Iwao's patchiness regression models (Pedigo & Buntin, 1994). Departure from a random distribution was tested by calculating the index of dispersion, I_D , where *n* was the number of sample:

$$I_D = (\ n\text{-}1)\ s^2 / m$$

In the next stage, Z coefficient was calculated for testing the goodness of fit:

$$Z = \sqrt{2\ I_D} - \sqrt{(2v-1)}$$

Where v was the number of degree of freedom (n-1). Taylor's power law was calculated as follows:

$$S^2 = am^b \text{ or } \log S^2 = \log a + b \log m$$

Where the parameter a is a scaling factor related to sample size (Southwood & Henderson, 2000) and the slope b is an index of aggregation. Iwao's patchiness regression method was to quantify the 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 scanner as b of Taylor's power law. Student t-test can be used to determine the colonies dispersed randomly.

OPTIMAL SAMPLE SIZE

The optimal sample size using Taylor power law was determined using following equation:

$$n_{opt} = \left(\frac{t\alpha / 2}{d} \right)^2 a\mu^{b-2}$$

d is the constant and desired ratio of mean. Therefore if d = 0.2, shows that may be it is 95% probable that the mean of sampling data, is 20% above or below the real mean.

POPULATION FLACTUATION

The population fluctuation of *O. lybicus* was determined at 25th March and 11th November in 2008 and mean weekly densities of eggs, nymphs and adults leafhoppers on leaflets were obtained for each date and then the graphs were drawn.

RESULTS

SAMPLING PROGRAM

From the primary sampling, the reliable sample size of leaflets with maximum variation for a precision of 20% was 40 samples. The relative (*RV*) of the primary sampling data was 6.8% and was very appropriate for a sampling program.

SPATIAL DISTRIBUTION

The results of the variance to mean ratio (S^2/m), coefficient of dispersion (I_D) and *Z* test are presented in Table(1). The results of sampling on two generations showed that the spatial distribution of nymphs, adults and both of them were aggregated.

In Taylor's model, the regression between log S^2 and log m was significant at the first, second and both generations. In 2008, b was significantly greater than one at two generations for nymphs, adults and both them (Table 2). The calculated t (t_c) was greater than t-table (t_t) at two generations for nymphs, adults and both them which indicated an aggregated spatial distribution of *O. lybicus*.

Iwao's model showed that β was significantly greater than one and t_c was greater than t_t for nymphs, adults and both of them at two generations (Table 3) indicating an aggregated spatial distribution pattern.

OPTIMAL SAMPLE SIZE

The optimal sample size of leaflets was obtained 13.

POPULATION FLACTUATION

Population density estimated as the mean number of insects (eggs, nymphs and adults) per leaflet at two generations in 2008 shown in Fig. 1 & 2. The results indicated that the lowest population density of eggs was in 9th sampling week at two generations, late May and late September, respectively. At two generations, the highest population density of adults was recorded in 11th sampling week (early June) and 13th sampling week (late October), respectively. In both generations, nymphs were active from April to May and August to October, respectively. Adults of the first and second generations were active from May to June and September to November, respectively.

DISCUSSION

There is no reported about spatial distribution of *O. lybicus* in the literature. Spatial distribution is one of the most characteristic ecological properties of species (Taylor, 1984). The regression models of Taylor's power law and Iwao's patchiness have various results and accuracy in calculating spatial distribution of *O. lybicus*. By calculating the coefficient of dispersion (CD), Decante & Helden (2006) determined that the grape leafhopper *Empoasca vitis* (Goethe) have an aggregated spatial distribution in vineyards.

Lessio & Alma (2006) determined the spatial distribution of the nymphs of leafhopper *Scaphoideus titanus* (Ball). The nymphal distribution, analyzed via Taylor's power law, was aggregated, with b = 1.49. Thus our finding of *O. lybicus* on date palms is similar to Lessio & Alma on *S. titanus*. Both Taylor's and Iwao's models indicated aggregated distribution of nymphs and adults of *O. lybicus* at two generations in 2008 (Tables 1 & 2). This is probably due to the high population density on date palm leaflets or to some particular behavioral characteristics of the insect. However, at first generation, the data obtained for

nymphs, adults and both them fitted better to Taylor's model (r^2 = 0.980, 0.839 and 0.968, respectively) than Iwao's (r^2 = 0.935, 0.836 and 0.787, respectively). At second generation, for nymphs, adults and both of them data fitted better to Taylor's power law (r^2=0.971, 0.966 and 0.843, respectively) than Iwao's (r^2=0.910, 0.905 and 0.833, respectively). In the first generation of *O. lybicus* the eggs were hatched in April or May. The eggs of this generation aestivate over the hot summer, hatching towards the end of August. The egg hatch of the second generation was initiated in late August and the nymphs were maturied about the end of September in Iraq, Egypt, Saudi Arabia and Trinidad (Talhouk, 1977; Howard et al., 2001). Our findings on *O. lybicus* in Bam region was similar to Talhouk (1977) and Howard et al. (2001) in the countries mentioned.

CONCLUSIONS

This research demonstrated that by increasing temperature, *O. lybicus* aestivatied in the egg stage for 5 weeks. The coefficients of the spatial distribution models can be used in developing a sampling program, detecting pest levels that justify control measures and assessing crop loss at two generations of *O. lybicus*.

ACKNOWLEDGMENTS

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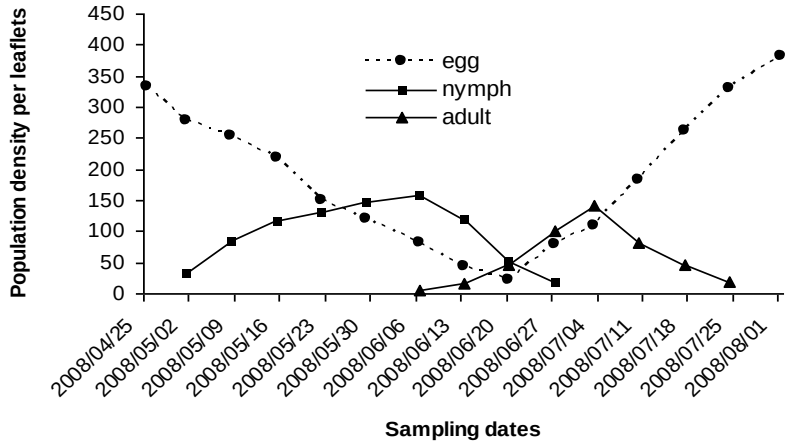

Figure 1. Population fluctuation of *O. lybicus* at first generation in 2008.

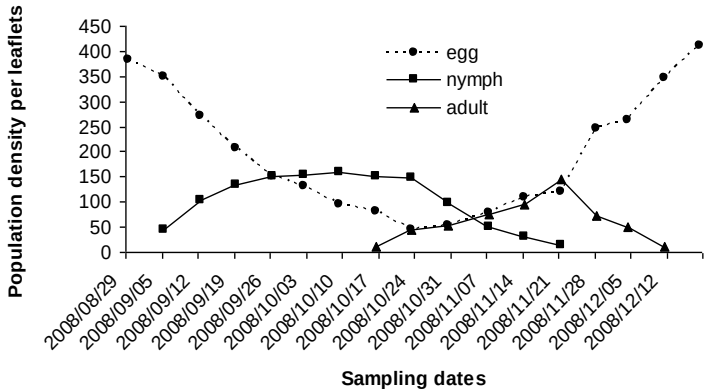

Figure 2. Population fluctuation of *O. lybicus* at second generation in 2008.

Table 1. Spatial distribution coefficients of *O. lybicus* at two generations in 2008 using the variance to mean ratio and the Z coefficient for testing the goodness - of – fit.

Generation	Developing stage	*n*	*m*	s^2	s^2/m	*Z*
First	Nymph	725	80.56	2077.80	25.79	193.24
	Adult	333	41.63	1551.05	37.26	85.47
	Nymph & Adult	1058	81.38	1788.55	21.98	106.27
Second	Nymph	1017	84.75	2426.35	28.63	125.48
	Adult	409	45.44	1542.78	33.95	89.14
	Nymph & Adult	1426	95.07	1972.49	20.75	118.57
First and Second	Nymph	1742	82.95	2118.02	25.53	151.83
	Adult	1742	43.56	1327.34	30.47	111.78
	Nymph & Adult	2484	88.71	1801.24	20.30	154.05

Z = standard normal deviate

Table 2. Spatial distribution coefficients of *O. lybicus* at two generation in 2008 using Taylor's power law regression analysis.

Generation	Developing stages	Parameters estimation					Test for slope	
		a	*b*	SE_b	r^2	*p*	t_c	t_t
First	Nymph	0.405	1.32	0.024	0.980	0.000	13.330	2.365
	Adult	0.339	1.24	0.079	0.839	0.001	3.038	2.447
	Nymph & Adult	0.424	1.29	0.194	0.968	0.000	4.639	2.201
Second	Nymph	0.403	1.24	0.019	0.971	0.000	13.261	2.228
	Adult	0.307	1.09	0.026	0.966	0.000	3.461	2.365
	Nymph & Adult	0.280	1.39	0.043	0.843	0.000	9.069	2.160
First and Second	Nymph	0.404	1.27	0.010	0.873	0.000	26.000	2.093
	Adult	0.290	1.10	0.027	0.863	0.000	3.704	2.131
	Nymph & Adult	0.351	1.33	0.019	0.873	0.000	17.368	2.056

Table3. Spatial distribution coefficients of *O. lybicus* at two generations in 2008 using Iwao's patchiness regression analysis.

Generation	Developing stages	Parameters estimation					Test for slope	
		α	β	SE_β	r^2	*p*	t_c	t_t
First	Nymph	0.714	1.710	0.024	0.935	0.000	13.330	2.365
	Adult	0.910	1.630	0.103	0.836	0.001	3.038	2.447
	Nymph & Adult	1.110	1.550	0.068	0.787	0.000	8.088	2.201
Second	Nymph	0.673	1.610	0.019	0.910	0.000	12.245	2.228
	Adult	0.843	1.060	0.010	0.905	0.000	6.000	2.365
	Nymph & Adult	0.644	1.500	0.046	0.833	0.000	10.896	2.160
First and Second	Nymph	0.753	1.650	0.025	0.918	0.000	26.000	2.093
	Adult	0.832	1.340	0.047	0.761	0.000	7.234	2.131
	Nymph & Adult	0.957	1.480	0.028	0.793	0.000	17.143	2.056

EVALUATION OF INSECTICIDE RESISTANCE AND BIOCHEMICAL MECHANISM IN TWO POPULATIONS OF *EURYGASTER INTEGRICEPS* PUTON (HETEROPTERA: SCUTELLERIDAE)

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ABSTRACT: Sunn pest (*Eurygaster integriceps* Puton) (Heteroptera: Scutelleridae), is one of the most serious insect pests of wheat and barley in Iran and in the neighboring countries. In Iran since 1950's control of Sunn pest was mainly based on chemical control especially of DDT followed by organophosphorus insecticide such as fenitrothion (since 1970's). In the current study susceptibility of the two geographic populations (Mazandaran and Tehran provinces) of the insect to fenitrothion was assessed using bioassays as well as enzymatic evaluations. Calculted LD_{50} values against adult insects of Tehran and Mazandaran populations were 0.19 and 0.08 µg insect^{-1}, respectively. Residual assays against second-instar nymphs of the Sunn pest showed that LC_{50} value for Tehran strain was 1.71 ppm while LC_{50} value for Mazandaran strain was 0.77 ppm. These data indicated that Tehran colony is less susceptible to insecticide than the Mazandaran colony. These findings were further supported by determination of esterase activity and I_{50} values of the two populations. Esterase activity of female individuals of Tehran and Mazandaran colonies to 1-NA (alpha naphthylacetate) substrate was 1.16 and 0.68 µM product/min/mg protein, respectively. The female individuals of Tehran population contained almost twice as much esterase activity as Mazandaran population. Analysis of variance showed that there were significant differences between esterase activity of male and female and between two populations ($P < 0.05$).

KEY WORDS: Sunn pest, Fenitrothion, Susceptibility, Esterase activity.

Sunn pest (*Eurygaster integriceps* Puton) (Heteroptera: Scutelleridae), is one of the most serious insect pests of wheat and barley in Iran and 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; Radjabi, 2000).

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 (Radjabi, 2000). Migration from diapausing site toward wheat field occurs at the end of the winter when the average daily temperature exceeds 10°C. Soon after settling in the field, the insects start feeding followed by oviposition. At 25°C, Embryonic and post embryonic development lasts about 10 and 30 days, respectively.

The Sunn pest feeds on various structures of the host plants e.g. leaves, stems and grains and as a consequence, the nature of the injury 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 out the liquefied cells' contents (Panizzi, 1997; Cohen, 2000; Boyd et al., 2002). Seeds are preferred feeding sites. Feeding punctures appeared as minute darkish spots on

the seeds. Sunn pest feeding on different stages of developing seeds causes quantitative 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. The most important times in the life cycle of *E. integriceps* are the period of nymphal development especially after the third instar and the intense feeding of the newly emerged adults before migration. Most of economic loss attributed to this species is caused by larval and adult injury to the wheat grain. Yield loss because of Sunn pest infestation in some area is 100% and it has been observed that because of the insect severe infestation a wide area of wheat field is not harvested. In Iran alone more than one million hectare of wheat field are sprayed against this pest. Spraying area has annually been increased for example in 1976 only 76000 hectares sprayed whereas in 2001 more than one million hectares has been sprayed (Nouri, 2002).

Since 1970's, organophosphorus insecticide fenitrothion extensively used in order to control this insect in Iran. As a consequence of the intensive use of fenitrithion, in recent years there are some complaints about the insecticide performance, especially in areas where spraying was used consistently for different consecutive 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).

Esterases are a large group of proteins that use water to hydrolyze endogenous and exogenous esters and produce alcohols and acids as products (Benning, 1994; Kim et al., 1997).

Esterase-mediated metabolic resistance is widespread and has been detected in almost all pests and against all classes of insecticides containing an ester moiety. Enhanced metabolism by esterases is a major mechanism in OP resistance, and has been detected in a number of dipterans (Hemingway, 1981; Whyard et al., 1995), homopterans (Devonshire & Sawicki, 1979; Devonshire & Moores, 1982; Devonshire, 1991), coleopterans (Conyers et al., 1998; Zhou et al., 2002), lepidopterans (Beeman & Schmidt, 1982), and hymenopterans (Baker et al., 1998).

Despite prolonged and extensive use of organophosphorous pesticides against Sunn pest, no documented reports exist on the possible development of insecticide resistance in the insect. So, the aim of the current study was to assess susceptibility of two geographic populations of the Sunn pest to fenitrithion in order to determine occurrence of resistance, if any, in their populations. This knowledge will help to new management strategies for the pest control.

MATERIAL AND METHODS

Insects

The insects were collected from Karaj and Marzan-Abad wheat farms in Tehran and Mazandaran provinces, respectively. The Tehran population was collected from areas where control measures using pesticides have been taking place for more than three decades. Mazandarn population was collected from an

area where control measure is not practiced and assuming this population is susceptible to the pesticide.

The both colonies 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.

Topical application bioassays

The efficacy of fenitrothion (EC 50%) against the two different populations of the Sunn pest adults from Tehran and Mazandaran provinces was determined using five concentrations of the insecticide. Fenitrothion were dissolved in acetone to give final concentrations of 0.40, 0.26, 0.17, 0.12, 0.08 µg insect $^{-1}$ for Tehran population while for Mazandaran population working solutions were 0.20, 0.11, 0.06, 0.03, and 0.02 µg insect $^{-1}$. Controls were treated with acetone alone. Bioassays were carried out by topical application of one microliter of insecticide solution to the thoracic notum of adults. Each concentration was replicated four times using 10 adult insects per replicate. All tests were run at 25 ± 2 °C and 14:10 h photoperiod. Mortality was measured at 24 h after treatment and mortality data were corrected using abbot formula (Abbot 1925).

Residual bioassays

Residual assays were done against second-instar nymphs (the same size and age) of the two different of the above mentioned populations. Fenitrothion was dissolved in acetone to give desired concentration. For Tehran population, working solutions of 4.0, 2.0, 1.0, 0.50 and 0.25 ppm were prepared and for Mazandaran population insecticide concentrations of 3.60, 1.3, 0.57, 0.24, and 0.18 were prepared.

Petri dishes (9 cm diameter) lined with Whatman No. 1 filter paper and 800 µl of each concentration were applied to the filter paper followed by air drying for one hour at room temperature. Controls were treated with acetone alone. Each treatment was replicated five times using 20 second-instar nymphs per replicate. All tests were run at 25 ± 2 °C and 14:10 h photoperiod. Mortality was measured at 24 h after treatment and mortality data were corrected using abbot formula (Abbot, 1925).

Enzyme preparation

Preparation of the enzyme was done according to Mendoza et al. (2000) and Barbier et al. (2000) with slight modification. Briefly, the insects (adults) were randomly selected and immobilized by placing them in ice, after which their antenna, legs, wings, and mouthparts were cut and removed. The rest of the insects' bodies were homogenized in ice-cold 0.02 M sodium phosphate buffer (pH 7.0). The crude homogenates were transferred to centrifuge tubes and centrifuged at 10,000 g for 15 min at 4 °C. The supernatant (crude extract) were pooled, stored at -20 °C and used as the enzyme source for subsequent assays.

Enzyme assay

Adults' esterases were determined from both populations according to Van-Asperen colorimetric method (Van-Asperen, 1962), Hemingway and Georgiou (1984) and Mendoza et al. (2000) with some modifications. Esterase activity was measured using alpha- and beta naphthylacetate (Merk, Germany) (1-NA and 2-NA) (4 mg ml^{-1} in acetone). The assay mixture was composed of 20 µl enzyme (containing 5 mg ml^{-1} protein), 260 µl phosphate buffer (0.02M and pH 7.0), 20 µl substrate either 1-NA or 2-NA. The reaction was started by the addition of enzyme and incubation was done in water-bath at 30 °C for 30 min. After that, 65 µl of Fast blue solution (Merk, Germany) (10 mg Fast blue B in 1 ml distilled water plus 5 ml of 5% sodium dodecyl sulfate) was added and left for 10 min to stabilize the color. Then 335 µl phosphate buffer was added to get a final volume of 700 µl

and the absorbance determined at 600 nm by spectrophotometer. Controls were run in parallel, which contained 20 µl of distilled water to replace the 20 µl of the enzyme. All assays were done in duplicates and repeated at least three times. The quantity of naphthol produced from esterase reactions was calculated from standard curves of alpha- and beta-naphthol. Results were expressed as µM product/min/mg protein.

Calculation of I_{50}

To calculate I_{50}s (concentration of the insecticide required to inhibit 50% of the esterase activity) various concentrations of the inhibitor (insecticide) in phosphate buffer were added to the reaction mixture. For Tehran population seven concentrations of 0.0, 38.0, 200.00, 500.0, 950.0, 1400.0, and 1850.0 ppm were used while for Mazandaran population seven concentrations of 0.0, 10.0, 25.0, 40.0, 55.0, 70.0, 85.0, and 125.0 ppm were used. Briefly, each insecticide concentration was pre-incubated with the enzyme at 30 ^{o}C for 30min, followed by addition of the substrate (1-NA) and the assays were proceeded as described in the previous section.

Protein determination

Bradford method (Bradford, 1976) was used to assess protein concentration with bovine serum albumin as standard.

Data analysis

The dose-mortality data from each colony were subjected to probit analysis, using Polo program (Finney, 1971). Lethal dose 50 % (LD_{50}) values obtained in probit were expressed as microgram of fenitrothion per insect. Obtained lethal concentration 50 % (LC_{50}) values were expressed as part per million (ppm). Analysis of variance (ANOVA) was used to compare LD_{50}s, LC_{50}s, and esterase activity within and among populations.

RESULTS

Topical bioassays

Topical assays against both populations of adult insects of *E. integriceps* showed that Mazandaran province insects are more susceptible to the toxic activity of fenitrithion. LD_{50} values were 0.19 and 0.08 µg insect^{-1} against Tehran and Mazandaran populations, respectively (Table 1) (Figure 1). So, based on these LD_{50} values it is evident that Tehran strain is more resistant to insecticide than the other strain. The resistance ratio (R/S) (RR) for resistant population was 2.4 which is relatively low value. Although the resistance ratio is low, there are significant differences between LD_{50} values of the two populations ($F = 80.55$; $P < 0.01$). Also, 95 % confidence limit of two LD_{50} values fails to overlap (Table 1).

Residual bioassays

Residual assays against second-instar nymphs of both populations of the Sunn pest showed that Tehran population has higher LC_{50} value than Mazandaran population (Table 1). LC_{50} value for Tehran strain was 1.71 ppm while LC_{50} value for Mazandaran strain was 0.77 ppm (Figure 2). Analysis of variance showed that there were significant differences between LC_{50} values of the two populations ($F = 7.46$; $P < 0.01$). Calculated resistance ratio (RR) for resistant population was 2.22. Based on LC_{50} values and calculated RR it could be concluded that Mazendaran strain of *E. integriceps* is more susceptible to the insecticide than Tehran strain.

Enzyme activity

Alterations in the esterase activity of the two populations of the Sunn pest were observed. Also, activity of the enzyme between males and females of one population was not the same. The measured activity of esterases from two

populations to 1-NA and 2-NA was summarized in table 2. As can be seen from the table, esterase activity of female individuals of Tehran population to 1-NA and 2-NA was 1.16 and 0.47 µM product/min/mg protein, respectively. Esterase activity of female individuals of Mazendaran population to 1-NA and 2-NA was 0.68 and 0.23 µM product/min/mg protein, respectively. More or less the same values of esterase activity were seen between male individuals of the two populations e.g. esterase activity of males from Mazandaran population against 1-NA and 2-NA was 0.31 and 0.1 µM product/min/mg protein, respectively, whereas esterase activity of males from Tehran population against 1-NA and 2-NA was 0.42 and 0.21 µM product/min/mg protein, respectively. Analysis of variance showed that there were significant differences between esterase activity of male and female and between two populations esterase activity ($P < 0.05$). Also, there were significant differences in esterase activity against two substrates ($P < 0.05$).

I_{50} estimation

The effect of various concentrations of fenitrothion on esterase activity of the two populations was shown in figures 3 and 4. The efficiency of the inhibitor (insecticide) on the two populations was compared based on their I_{50}s. Measured I_{50} for Tehran population was 311.89 µM, whereas calculated I_{50} for Mazandaran population was 40.02 µM. Analysis of variance showed that there were significant differences between I_{50} values of two colonies ($F = 24898.84$, $P < 0.001$) (Fig. 5). Based on these data it should be said that esterase of Mazandaran population was more sensitive to the inhibitory action of fenitrothion than that of Tehran population.

DISCUSSION

In Iran since 1950's and even before control of Sunn pest, *E. integriceps* was mainly based on chemical control especially of DDT followed by organophosphorus insecticide such as fenitrothion (since 1970's) (Javad-Zadeh, 1991). The continuous use of insecticides in some area decreased the susceptibility of Sunn pest population to insecticides. In the current study susceptibility of the two different geographic populations of the insect to the insecticide was assessed using bioassays against both mature and immature stages as well as enzymatic evaluations.

The presented data showed that susceptibility of the sunn pest has changed in the area where insecticides have been used extensively for a long period. LD_{50} values of the Tehran population was 0.19 µg insect $^{-1}$ while that of Mazandaran population was 0.08 µg insect $^{-1}$.These data indicated that Tehran colony is less susceptible to insecticide than the other colony. These findings were further supported by determination of LC_{50} values of pesticide against immature insects. Temizer (1976) reported that LD_{50} value of DDT against Sunn pest has been increased from 0.13 to 0.55 µg insect $^{-1}$ over two year application. Resistance Ratio (RR) for adults and nymphs determined to be 2.4 and 2.2, respectively, which is relatively low. Nevertheless, low resistance ratio might be attributed to restricted generation of insect (one) per year as a result insects are not exposed to the insecticide more than once a year. In some insects RR of more than 2500 have been reported (Baker, 1995). Resistance to deltametrin in Brazilian (RR equal to 7) and Argentinian (RR equal to 2 to 7.9) heteropteran species (*Triatoma infestans*) has been reported (Gonzalez-Audino et al., 2004).

Both Esterase assays and I_{50} estimations confirmed the *in vivo* assays (insecticidal assays) that Tehran colony was less susceptible to the action of fenitrothion insecticide. Fenitrothion is organophosphorus insecticide which is

susceptible to hydrolysis and sequestration by esterases. The enzymes that hydrolyze simple ester substrates such as naphthylacetate are termed non-specific esterases or general esterases. The esterase abundance protects the resistant insects by binding and sequestering insecticides rather than by rapid hydrolysis (Haubruge et al., 2002). Esterases are divided into three groups depending on their inhibition by organophosphate: arylesterase (A type), carboxylesterase (B type) and acetyl esterase (C type) (Barbier et al., 2000). Elevated esterase activity has been implicated in resistance to insecticides of a variety of insects (Devonshire & Sawicki, 1979; Hemingway, 1981; Devonshire & Moores, 1982; Mouches et al., 1986; Argentine et al., 1989; Devonshire, 1989; Whyard et al., 1995; Baker et al., 1998; Haubruge et al., 2002; Wang et al., 2004). In the current study it was found that esterase activity of female individuals of Tehran and Mazandaran colonies to 1-NA substrate was 1.16 and 0.68 μM product/min/mg protein, respectively. So, the female individuals of Tehran population contained almost twice as much esterase activity as Mazandaran population. For example in various *Tribolium* strains, the naphthyl esterase activity was much more active in susceptible strain than in malathion resistant strain (Wool et al., 1982; Haubruge et al., 2002).

Our results showed that female individuals have more esterase activity than males. For example in Tehran population esterase activity of females determined to be about 2-fold more than males (Table 2.). While the reason/s for differences is not known, it could be possible attributed to the high content of fat body in the female than male individuals. Our unpublished data indicated that females are heavier than males e.g. well feed females usually weigh more than 100 mg while males in the same population weigh less than 100 mg. The other reasons that could be said are the searching of females for oviposition sites. It has been shown that selection by toxic substances can increases the amount of enzymes that are responsible for detoxification (Ferrari & Georghiou 1990; Scharf et al., 1998; Mendoza et al., 2000). The females may have been under continual selection pressure when seeking plant fluids, resting sites or oviposition sites that are associated with insecticide-treated area. Thus, these types of selection pressure may have played a significant role in the higher esterase activity observed in the females. It has been reported that gene amplification is involved in the increase of enzyme quantity. Also, gene amplification reported to be the mechanism causing protein overproduction when an organism is under environmental stress (Mouches et al., 1990).

Based on the values of I_{50}s, Tehran colony of Sunn pest was less sensitive to the inhibitory action of fenitrothion than that of Mazandaran population. The differences are due to the different geographic population used that Tehran population has been more under selection pressure than that of Mazandaran.

The presented data suggest that the higher sensitivity of Mazandaran population to insecticide than Tehran population implies that underlying mechanism of tolerance in insecticide bioassays is largely due to metabolic activities which either detoxify or limit the intoxicating ability of fenitrothion. So, the present study has provided some basic information on the esterases 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. The toxicity of fenitrothion to E. *integriceps* adults and second instar nymphs of two different geographic populations (Tehran and Mazandaran provinces) of Iran.

Insect	Population	LD_{50} (µg/insect) for adults and LC_{50} (PPM) for nymphs and their 95% confidence limit[1].	Slope ± SE	X^2	dF
Adult	Tehran	0.190 (0.169-0.222)	3.313±0.218	1.140	3
	Mazandaran	0.083 (0.070-0.103)	2.480±0.123	0.577	3
Nymph	Tehran	1.710 (1.339-2.385)	1.832±0.091	2.568	3
	Mazandaran	0.766 (0.600-0.995)	2.310±0.555	3.317	3

1. LD_{50} or LC_{50} is considered significantly different when the 95% confidence limit fails to overlap.

Table 2. Esterase activity of two different geographic populations (Tehran and Mazandaran provinces) of *E. integriceps* to 1-NA (alpha-naphthyl acetate) and 2-NA (beta naphthyl acetate).

Population	Substrate	Sex	Esterase activity (µM product/min/mg protein)
Tehran	1-NA	Male	0.47 ±
		Female	1.16 ±
	2-NA	Male	0.21 ±
		Female	0.42 ±
Mazandaran	1-NA	Male	0.31 ±
		Female	0.68 ±
	2-NA	Male	0.1 ±
		Female	0.23 ±

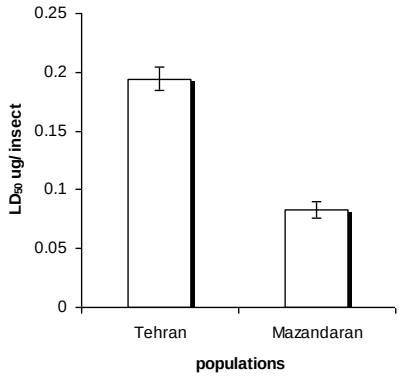

Figure 1. Comparison of toxicity (LD_{50} values) of the fenitrothion against adults of Tehran and Mazandaran populations of the Sunn pest.

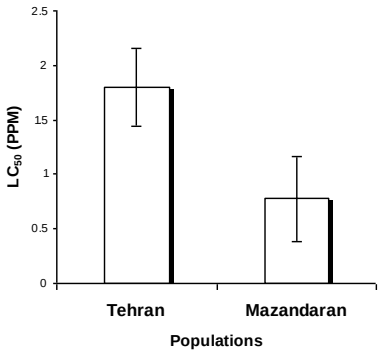

Figure 2. Comparison of toxicity (LC_{50} values) of the fenitrothion against second instar nymphs of Tehran and Mazandaran populations of the Sunn pest.

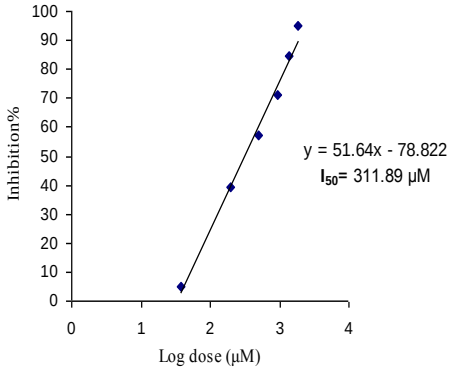

Figure 3. Inhibitory effect (I_{50}) of fenitrothion on adult esterase activity of Tehran population.

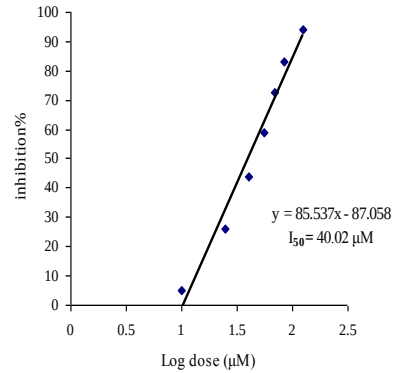

Figure 4. Inhibitory effect (I_{50}) of fenitrothion on adult esterase activity of Mazandaran population.

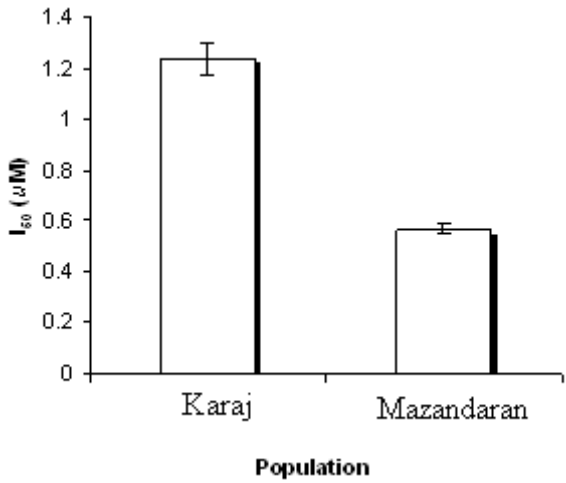

Figure 5. Comparison of toxicity (I_{50} values) of the fenitrothion to esterase activity of the adults of Tehran and Mazandaran populations of the Sunn pest.

NEW NAMES FOR SOME PREOCCUPIED SPECIFIC EPITHETS IN THE SUPERFAMILY DIAPRIOIDEA (HYMENOPTERA)

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[Özdikmen, H. 2010. New names for some preoccupied specific epithets in the superfamily Diaprioidea (Hymenoptera). Munis Entomology & Zoology, 5 (2): 745-752**]**

ABSTRACT. According to the International Code of Zoological Nomenclature (ICZN, 1999), *Aclista insularis* (Kieffer, 1912); *Aclista striolata* (Kieffer, 1909); *Pantoclis californicus* (Kieffer, 1906); *Pantoclis longipennis* (Risbec, 1950) and *Pantoclis sulcatus* Sharma, 1980 in the subfamily Belytinae and *Basalys bispinosus* Rajmohana & Narendran, 2006; *Spilomicrus brevicornis* (Kieffer, 1910); *Spilomicrus kiefferi* (Ogloblin, 1966); *Spilomicrus maculipennis* Kieffer, 1907; *Spilomicrus sulcaticeps* (Dodd, 1915); *Spilomicrus superbus* Masner, 1991; *Trichopria affinis* Dodd, 1915; *Trichopria atturiensis* Rajmohana & Narendran, 2006; *Trichopria montana* Sharma, 1979 and *Trichopria spinosa* Rajmohana & Narendran, 2006 in the subfamily Diapriinae are not correct because the specific epithets are illegitimate. The author request the replacement names of their specific epithets and he suggest *nihalia* nom. nov., *nottoni* nom. nov., *kiefferji* nom. nov., *risbeci* nom. nov., *sharmaski* nom. nov., *rajmohanai* nom. nov., *beyarslani* nom. nov., *ogloblini* nom. nov., *haticei* nom. nov., *doddi* nom. nov., *lubomiri* nom. nov., *novaffinis* nom. nov., *narendrani* nom. nov., *novomontana* nom. nov. and *neospinosa* nom. nov..

KEY WORDS. Nomenclatural change, homonymy, replacement name, Hymenoptera, Diaprioidea, Diapriidae, Diapriinae, Belytinae.

Family DIAPRIIDAE
Subfamily BELYTINAE
Genus *ACLISTA* Förster, 1856
ACLISTA NIHALIA nom. nov.

Aclista insularis (Kieffer, 1912). Trans. Linn. Soc. London, Zool., 15: 76. Preoccupied by *Aclista insularis* (Ashmead, 1893). Bull. Un. St. Nat. Mus., 45: 367, 369. (Hymenoptera: Diaprioidea: Diapriidae: Belytinae).

The specific epithet *insularis* was initially introduced by Ashmead (1893) with the original combination *Pantoclis insularis* Ashmead, 1893. It is still used as a valid species name. Subsequently, Kieffer (1912) described a new species with the same specific epithet as *Xenotoma insularis* Kieffer, 1912 by original combination. *Aclista insularis* (Ashmead, 1893) has priority over *Aclista insularis* (Kieffer, 1912). The name *Aclista insularis* (Kieffer, 1912) is a secondary junior homonym of the name *Aclista insularis* (Ashmead, 1893). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *insularis* Kieffer, 1912 the replacement name *nihalia* nom. nov..

Etimology: The name is dedicated to Nihal Mercan (Turkey).

Summary of nomenclatural changes:

Species *Aclista nihalia* **nom. nov.**

pro *Aclista insularis* (Kieffer, 1912) **syn. n.** [nec *Aclista insularis* (Ashmead, 1893)]

[orig. comb.: *Xenotoma insularis* Kieffer, 1912 from Seychelles]

ACLISTA NOTTONI nom. nov.

Aclista striolata (Kieffer, 1909). Species des Hyménoptères d'Europe et d'Algérie, 10: 539. Preoccupied by *Aclista striolata* (Thomson, 1858). Öfversigt af Kongliga Ventenskaps-Akadamiens Förhandlingar, 15: 157. (Hymenoptera: Diaprioidea: Diapriidae: Belytinae).

The specific epithet *striolata* was initially introduced by Thomson (1858) with the original combination *Acoretus striolatus* Thomson, 1858. It is still used as a valid species name. Subsequently, Kieffer (1909) described a new species with the same specific epithet as *Anectata* (*Anectata*) *striolata* Kieffer, 1909 by original combination. *Aclista striolata* (Thomson, 1858) has priority over *Aclista striolata* (Kieffer, 1909). The name *Aclista striolata* (Kieffer, 1909) is a secondary junior homonym of the name *Aclista striolata* (Thomson, 1858). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *striolata* Kieffer, 1909 the replacement name *nottoni* nom. nov..

Etimology: The name is dedicated to David G. Notton (United Kingdom).

Summary of nomenclatural changes:

Species *Aclista nottoni* **nom. nov.**

pro *Aclista striolata* (Kieffer, 1909) **syn. n.** [nec *Aclista striolata* (Thomson, 1858)]

[orig. comb.: *Anectata* (*Anectata*) *striolata* Kieffer, 1909]

Genus *PANTOCLIS* Förster, 1856

PANTOCLIS KIEFFERJI nom. nov.

Pantoclis californicus (Kieffer, 1906). Berl. Ent. Zeit., 50: 279. Preoccupied by *Pantoclis californica* Ashmead, 1893. Bull. Un. St. Nat. Mus., 45: 367, 371. (Hymenoptera: Diaprioidea: Diapriidae: Belytinae).

The specific epithet *californica* was initially introduced by Ashmead (1893) with the original combination *Pantoclis californica* Ashmead, 1893. It is still used as a valid species name. Subsequently, Kieffer (1906) described a new species with the same specific epithet as *Oxylabis californica* Kieffer, 1906 by original combination. *Pantoclis californica* Ashmead, 1893 has priority over *Pantoclis californicus* (Kieffer, 1906). The name *Pantoclis californicus* (Kieffer, 1906) is a secondary junior homonym of the name *Pantoclis californica* Ashmead, 1893. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *californicus* Kieffer, 1906 the replacement name *kiefferji* nom. nov..

Etimology: The name is dedicated to J. J. Kieffer who is the author name of the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Pantoclis kiefferji* **nom. nov.**

pro *Pantoclis californicus* (Kieffer, 1906) **syn. n.** [nec *Pantoclis californica* Ashmead, 1893]

[orig. comb.: *Oxylabis californica* Kieffer, 1906]

PANTOCLIS RISBECI nom. nov.

Pantoclis longipennis (Risbec, 1950). Travaux du Laboratoire d'Entomologie du Secteur Soudanis de Recherches Agronomiques. Gouvernement Général de l'Afrique Occidentale Française, Paris. p. 520. Preoccupied by *Pantoclis longipennis* (Thomson, 1858). Öfv. Kongl. Ventens.-Akad. Förh., 15: 173. (Hymenoptera: Diaprioidea: Diapriidae: Belytinae).

The specific epithet *longipennis* was initially introduced by Thomson (1858) with the original combination *Belyta longipennis* Thomson, 1858. It is still used as a valid species name. Subsequently, Risbec (1950) described a new species with the same specific epithet as *Oxylabis longipennis* Risbec, 1950 by original combination. *Pantoclis longipennis* (Thomson, 1858) has priority over *Pantoclis longipennis* (Risbec, 1950). The name *Pantoclis longipennis* (Risbec, 1950) is a

secondary junior homonym of the name *Pantoclis longipennis* (Thomson, 1858). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *longipennis* Kieffer, 1906 the replacement name *risbeci* nom. nov..

Etimology: The name is dedicated to J. Risbec who is the author name of the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Pantoclis risbeci* **nom. nov.**

pro *Pantoclis longipennis* (Risbec, 1950) **syn. n.** [nec *Pantoclis longipennis* (Thomson, 1858)]

[orig. comb.: *Oxylabis longipennis* Risbec, 1950]

PANTOCLIS SHARMASKI nom. nov.

Pantoclis sulcatus Sharma, 1980. Or. Ins., 14: 56. Preoccupied by *Pantoclis sulcata* (Thomson, 1858). Öfv. Kongl. Ventens.-Akad. Förh., 15: 173. (Hymenoptera: Diaprioidea: Diapriidae: Belytinae).

The specific epithet *sulcata* was initially introduced by Thomson (1858) with the original combination *Belyta sulcata* Thomson, 1858. It is still used as a valid species name. Subsequently, Sharma (1980) described a new species with the same specific epithet as *Pantoclis sulcatus* Sharma, 1980 by original combination. *Pantoclis sulcata* (Thomson, 1858) has priority over *Pantoclis sulcatus* Sharma, 1980. The name *Pantoclis sulcatus* Sharma, 1980 is a secondary junior homonym of the name *Pantoclis sulcata* (Thomson, 1858). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *sulcatus* Sharma, 1980 the replacement name *sharmaski* nom. nov..

Etimology: The name is dedicated to S. K. Sharma who is the author name of the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Pantoclis sharmaski* **nom. nov.**

pro *Pantoclis sulcatus* Sharma, 1980 **syn. n.** [nec *Pantoclis sulcata* (Thomson, 1858)]

[orig. comb.: *Pantoclis sulcatus* Sharma, 1980]

Subfamily DIAPRIINAE
Genus *BASALYS* Westwood, 1833
BASALYS RAJMOHANAI nom. nov.

Basalys bispinosus Rajmohana & Narendran, 2006. Mem. Zool. Surv. India, 21(1): 29, 30. Preoccupied by *Basalys bispinosa* (Tomsik, 1949). Ent. Listy, 12: 23, 24. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *bispinosa* was initially introduced by Tomsik (1949) with the original combination *Acidopria bispinosa* Tomsík, 1949. It is still used as a valid species name. Subsequently, Kieffer (1912) described a new species with the same specific epithet as *Basalys bispinosus* Rajmohana & Narendran, 2006 by original combination. *Basalys bispinosa* (Tomsik, 1949) has priority over *Basalys bispinosus* Rajmohana & Narendran, 2006. The name *Basalys bispinosus* Rajmohana & Narendran, 2006 is a secondary junior homonym of the name *Basalys bispinosa* (Tomsik, 1949). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *bispinosus* Rajmohana & Narendran, 2006 the replacement name *rajmohanai* nom. nov..

Etimology: The name is dedicated to K. Rajmahana who is the first author name of the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Basalys rajmohanai* **nom. nov.**
pro *Basalys bispinosus* Rajmohana & Narendran, 2006 **syn. n.** [nec *Basalys bispinosa* (Tomsik, 1949)]
[orig. comb.: *Basalys bispinosus* Rajmohana & Narendran, 2006]

Genus *SPILOMICRUS* Westwood, 1832

SPILOMICRUS BEYARSLANI nom. nov.

Spilomicrus brevicornis (Kieffer, 1910). Ent. Rund., 27: 40, 47. Preoccupied by *Spilomicrus brevicornis* (Ashmead, 1893). Bull. Un. St. Nat. Mus., 45: 443, 446. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *brevicornis* was initially introduced by Ashmead (1893) with the original combination *Basalys brevicornis* Ashmead, 1893. It is still used as a valid species name. Subsequently, Kieffer (1910) described a new species with the same specific epithet as *Hoplopria brevicornis* Kieffer, 1910 by original combination. *Spilomicrus brevicornis* (Ashmead, 1893) has priority over *Spilomicrus brevicornis* (Kieffer, 1910). The name *Spilomicrus brevicornis* (Kieffer, 1910) is a secondary junior homonym of the name *Spilomicrus brevicornis* (Ashmead, 1893). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *brevicornis* Kieffer, 1910 the replacement name *beyarslani* nom. nov..
Etimology: The name is dedicated to Prof. Dr. Ahmet Beyarslan (Turkey).
Summary of nomenclatural changes:
Species *Spilomicrus beyarslani* **nom. nov.**
pro *Spilomicrus brevicornis* (Kieffer, 1910) **syn. n.** [nec *Spilomicrus brevicornis* (Ashmead, 1893)]
[orig. comb.: *Hoplopria brevicornis* Kieffer, 1910]

SPILOMICRUS OGLOBLINI nom. nov.

Spilomicrus kiefferi (Ogloblin, 1966). Rev. Soc. Ent. Argentina, 28: 71, 77. Preoccupied by *Spilomicrus kiefferi* (Crawford, 1910). Proc. U. S. Nat. Mus., 38: 124. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *kiefferi* was initially introduced by Crawford (1910) with the original combination *Cologlyptus kiefferi* Crawford, 1910. It is still used as a valid species name. Subsequently, Ogloblin (1966) described a new species with the same specific epithet as *Hoplopria kiefferi* Ogloblin, 1966 by original combination. *Spilomicrus kiefferi* (Crawford, 1910) has priority over *Spilomicrus kiefferi* (Ogloblin, 1966). The name *Spilomicrus kiefferi* (Ogloblin, 1966) is a secondary junior homonym of the name *Spilomicrus kiefferi* (Crawford, 1910). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *kiefferi* Ogloblin, 1966 the replacement name *ogloblini* nom. nov..
Etimology: The name is dedicated to A. A. Ogloblin who is the author name of the preexisting specific epithet.
Summary of nomenclatural changes:
Species *Spilomicrus ogloblini* **nom. nov.**
pro *Spilomicrus kiefferi* (Ogloblin, 1966) **syn. n.** [nec *Spilomicrus kiefferi* (Crawford, 1910)]
[orig. comb.: *Hoplopria kiefferi* Ogloblin, 1966]

SPILOMICRUS HATICEI nom. nov.

Spilomicrus maculipennis Kieffer, 1907. Berl. Ent. Zeit., 51: 260. Preoccupied by *Spilomicrus maculipennis* (Cameron, 1888). Biol. Cent. Amer., p. 438. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *maculipennis* was initially introduced by Cameron (1888) with the original combination *Paramesius maculipennis* Cameron, 1888. It is still used as a valid species name. Subsequently, Kieffer (1907) described a new species with the same specific epithet as *Spilomicrus maculipennis* Kieffer, 1907 by original combination. *Spilomicrus maculipennis* (Cameron, 1888) has priority over *Spilomicrus maculipennis* Kieffer, 1907. The name *Spilomicrus maculipennis* Kieffer, 1907 is a secondary junior homonym of the name *Spilomicrus maculipennis* (Cameron, 1888). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *maculipennis* Kieffer, 1907 the replacement name *haticei* nom. nov..

Etimology: The name is dedicated to Hatice Tunç (Turkey).

Summary of nomenclatural changes:

Species *Spilomicrus haticei* **nom. nov.**

pro *Spilomicrus maculipennis* Kieffer, 1907 **syn. n.** [nec *Spilomicrus maculipennis* (Cameron, 1888)]

[orig. comb.: *Spilomicrus maculipennis* Kieffer, 1907]

SPILOMICRUS DODDI nom. nov.

Spilomicrus sulcaticeps (Dodd, 1915). Trans. Proc. Roy. Soc. S. Australia, 39: 417, 425. Preoccupied by *Spilomicrus sulcaticeps* Kieffer, 1914. Insecta, 4: 192. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *sulcaticeps* was initially introduced by Kieffer (1914) with the original combination *Spilomicrus sulcaticeps* Kieffer, 1914. It is still used as a valid species name. Subsequently, Dodd (1915) described a new species with the same specific epithet as *Hoplopriella sulcaticeps* Dodd, 1915 by original combination. *Spilomicrus sulcaticeps* Kieffer, 1914 has priority over *Spilomicrus sulcaticeps* (Dodd, 1915). The name *Spilomicrus sulcaticeps* (Dodd, 1915) is a secondary junior homonym of the name *Spilomicrus sulcaticeps* Kieffer, 1914. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *sulcaticeps* Dodd, 1915 the replacement name *doddi* nom. nov..

Etimology: The name is dedicated to A. P. Dodd who is the author name of the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Spilomicrus doddi* **nom. nov.**

pro *Spilomicrus sulcaticeps* (Dodd, 1915) **syn. n.** [nec *Spilomicrus sulcaticeps* Kieffer, 1914]

[orig. comb.: *Hoplopriella sulcaticeps* Dodd, 1915]

SPILOMICRUS LUBOMIRI nom. nov.

Spilomicrus superbus Masner, 1991. The Can. Ent., 123: 117, 151. Preoccupied by *Spilomicrus superba* (Ogloblin, 1966). Rev. Soc. Ent. Argentina, 28: 77, 78. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *superba* was initially introduced by Ogloblin (1966) with the original combination *Hoplopria superba* Ogloblin, 1966. It is still used as a valid species name. Subsequently, Masner (1991) described a new species with the same specific epithet as *Spilomicrus superbus* Masner, 1991 by original combination. *Spilomicrus superba* (Ogloblin, 1966) has priority over *Spilomicrus superbus* Masner, 1991. The name *Spilomicrus superbus* Masner, 1991 is a secondary junior homonym of the name *Spilomicrus superba* (Ogloblin, 1966). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *superbus* Masner, 1991 the replacement name *lubomiri* nom. nov..

Etimology: The name is dedicated to Lubomir Masner who is the author name of the preexisting specific epithet.
Summary of nomenclatural changes:
Species *Spilomicrus lubomiri* **nom. nov.**
pro *Spilomicrus superbus* Masner, 1991 **syn. n.** [nec *Spilomicrus superba* (Ogloblin, 1966)]
[orig. comb.: *Spilomicrus superbus* Masner, 1991]

Genus *TRICHOPRIA* Ashmead, 1893

TRICHOPRIA NOVAFFINIS nom. nov.

Trichopria affinis Dodd, 1915. Trans. Proc. Roy. Soc. S. Australia, 39: 435, 437. Preoccupied by *Trichopria affinis* (Ashmead, 1893). Bull. U. S. Nat. Mus., 45: 437, 440. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *affinis* was initially introduced by Ashmead (1893) with the original combination *Phaenopria affinis* Ashmead, 1893. It is still used as a valid species name. Subsequently, Dodd (1915) described a new species with the same specific epithet as *Trichopria affinis* Dodd, 1915 by original combination. *Trichopria affinis* (Ashmead, 1893) has priority over *Trichopria affinis* Dodd, 1915. The name *Trichopria affinis* Dodd, 1915 is a secondary junior homonym of the name *Trichopria affinis* (Ashmead, 1893). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *affinis* Dodd, 1915 the replacement name *novaffinis* nom. nov..
Etimology: The name derived from the preexisting specific epithet.
Summary of nomenclatural changes:
Species *Trichopria novaffinis* **nom. nov.**
pro *Trichopria affinis* Dodd, 1915 **syn. n.** [nec *Trichopria affinis* (Ashmead, 1893)]
[orig. comb.: *Trichopria affinis* Dodd, 1915]

TRICHOPRIA NARENDRANI nom. nov.

Trichopria atturiensis Rajmohana & Narendran, 2006. Mem. Zool. Surv. India, 21 (1): 76. Preoccupied by *Trichopria atturensis* Sharma, 1980. Or. Ins., 14: 59. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *atturensis* was initially introduced by Sharma (1980) with the original combination *Trichopria atturensis* Sharma, 1980. It is still used as a valid species name. Subsequently, Rajmohana & Narendran in Rajmohana (2006) described a new species with the same specific epithet as *Trichopria atturiensis* Rajmohana & Narendran, 2006 by original combination. *Trichopria atturensis* Sharma, 1980 has priority over *Trichopria atturiensis* Rajmohana & Narendran, 2006. The name *Trichopria atturiensis* Rajmohana & Narendran, 2006 is a primary junior homonym of the name *Trichopria atturensis* Sharma, 1980. According to Article 58.15 and 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *atturiensis* Rajmohana & Narendran, 2006 the replacement name *narendrani* nom. nov..
Etimology: The name is dedicated to T. C. Narendran who is the second author name of the preexisting specific epithet.
Summary of nomenclatural changes:
Species *Trichopria narendrani* **nom. nov.**
pro *Trichopria atturiensis* Rajmohana & Narendran, 2006 **syn. n.** [nec *Trichopria affinis* (Ashmead, 1893)]
[orig. comb.: *Trichopria atturiensis* Rajmohana & Narendran, 2006]

TRICHOPRIA NOVOMONTANA nom. nov.

Trichopria montanus Sharma, 1979. Mem. Sch. Ent. St. John. Coll., 7: 63, 73. Preoccupied by *Trichopria montana* (Ashmead, 1893). Bull. U. S. Nat. Mus., 45: 438, 440. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *montana* was initially introduced by Ashmead (1893) with the original combination *Phaenopria montana* Ashmead, 1893: 438. It is still used as a valid species name. Subsequently, Sharma (1979) described a new species with the same specific epithet as *Trichopria montanus* Sharma, 1979 by original combination. *Trichopria montana* (Ashmead, 1893) has priority over *Trichopria montanus* Sharma, 1979. The name *Trichopria montanus* Sharma, 1979 is a secondary junior homonym of the name *Trichopria montana* (Ashmead, 1893). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *montanus* Sharma, 1979 the replacement name *novomontana* nom. nov..

Etimology: The name derived from the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Trichopria novomontana* **nom. nov.**

pro *Trichopria montanus* Sharma, 1979 **syn. n.** [nec *Trichopria affinis* (Ashmead, 1893)]

[orig. comb.: *Trichopria montanus* Sharma, 1979]

TRICHOPRIA NEOSPINOSA nom. nov.

Trichopria spinosa Rajmohana & Narendran, 2006. Mem. Zool. Surv. India, 21 (1): 77, 94. Preoccupied by *Trichopria spinosa* Kieffer, 1911. Species des Hyménoptères d'Europe et d'Algérie, 10: 991. (Hymenoptera: Diaprioidea: Diapriidae: Diapriinae).

The specific epithet *spinosa* was initially introduced by Kieffer (1911) with the original combination *Trichopria spinosa* Kieffer, 1911. It is still used as a valid species name. Subsequently, Rajmohana & Narendran in Rajmohana (2006) described a new species with the same specific epithet as *Trichopria spinosa* Rajmohana & Narendran, 2006 by original combination. *Trichopria spinosa* Kieffer, 1911 has priority over *Trichopria spinosa* Rajmohana & Narendran, 2006. The name *Trichopria spinosa* Rajmohana & Narendran, 2006 is a primary junior homonym of the name *Trichopria spinosa* Kieffer, 1911. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *spinosa* Rajmohana & Narendran, 2006 the replacement name *neospinosa* nom. nov..

Etimology: The name derived from the preexisting specific epithet.

Summary of nomenclatural changes:

Species *Trichopria neospinosa* **nom. nov.**

pro *Trichopria spinosa* Rajmohana & Narendran, 2006 **syn. n.** [nec *Trichopria spinosa* Kieffer, 1911]

[orig. comb.: *Trichopria spinosa* Rajmohana & Narendran, 2006]

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A CONTRIBUTION TO THE FAUNA OF WEEVILS (COLEOPTERA: CURCULIONIDAE) ASSOCIATED WITH SUGAR BEET FIELDS IN NORTH–EAST OF IRAN

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[Sadeghi, H., Eshraghi, S. & Behne, L. 2010. A contribution to the fauna of weevils (Coleoptera: Curculionidae) associated with sugar beet fields in North–East of Iran. Munis Entomology & Zoology, 5 (2): 753-757**]**

ABSTRACT: In a faunistic survey on curculionidae inhabiting sugar beet fields in the main sugar beet growing areas of Iran, the province of Razavi Khorasan, 17 curculionid species belonging to 3 subfamilies and 4 tribes were identified. 14 of which are first records for the study area, including 10 new for Iran. This brings the total number of weevils fauna of sugar beet recorded from Iran to 49 species. Clearly, more species are to be expected after more intensively collecting.

KEY WORDS: Faunistic records, Beet crop, Snout beetle, Razavi Khorasan, Iran.

Sugar beet (*Beta vulgaris* L.) is one of the most important sucrose-producing crops in temperate regions. Over 35% of the world's sugar is produced by sugar beet in around 8 million hectares of land. In Iran, nearly 70 % of the sugar consumed derived from sugar beet that is cultivated on about 160,000 ha in 21of the 30 provinces of Iran. The province of Razavi Khorasan, with it's about 55,000 ha ranks the first in sugar beet acreage and production in Iran.

Among the families of curculionoidea which compromise about 15.5 % of a total of 400,000 described beetle species, the family curculionidae with about 51,000 described species, i.e.80 % of all weevil species is one of the largest families of insects, in which the majority of its species are plant feeders, and many are serious pests on a variety of plants. Almost every part of a plant, from roots upward may be attacked. The larvae usually feed inside the tissues of the plants, and the adults drill holes in aerial plant parts (Borror et al., 1989). A few species of this family are considered as serious pests of beet crop in Iran. Literature review (e.g., Afshar, 1938; Davatchi & Kheyri, 1964; Perrin, 1970; Broumand, 1976; Kheyri, 1989; Broumand, 1998; Zarrabi et al., 2007) showed that the weevil fauna of sugar beet in Iran is not yet completely surveyed and would benefit from further detailed study. To reach this goal, regional field studies should be carried out in every part of Iran. Previous faunistic surveys on the curculionid species inhabiting sugar beet fields in different parts of Iran have resulted in a list of 39 species, of which only12 species were reported from northeastern region of Iran. To the best of our knowledge there has been no previous specific study on Curculionidae associated with sugar beet in this region.

MATERIALS AND METHODS

The study area, Razavi Khorasan province is an area of 127432 sq. kilometres located at 30º, 21'- 38º, 17' N & 55º, 28'- 61º, 20' E. It is bounded on the north by North Khorasan and the Republic of Turkmenistan, on the east by Afghanistan,

on the south by the province of South Khorasan, and on the west by provinces of Yazd and Semnan.

During the years 2008 and 2009, the first two authors collected weevils in different locations of Razavi Khorasan province. The majority of specimens collected directly by hands when walking through the sugar beet fields. Also, collections were made using pitfall traps. To do this, several plastic pitfall traps with about 8 cm in diameter and 10 cm depth, filled partly with ethanol 75% and a few drops of glycerin were used inside the fields during the growth season. Addition to these, several other collected specimens by the students have been included. Data, such as number of specimens, locations and dates were recorded. The materials were identified by the third author. Classification and nomenclature used in this paper followed the data base, www.faunaeur.org., and Alonso-Zarazaga & Lyal (1999).

The voucher specimens are held in the Department of Plant Protection, College of Agriculture, Ferdowsi University of Mashhad, Iran.

RESULTS

A total of 17 weevil species belonging to 3 subfamilies and 4 tribes were identified in this study. 14 of recorded species are new to the study area, including 10 new for Iran. The list of species is given bellow:

Subfamily Lixinae
Tribe Cleonini

***Adosomus strabus* (Gyllenhal, 1834)**
Material examined: 2 specimens, Fariman, August 2006; 1 specimen, Ghochan, July 2008; 8 specimens, Chenaran, July-August 2009; 5 specimens, Mashhad, July 2009; 1 specimen, Torbat-heydariyah, August 2007.
Previous records for Iran: This is the first report of the occurrence of this weevil species in Iran.

***Ammocleonus aschabadensis* (Faust, 1884)**
Material examined: 3 specimens, Chenaran, July 2009; 1specimen Mashhad, June 2008; 1specimen Neyshabor, May 2008.
Previous records for Iran: Fars, Kerman (Broumand, 1975; Kheyri, 1989). This is the first record of this species in the province of Razavi Khorasan.

***Asproparthenis nubeculosus* (Gyllenhal, 1834)**
Material examined: 2 specimens, Mashhad, September 2009; 1 specimen Ghochan, August 2007; 2 specimens Torbat-heydariyah, October 2008.
Previous records for Iran: This record is new for Iran.

***Conorhynchus nigrivittis* (Pallas, 1781)**
Material examined: 2 specimens, Mashhad, September 2009; 1 specimen, Fariman, November 2008.
Previous records for Iran: West Azarbaijan, Khorasan and Tehran (Kheyri 1989; Modarres Awal 1997).

***Conorhynchus faldermanni* (Fahraeus, 1842)**
Material examined: 2 specimens Chenaran, July 2009.
Previous records for Iran: This is a new record for Iran.

***Conorhynchus hololeucus* (Pallas, 1781)**
Material examined: 1 specimen, Mashhad, September 2009; 1 specimen Neyshabor (Ghadamgah), June 2008.
Previous records for Iran: This is the first record of this species from Iran.

***Coniocleonus nigrosuturatus* (Goeze, 1777)**
Material examined: 1 specimen, Chenaran, May 2009; 1 specimen Mashhad (Toos), August 2007.
Previous records for Iran: Fars, Tehran and Isfahan (Broumand 1976; Kheyri, 1989, Zarrabi et al., 2007). This species is recorded for the fist time from Razavi Khorasan Province.

***Terminasiania granosa* (Zoubkov, 1833)**
Material examined: 1 specimen, Ghochan, September 2009.
Previous records for Iran: This species is recorded for the first time from Iran.

***Temnorhinus verecundus* (Faust, 1883)**
Material examined: 2 specimens, Mashhad (Golmakan), July 2009; 1 specimen, Torbat-Jam, May 2008.
Previous records for Iran: This is a new record for Iran.

***Mecaspis darwini* Faust, 1883**
Material examined: 1 specimen, Fariman, October 2008.
Previous records for Iran: This species is recorded for the first time from Iran.

***Chromosomus fischeri* (Fahraeus, 1842)**
Material examined: 1 specimen Mashhad (Torogh), June 2009.
Previous records for Iran: Fars, Khorasan, Isfahan (Broumand, 1976; Kheyri, 1989; Zarrabi et al., 2007).

Tribe Lixini Schoenherr, 1828

***Lixus incanescens* Boheman, 1835**
Material examined: 2 specimens, Chenaran, July 2009; I specimen, Neyshabor, May 2008; 1 specimen, Mashhad, November 2008.
Previous records for Iran: West Azarbaijan, Khorasan, Tehran, Fars, Isfahan, Kerman (Kheyri & Davatchi, 1966; Kheyri, 1989; Zomorrodi, 1990; Modarres Awal, 1997).

***Lixus desertorum* Gebler, 1830**
Material examined: 1 specimen, Fariman, June 2008.
Previous records for Iran: This record is new for Iran.

***Lixus linearis* Boheman, 1836**
Material examined: 1 specimen, Mashhad, September 2009.
Previous records for Iran: This is a new record for the fauna of Iran.

Subfamily Entiminae
Tribe Sitonini

***Sitona cylindricollis* (Fahraeus, 1840)**
Material examined: 2 specimens, Chenaran, August 2009; 1 specimen Torbat-heydariyah, June 2008.
Previous records for Iran: Semnan, Tehran, Fars (Broumand, 1976; Kheyri, 1989; Modarres Awal, 1997). This is a new record for the fauna of the province.

***Sitona humeralis* Stephens, 1831**
Material examined: 1 specimen Mashhad (Toos), October 2009).

Previous records for Iran: Isfahan, Fars, Semnan, Markazi, Tehran, East Azarbaijan (Broumand, 1976; Modarres Awal, 1997).

Subfamily Molytinae
Tribe Mecysolobini

***Sternuchopsis karelini* (Boheman, 1844)**

Material examined: 1 specimen, Torbat-Jam, July 2008; 1 specimen Mashhad, November 2009.

Previous records for Iran: This is the first report of the occurrence of this species in Iran.

DISCUSSION

During this study up to 23 species associated with sugar beet fields in Razavi Khorasan, were collected. However, only the 17 known species were reported here.

A few species belonging to the following tribes and genera: Cleonini, Polydrusini and *Larinus* sp., *Lixus* sp., *Asproparthenis* sp., *Adosomus* sp. remained undetermined.

The following weevils have already been reported from sugar beet field in the study area, but not encountered in this study:

Bothynoderes carinatus Zubk., *B. punctiventris* Germ., *B. steveni* Farh., *Chromonotus confluens* Fahr., *Conorhynchus brevirostris* Gyll., *Monocleonus anxius* Gyll., *Pachycerus cordiger* Germ., *Sitona puncticollis* Steph., *Stephanophorus vagus* Bed.

The new records for Iranian fauna:

Sternuchopsis (= *Alcides*) *carelini* (Boheman, 1844)
Lixus linearis (=*cribricollis*) Boheman, 1836
Lixus desertorum Gebler, 1830
Mecaspis darwini Faust, 1883
Temnorhinus verecundus (Faust, 1883)
Terminasiania(=*Isomerus*) *granosa* (Zoubkov, 1833)
Conorhynchus hololeucus (Pallas, 1781)
Conorhynchus faldermanni (Fahraeus, 1842)
Asproparthenis (=*Bothynoderes*) *nubeculosus* (Gyllenhal, 1834)
Adosomus (=*Stephanophorus*) *strabus* (Gyllenhal, 1834)

The first records for the study area:

Coniocleonus nigrosuturatus (Goeze, 1777)
Ammocleonus aschabadensis (Faust, 1884)
Sitona cylindricollis (Fahraeus, 1840)
Sitona humeralis Stephens, 1831

According to Zarrabi et al. (2007), among the reported curculionid species from sugar beet fields in Iran, two species namely *Conorhynchus brevirostris* and *Lixus incanescens* are the most common ones in the country. However, this study did not found the first species in the study area. Instead, we found *Adosomus strabus* the most abundant and widespread in sugar beet fields of north-east of Iran. In the meantime, although the curculionids reported in this study have been collected from sugar beet fields, this does not necessarily mean that sugar beet is their host. In other word, it is likely that some species may accidentally occur in the sampled fields or their preferred host is another plant species. For example, the weevil, *Pachycerus cordiger* Germar has been reported as sugar beet weevil in

Iran (Modarres Awal, 1997; Khanjani, 2005), while the adults feed on leaves and larvae feed on main root of the weed, *Heliotropium europaeum* L. (Boraginaceae) in Australia, and it is considered as a biocontrol agent of this weed (Huber & Vayssieres, 1990). Host preferences and distribution of recorded weevils in this study needs further investigations.

CONCLUSION

This study added 14 and 10 new records of weevils to the fauna of the Razavi Khorasan province and Iran respectively. Also, it was found that the curculionid, *Stephanophorus strabus* was more abundant and wide spread than other species collected from sugar beet fields of the study area. By this study, the total number of weevils inhabiting sugar beet plantations in Iran reached to 49 species. Clearly, more species are to be expected after more intensively collecting.

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DISTRIBUTION OF ENTOMOPATHOGENIC NEMATODES OF THE FAMILIES STEINERNEMATIDAE AND HETERORHABDITIDAE IN POTATO FIELDS IN NORTH-WEST IRAN (NEMATODA: RHABDITIDA)

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[Agazadeh, M., Mohammadi, D. & Eivazian Kary, N. 2010. Distribution of entomopathogenic nematodes of the families Steinernematidae and Heterorhabditidae in potato fields in north-west Iran (Nematoda: Rhabditida). Munis Entomology & Zoology, 5 (2): 758-763**]**

ABSTRACT: During 2009 a survey on entomopathogenic nematodes was conducted in potato fields in two provinces in the north-west of Iran. Out of a total of 320 soil samples, 9 were positive for entomopathogenic nematodes (2.81%), with 7 (2.18%) containing *Heterorhabditis* and 2 (0.62%) *Steinernema* isolates. Morphological and molecular studies were undertaken to characterize these isolates. The *Heterorhabditis* isolates were identified as *Heterorhabditis bacteriophora* and one new undescribed species and two species of *Steinernema* isolates were identified as *S. feltiae* and *S. carpocapsae*. *Heterorhabditis bacteriophora* was recovered from 6 sites and *Heterorhabditis* n. sp. Nas7 from only one site like two other species of *Steinernema*.

KEYWORDS: *Heterorhabditis bacteriophora, Heterorhabditis* n. sp. Nas7. Potato fields. *Steinernema carpocapsae*, *Steinernema feltiae*.

Entomopathogenic nematodes (EPNs) of the genus *Steinernema* have been globally used as safe biocontrol agents against soil borne insect pests. These nematodes are symbiotically associated with entomopathogenic bacteria *Photorhabdus* (Boemare et al., 1993) and *Xenorhabdus* (Thomas & Poinar, 1974). The third-stage infective juvenile (IJ) is the only free-living stage that persists in the soil in search of a host. Following entry, IJs release the symbiotic bacteria into the insect hemocoel, multiply and kill the host, usually within 24-48 h (Ciche and Ensign, 2003; Poinar, 1990).

In the first survey in Iran, three species of *Steinernema* and one *Heterorhabditis* species, including *S. bicornutum*, *S. carpocapsae*, *S. feltiae* and *H. bacteriophora* have been reported from north-west regions (Eivazian Kary et al., 2009). Regarding the area wide we conducted second survey in that regions but mainly focused on potato fields with the goal of finding EPNs isolates which are probably act as a biological control agents against relevant insect pests in potato fields specially Colorado Potato Beetle.

MATERIAL AND METHODS

Sampling strategy

In total, 320 soil samples were collected randomly from potato fields during 2009. Each soil sample was a composite of 5-20 random sub-samples taken in the same location but at least 10 m away from each other and to a depth of 30 cm,

using a small shovel. Between sampling site, the shovel was thoroughly rinsed with water and air dried to prevent contamination of the next sampling unit. The soil was thoroughly mixed on a plastic sheet and half of each sample was used for extraction of EPN.

Nematodes extraction

EPN were recovered from soil samples using an insect baiting method, described by Bedding and Akhurst (1975). To maximize recovery of nematodes from the soil samples, a second baiting round was done by placing fresh *G. mellonella* into the containers with the same soil.

Taxonomic studies

For morphological studies, nematodes were examined live or heat killed in 60°C Ringer's solution. All nematodes used in this study were reared in *Galleria mellonella* larvae. For isolating mature females and males of the first and second generations, the infected larvae were dissected in Ringer's solution 3 and 5 days after infection, respectively.

Heat killed nematodes were placed in triethanolamin-formalin (TAF) fixative (Kaya and Stock, 1997) and processed to anhydrous glycerine for mounting by a slow evaporation method. Morphology and morphometric studies were made using an Olympus BX41 microscope equipped with differential interference contrast optics. Measurement of specimens was made using UTHSCSA Image Tool software (Vilcox et al., 1995). Morphological identification was made using taxonomic criteria suggested by Stock and Kaya (1996) and Hominick et al. (1997).

Molecular characterization

Total genomic extraction and ITS-rDNA amplification were done as described by Eivazian Kary et al. (2009). Amplified products were purified using a Qiagen Purification kit (Qiagen, Leusden, The Netherlands). Purified DNA was sequenced in IBMP-CNRS, France. The DNA sequences were edited with Chromas 2.01 and aligned using Clustal X 1.64 (Thompson et al., 1997) with the sequences of other *Heterorhabditis* and *Steinernema* species obtained from GenBank.

Molecular phylogenetic relationships were obtained by equally weighted maximum parsimony (MP) and maximum likelihood (ML) using PAUP* 4.0b8 (Swofford, 1998). MP was performed with a heuristic search with the following setting: one hundred replicates of random taxon addition (RTA), tree-bisection-reconnection (TBR) branch swapping, multiple trees retained, no steepest descent and accelerated transformation. All data were assumed to be unordered, all characters were treated as equally weighted, and gaps were treated as missing data. For ML analysis, the appropriate substitution model of DNA evolution that best fitted the data set was determined by the Akaike Information Criterion with Model Test 3.06 (Posada & Crandall, 1998). Bootstrap analysis with 1000 replicates was conducted as a measure of support for individual clades for MP and ML trees. For the phylogeny analysis *Caenorhabditis elegans* (Maupas, 1899) (AF331911) were treated as the outgroup taxon.

RESULTS AND DISCUSSION

From total of 320 samples, entomopathogenic nematodes were recovered from 9 samples (2.81%); 7 isolates (2.18%) were positive for the occurrence of heterorhabditids and 2 (0.62%) for steinernematids. Based on morphological and

molecular characterization two species of *Heterorhabditis* and two species of *Steinernema* were found. Six isolates of *Heterorhabditis* were identified as *Heterorhabditis bacteriophora* and one as *Heterorhabditis* n. sp. Nas7. *Steinernema* species were identified as *Steinernema carpocapsae* and *S. feltiae* (Fig. 1 and 2).

The Colorado Potato Beetle (CPB), *Leptinotarsa decemlineata* (Say) is the most economically damaging pest to potatoes in most areas of the Iran. If potato field left uncontrolled, it can completely defoliate it. The first goal of the present work was to identify species of EPNs which exist in potato fields and probably have impact on CPB population. In biological control programmes, using native biocontrol agents is often preferable to using exotic ones, since they are adapted to local conditions. Novel species and strains may have superior traits, making them suitable for direct commercial exploitation or as a source of genetic diversity for breeding improved strains (Choo et al., 1995).

From the results of these surveys, it appears that *Heterorhabditis bacteriophora* is of widespread occurrence in the potato fields of north-west of Iran. This species is widely distributed in the world (Hominick et al., 1996; Adams et al., 2006). The natural hosts of isolated EPN in potato fields are unknown but *Leptinotarsa dcemlineata* is the major insect pest in potato fields in studied regions. Because of the frequent occurrence of *H. bacteriophora* it is possible that CPB is amongst its natural hosts.

The reason for the low recovery of these three species is not known. *Steinernema carpocapsae* appears to have a global distribution. In the first survey in the region it was only appeared from one site (Eivazian Kary et al., 2009). Such a low frequency can be attributed to low ability of the species in colonizing new sites due to limitation in host range and niche conditions. *Steinernema feltiae* was detected from one site too but it was shown that this species has relatively high distribution in north-west of Iran and observed low frequency of the species in the potato fields may be result of unsuitability of human activities on it.

In the studied fields, chemical and cultural controls are two major strategies in deal with CPB. Without chemical control 100% damage will occur. Although chemical control is keystone in CPB managements but it can affect benefit organisms directly or indirectly by reducing available hosts. It seems that infevtice juveniles of heterorhabditids are more resistance to chemical poisons than steinernematids due to stability of second instar larvae sheet and this resistance may be other reason for high distribution of heterorhabditids compare than steinernematids but in order to determine the temporary or permanent existence of *S. carpocapsae* and *S. feltiae* in the potato files and impact of them as a biological control agents on CPB, extensive sampling and laboratory and fields studies are needed.

Molecular analysis of ITS-rDNA of collected isolates showed existence of probably new species from *Heterorhabditis* between them but for more confidence morphology and molecular studies are undertaken.

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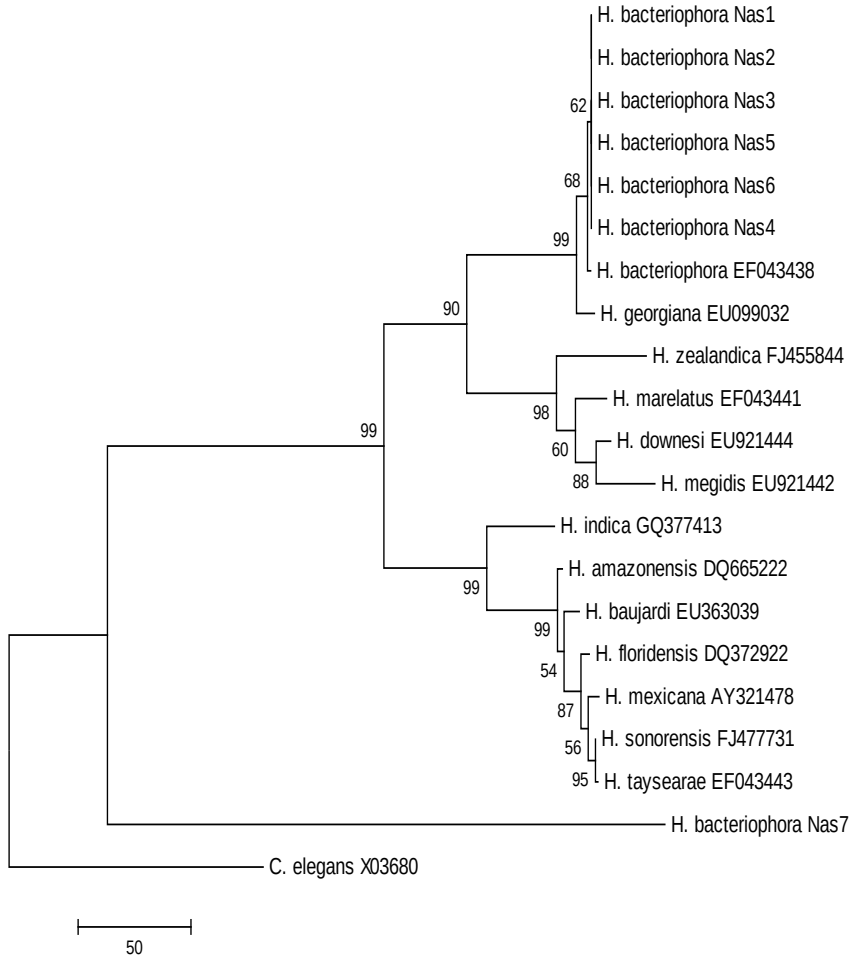

Figure 1. Phylogenetic relationship of studied isolates with other *Heterorhabditis* species based on ITS rDNA. The tree is rooted on *C. elegans*. Bootstraps for MP are shown on nodes.

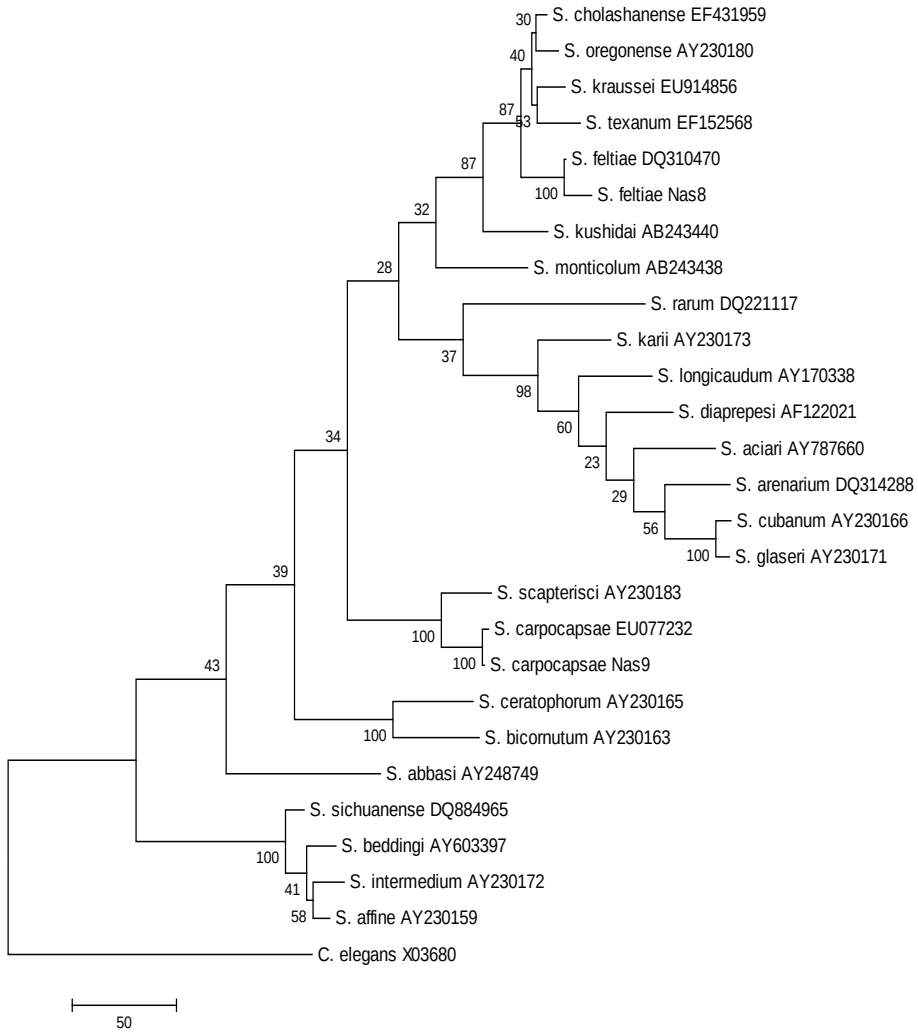

Figure 2. Phylogenetic relationship of studied isolates with other *Steinernema* species based on ITS rDNA. The tree is rooted on *C. elegans*. Bootstraps for MP are shown on nodes.

ECONOMIC INJURY LEVEL FOR COLORADO POTATO BEETLE, *LEPTINOTARSA DECEMLINEATA* (SAY), ON 'AGRIA' POTATOES IN ARDABIL, IRAN

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ABSTRACT: The Colorado potato beetle, *Leptinotarsa decemlineata* (Say), which had been a quarantine pest to Iran until 1984, has become the most injurious pest of potatoes in Ardabil plain at northwest of the country, where more than 25000 ha of irrigated land is allocated to potato production and more than 20% of the annual potato production of the country is produced. Uncontrolled populations of the first generation of the Colorado potato beetle may completely defoliate potato plant and destroy the crop. Potato growers in Ardabil region almost always apply insecticides to control the pest, yet little information on the economic benefits of these control measures are available. This study was carried out in years 2004 and 2005 in Ardabil. At each of two study years experiments were conducted in three different locations in Ardabil plain. At each location a randomized complete block experiment with four replications and five treatments were used. Treatments were densities of zero, 5, 10, 15 and 20 late (3 rd and 4 th instars) larvae per plant of the first generation that were caged on a potato plant. The purpose of this study was to determine the relationship between different densities of the first generation larvae of the Colorado potato beetle and the yield of the potato cultivar 'Agria' and to establish economic injury level for the pest. A linear relationship was observed between the insect density and the marketable yield in 2004 and 2005 at all three locations. The overall linear regression of two study years for three locations accounted for 93.39% of variation among the treatments. Economic injury levels of the pest were calculated as 5 and 6.458 late larvae per plant for 'Agria' cultivar in years 2004 and 2005 respectively. Therefore, based upon the results obtained in this research the control measure for the Colorado potato beetle is not recommended at pest densities of lower than 5 late larvae per plant , because the chemical control at lower densities is not only economically unfeasible but also by producing deleterious effect on natural enemies causes damage to the environment.

KEY WORDS: *Leptinotarsa decemlineata* (Say), potato, economic injury level, regression.

Colorado potato beetle, *Leptinotarsa decemlineata* (Say), is the most injurious defoliating insect pest of potato in Ardabil (Nouri-Ghanbalani, 1989). This insect had been a quarantine pest to Iran until 1984. At that time it was noticed for the first time in some of the potato fields of Ardabil (North – East of Iran). Eradication campaign of the government and potato farmers was not successful and the pest spread to all of the approximately 25000 ha potato farms of the province within a two year period. Since then it has spread to other potato growing parts of the country. Its biology, natural enemies and population dynamics has been studied in the province (Nouri-Ganbalani, 1989; Nouri-Ganbalani et al., 1998; Golizade et al., 2005). So far the Colorado potato beetle is the only insect pest that causes serious damage to the potato yield in Ardabil province and warrants control measures. The pest has two generations per year. Larvae are most abundant in late June and early July that coincides with early

blooming of the potato, and adults of first generation emerge from pupation in late July (Nouri-Ganbalani, 1989). Uncontrolled populations of the first generation larvae may completely defoliate potato plants and destroy the crop. The effect of Colorado potato beetle on potato yield has been studied extensively. Hare (1980) has reported that yield is little affected by relatively severe insect defoliation early or late in the season, whereas even a moderate mid-season defoliation causes a considerable reduction in yield. Similar results were obtained in mechanical defoliation studies (Cranshaw & Radcliffe, 1980; Shields & Wyman, 1984). Potato tuber yield is closely related to leaf area duration which is the leaf area index integrated over time (Bremner & Radley, 1966). Leaf area duration can be strongly influenced by loss of active photosynthetic area as a result of defoliating factors such as insect, hails, and foliar disease such as early and late blight (Oijen, 1990; Shtienberg & Fry, 1990). Some defoliating agents may also reduce leaf area duration by inducing early leaf senescence (Johnson & Teng, 1990). For defoliated plant canopies, a reduction in light interception is most likely the primary cause for yield reduction (Peterson & Higley, 2001). Yield losses as a result of single episode of defoliation have been studied by simulating real insect defoliation (Skuhravy, 1968; Cranshaw & Radciffe, 1980; Shields & Wyman, 1984). A general result of these studies is that plants can recover from early season defoliation, but defoliation at the middle of the season has the most severe effect on yield, and defoliation has diminishing effects on yield as harvest is approached. Defoliation of upper portions of the potato canopy reduces yield by more than the removal of equivalent leaf areas from the middle or lower parts of the canopy (Cranshaw & Radcliffe, 1980). Hence, defoliation by Colorado potato beetle, which feeds on the upper new leaves, may have more effect on yield than equal amounts of leaf area duration loss attributable to early blight, which causes premature senescence of lower older leaves (Johnson et al., 1986). Ziems et al. (2006) concluded that yield losses from defoliation in potato are associated with reduction in canopy light interception. Economic injury levels and economic thresholds are key components in decision-making for insect pest management (Pedigo, 1999). Stern et al. (1959) defined the economic injury level as the lowest population density of a pest that will cause economic damage, and the economic threshold as the density of the pest population at which pest must be controlled to prevent damage from reaching this density. Thresholds from single episode defoliation studies have been used in pest management programs (Connell et al., 1991). Economic injury level for the Colorado potato beetle have been recommended either on the base of leaf damage caused by insect feeding (Bremner & Radley, 1966; Ferro et al., 1983; Johnson & Teng, 1990; Connell et al., 1991; Boiteau, 1994; Zehnder et al., 1995) or on the base of insect number per plant (Hare & Moor, 1988; Martel et al., 1986; Senanayake & Holliday, 1990; Mailloux et al., 1991; Holliday, 1994). Potato growers in Ardabil almost always apply insecticide for Colorado potato beetle control, yet little information on the economic benefits of this control measure is available. Therefore, the purpose of this study was to quantify the effect of different densities of the first generation larvae of the Colorado potato beetle on the yield of the potato cultivar 'Agria' and to establish economic injury level for this cultivar in Ardabil.

MATERIALS AND METHODS

Each year in 2004 and 2005, a plot (70 by 70 m) of 'Agria' potatoes (a medium maturing variety) was planted at three different locations in Ardabil (Hassan Barogh, University farm and Alarogh). Plot preparation and farming practices in

the experiment were similar to that in commercial fields of 'Agria' potato in the same area, except that no insecticide was applied to the experimental plots. At each of the three locations a randomized complete block experiment with four replications and five treatments were used. Treatments were densities of zero, 5, 10, 15, and 20 late larvae (third and fourth instars larvae) per plant that were used at early blooming stage of potato. At the early blooming stage of potato in commercial fields of Ardabil most eggs of Colorado potato beetles hatch and more than 50% of the larvae enter to the third or fourth instars stage, and the density of larvae is at peak. Therefore, a practical economic threshold must be available to growers at the time of early blooming stage. Larvae were collected from the nearby commercial fields on the potato leaves and the desired numbers were transferred with the leaves to the upper part of the randomly selected plants. Before inoculation each plant was carefully searched for any egg mass, adult or larvae and they were hand-picked and excluded from the treatment plants. After the introduction of the larvae to the plants each plant was individually caged. A wood-framed screen cage of 80×80×100 cm in height was established on top of each treated plant. Cages were covered with white nylon screen (30 squares per cm) with 15 cm diameter sleeves on two opposing sides to give access to plant without moving the cage. Earth was banked against the bottom of the cages to prevent insect entry or exit. Caged plants were subjected to one of five treatments at the early blooming stage of potato in a random manner. The larvae were allowed to eat on the treated plants inside the cages. After the emergence of the first generation adult, each cage was removed carefully and all the adults and egg masses were removed by hand and the cage was re-established on the top of the plant and left intact until the end of the season. At harvest time (first week of September) each cage was removed, the foliage of the plant was cut and the tubers were dug by a hand shovel. Except the tubers of less than 4 cm in diameter, which were regarded as unmarketable, the remaining tubers of each plant was put in a paper bag separately and transferred to the laboratory, where it was weighted and recorded. The economic injury level was estimated using Pedigo, s (1999) equation as follows: EIL= $C/V.b.K$, where C is the control cost (insecticide + insecticide application cost per ha), b is the slope of regression line of pest number to yield loss and *K* is the relative effect of control measure. Control cost per ha was estimated by inquiry from 40 farmers in different crop growing areas and the mean cost was calculated as 50 $ per ha. Crop value was estimated via survey in wholesale markets for 15 days at harvest time of each of study years and the mean value was 0.2 $ per kg. The *K* value was determined via inquiry from the Department of Plant Protection of the Ministry of Agriculture and it was 0.8. The slope of regression line was calculated through the regression analysis. Among the above characters, market value (v) is the most uncertain variable in Iran's market situations. The management cost is less uncertain because the price of insecticide and the cost of application are relatively constant.

Economic injury level was calculated using Pedigo, s (1999) formula:

$$EIL = C / V . b . K$$

Statistical Analyses

Data were subjected to analysis of variance (ANOVA). Analyses of regression were used to determine relationship between variation in insect density and yield and to estimate coefficient of regression lines (b) using MSTAT-C program. Separations were made using the Duncan, s (1955) multiple range test at $p<0.01$ (SAS Institute, 1988).

RESULTS

The tuber yield of 'Agria' potato under different densities of late instars of the Colorado potato beetle larvae at early blooming stage is given in Table 1. Feeding by the Colorado potato beetle larvae reduced the yield of marketable tubers with increasing insect density and there were significant difference among the treatments (Table 2). There were also highly significant differences among years and locations with respect to tuber yield. Also the effect of year location and treatment year location were highly significant (Table 3). A linear relationship was observed between the insect density and the marketable yield in 2004 and 2005 at all three locations (Figs.1). The overall linear regression of two study years for three locations accounted for 93.39 of variation among treatments. There was a significant difference in mean yield per plant of different treatments ($P < 0.001$). The overall linear relationship between insect density and yield loss was:

$$Y = -43.172X + 1262.7 \quad (R2 = 93.39)$$

In control trial the mean yield of the tuber was estimated to be 23900 kg per ha. The overall control cost of the pest was estimated to be 50$ per ha, and the crop value was estimated to be 0.2$ per kg.

Using Pedigo, s (1999) method, economic injury level of the pest was calculated as 5 and 6.458 late larvae per plant for 'Agria' cultivar in year 2004 and 2005 respectively. Therefore, based upon the results obtained in this research the control measure for the Colorado potato beetle is not recommended at pest densities of lower than 5 late larvae per plant , because the chemical control at lower densities is not only economically unfeasible but also by producing deleterious effects on natural enemies and by damaging the environment considered unjustified.

DISCUSSION

To obtain a realistic economic injury level, plants must be exposed to known populations of Colorado potato beetles throughout the growing season. Such populations must have the same age structure and pattern of increase and decease as the field populations, but the density must be under the control of the researcher (Senanayake and Holliday, 1990). To achieve this degree of control, plants had to be placed in cages. However caged plant may not behave in the same way as plants in a field. We constructed the cages in a way to allow approximately the same amount of space for foliage as plants would have in the field. But competition for root space and nutrients was probably low in cages than in the field and this may account for the higher yield in cages. Sananayake and Holliday (1990) concluded that the cage studies overestimate the percentage yield reduction by 22% per larva.

The economic injury levels we have obtained for 'Agria' are different from those obtained by other researchers for most other production regions of the world. For example, Martel et al. (1986) determined the economic threshold to be 20 late larvae per plant in Canada and Wright et al. (1987) used an action threshold of 1.5 late larvae per stalk. A two year study of a bivoltine population of Colorado potato beetle on Superior potato in Massachusetts revealed that profits are maximized by treatments that prevent defoliation exceeding 10% until final two weeks before harvest (Ferro et al., 1983). Growth stage specific action

thresholds have been derived for Superior potato in eastern Virginia as: 20% defoliation for emergence to early bloom, 30% for early bloom to late bloom and 60% for late bloom onwards (Zehnder et al., 1995). A visual index of defoliation has been developed in New Brunswick of Canada as an action threshold (Boiteau, 1994). This approach recognizes that action must be taken when up to 2% of the plants have compound leaves that are at least 50% defoliated (Boiteau, 1995). Some action thresholds based on counts of the Colorado potato beetle have been developed. A threshold of 20 larvae per plant for first generation Colorado potato beetle on Katahdin potato unimpaired yield without the need for insecticide applications to the second generation of a bivoltine population in Connecticut (Hare & Moor, 1988). Martel et al. (1986) also used a threshold of 20 larvae per plant in Quebec of Canada, which is equivalent to yield losses of 10-27%. In North America, a preventable yield loss of 10% would cause a reduction in gross revenue of 220-500 $/ha, which is considerably more than the cost of a control measure (Holliday, 1994). Economic thresholds, based upon damage curves also have been used in Canada and economic injury levels found were 5 and 11 larvae per plant for susceptible and tolerant cultivars respectively in Manitoba. Mailloux et al. (1991) concluded that a larval population of 50 per plant is associated with 50% yield reduction in Superior and 90% yield reduction in Norland (Senanayake & Holliday, 1990).On the other hand Sananayake and Holliday (1990) concluded that the economic injury level for Colorado potato beetle for 'Norland' variety in Manitoba (Canada) varied from 0.14 to 0.82 late larvae per plant depending on the control cost and expected yield of the potato. A number of factors may contribute to these disparities. Climatic conditions, soil fertility, variety characteristics, specially the maturation duration of the variety and plant height may influence the economic injury level. In Ardabil plain currently a single application of insecticide at the early bloom stage of potato is the only economically justifiable control option. Since resistance to insecticides currently used in Ardabil is not evident, potato producers can achieve adequate control with single application of insecticide. The relatively lower control costs in Ardabil results in higher economic injury levels. In some countries where insecticide resistance has become a problem, costs of controlling Colorado potato beetle may exceed $500/ha (Wright et al., 1987). We concluded that the economic injury levels for Colorado potato beetles on 'Agria' potatoes in Ardabil are relatively higher than some other parts of the world, but we strongly believe that their adoption will reduce insecticide use in this region.

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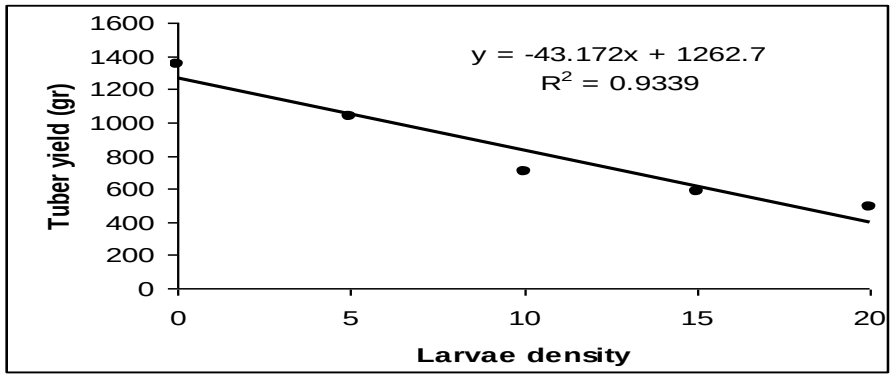

Figure 1. Linear relationship between late larvae density and mean tuber yield at three locations and two years (2004-2005).

Table 1. Effect of different densities per plant of late larvae of Colorado potato beetle on the tuber yield (gr) of caged potato in Ardabil province, Iran in years 2004 and 2005.

	Treatments(larvae/plant)														
location	Zero larvae (check)			5 (larvae/ plant)			10 (larvae/ plant)			15 (larvae /plant)			20 (larvae /plant)		
	2004	2005	mean	2004	2005	mean	2004	2005	mean	2004	2005	mean	2004	2005	mean
Hassan Barogh	1087	1290	1188.5^{a}	942	1083	990^{a}	457	680	568.5^{a}	398	527	462.5^{a}	411	528	469.5^{a}
University	2253	1888	2070.5^{c}	1396	1399	1397.5^{c}	1341	855	1098^{c}	1158	819	988.5^{c}	935	508	721.5^{c}
Alarogh	932	627	779.5^{b}	814	599	706.5^{b}	585	292	438.5^{b}	401	211	306^{b}	315	180	247.5^{b}
Overall mean	1346.07			1031.67			701.7			585.63			479.78		

Means in each column followed by similar letters are not significantly different at the 5% level of probability (SAS Institute 1988).

Table 2. Two years mean of the tuber yield (gr/plant) for different treatments for three locations.

Source of variation	Degrees of freedom	Mean squares
Year	1	493730.488**
Location	2	6137297.194**
Year. Location	2	611433.777**
Replication (Y.L)	18	41915.901**
Treatment	4	2993512.863**
Treatment. Year	4	18080.680**
Treatment. Location	8	205929.390ns
Treatment. Year. location	8	33099.462**
Error	72	15253.009

** and * indicate significant difference at the 1% and 5% levels of probability respectively, and ns indicates no significance.

Table 3. Analysis of variance of the treatments effects on tuber yield of potatoes

Treatment(larvae/plant)	Location			
	Hassan Barogh	University	Alarogh	Mean
Zero	1188.3375c	2070.5125a	779.3625a	1346.07a
5	991.125d	1397.425b	706.4875e	1031.67b
10	568.4875f	1098.0935c	438.525g	701.702c
15	462.3375	988.575d	305.9875h	585.63d
20	469.55g	752.6125e	247.20h	489.78e

Means in each column followed by similar letters are not significantly different at the 5% level of probability (SAS Institute 1988).

MOLECULAR IDENTIFICATION OF IRANIAN ISOLATES OF THE GENUS *PHOTORHABDUS* AND *XENORHABDUS* (ENTEROBACTERIACEAE) BASED ON 16S rRNA

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ABSTRACT: Five bacterial strains of *Photorhabdus* and six strains of *Xenorhabdus* originating from several geographical isolates of entomopathogenic nematodes have been studied moleculary to distinguish their position among the well defined species. Constructed phylogenetic trees based on the sequences of 16S-rRNA showed all of the studied *Photorhabdus* belong to the *P. luminescens* subsp. lumondii and *Xenorhabdus* were identified as *X. bovienii*, *X. nematophilus* and *X. budapestensis*. Among the *Steinernema feltiae* symbiont's one isolate named *Xenorhabdus* sp. IRA22 made a nearly distinct branch in the group and therefore it is possible to represent new species.

KEY WORDS: Entomopathogenic nematodes, *Photorhabdus, P. luminescens* subsp. lumondii, *Xenorhabdus, X. bovienii*, *X. budapestensis, X. nematophilus.*

Bacterial symbionts of entomopathogenic nematodes in the family Heterorhabditidae and Steinernematidaeare are members of the family Enterobacteriaceae and belong to the genera *Photorhabdus* and *Xenorhabdus* respectively (Thomas et al., 1979). The nematodes invade the larvae of susceptible insects and penetrate to the hemocoel, where they release their symbiotic bacteria (Kaya & Gaugler, 1993). In the hemocoel bacteria replicate within and kill the insect host (ffrench-Constant et al., 2003). Strains of *Photorhabdus* and Xenorhabdus species occur in two forms. The first is the bacterium isolated from IJ and was named the phase I variant. The second variant form, named phase II, appears spontaneously during period of an in vitro culture or during nematode rearing on an artificial diet (Boemare et al., 1988.). Different species and strains differ in virulence (Aguillera et al., 1993; Han et al., 1991) and therefore correct identification or grouping of the strains is essential in relation to experimental work.

16s rRNA gene has been revealed as a good marker to determine diversity among bacteria and currently all species description should now include the 16s rRNA sequence species. However, 16S rRNA evolves so slowly and may not always be high enough to distinguish closely related strains (Adams et al., 2006).

Three and nineteen species have been described for *Photorhabdus* and *Xenorhabdus* respectively: *P. luminescens* ssp. *luminescens* (type species), *P. luminescens* ssp. *akhurstii*, *P. luminescens* ssp. *laumondii*, *P. luminescens* ssp. *kayaii*, *P. luminescens* ssp. *thracensis*, *P. temperata*, *P. temperata* ssp. *temperata*, and *P. asymbiotica* ssp. asymbiotica and *P. asymbiotica* ssp. americana (Akhurst et al., 2004), *X. nematophilus*; *X. bovienii*; *X. poinarii*; *X. beddingii* (Akhurst & Boemare, 1988); *X. japonica* (Nishimura, 1994); *X. budapestensis*; *X. innexii*; *X. szentirmaii*; *X. ehlersii* (Lengyel et al., 2005); *X.*

doucetiae; *X. griffiniae*; *X. cabanillassii*; *X. mauleonii*; *X. kozodoii*; *X. hominickii*; *X. koppenhoeferii*; *X. miraniensis*; *X. romanii; X. stokiae* (Tailliez et al., 2006).

In the current study we characterize molecularly the isolates of *Photorhabdus* and *Xenorhabdus* that are symbiotically associated with different isolates of entomopathogenic nematodes, *H. bacteriophora*, *S. bicornutum*, *S. carpocapsae* and *S. feltiae* which were recently isolated from north-west of Iran (Eivazian et al., 2009).

MATERIAL AND METHODS

Bacteria. Symbiotic isolates were provided by the Insect Pathology Lab. Of the Science Department of the Azarbaijan University of Tarbiat Moallem.

Extraction of DNA. Qiagen DNeasy kit was used to extract DNA from cell harvested from 24 h nutrient broth cultures.

Amplification of the 16s rDNAs. The prokaryote-specific primers of Fischer-Le Saux et al. (1999) were used in PCR amplification of the 16S rRNA gene. PCR was performed in 50 µl reaction that contained: 200 mM each deoxynucleoside triphosphate, 10 mM Tris-HCl (pH 8.3), 50 mM KCl, 4 mM $MgCl_2$, 0.01% gelatin, 0.1 mM each primer, template DNA (5 µl), and 2 U of *Taq* polymerase. In all cases negative controls contained all components for the PCR except the template DNA. Reactions were run on a Biometra thermocycler, with 35 cycle of denaturation at 96 ºC for 1 min, annealing at 55 ºC for min and extension at 72 ºC for 2.5 min, followed by a final extension at 72 ºC for 4 min and a renaturation step at 25 ºC for 10 min.

Sequencing and Phylogenetic analysis. Multiple-sequence alignments were created using CLUSTAL X version 2 (Thompson et al., 1997). Sequence data were analyzed by unweighted maximum parsimony (MP) using PAUP* version 4.0b (Swofford, 1998). All data were assumed to be unordered. Tree searches of the ITS datasets were performed using heuristic methods with TBR (tree-bisection reconnection) branch swapping, and a minimum of 1000 replicates of random stepwise addition. Sequences used as outgroups were the 16S rRNA gene sequences of *E. coli* (GenBank accession no. J01695). Trees were represented graphically with the software TREEVIEW version 1.6.6 (Page, 2001).

RESULTS AND DISCUSSION

Molecular methods can be employed to determine diversity among bacteria or used for rapid Identifcation of a bacterium in question so as to avoid laborious phenotypic characterization (Adams et al., 2006). Phylogenies based on 16S rRNA gene sequences have previously been used to distinguish several groups within the genus *Photorhabdus* and *Xenorhabdus* (Szállás et al., 1997; Fischer-Le Saux et al., 1999). The almost complete 16S rRNA gene sequences of the isolates were aligned to the homologous sequences of *Xenorhabdus* and *Photorhabdus* (GenBank). In the case of studied *Photorabdus* isolates phylogenetic dendrogram grouped them together with the EU513181, AY278650 and AB355874 sequences, while isolates IRA10 and EU513181 and IRA3 and IRA4 were in separate sub-groups. Although phylogenetic analysis of 16S rRNA gene sequences supported the grouping of isolates into the subspecies groupings identified by Fischer-Le

Saux et al. (1999), these subspecies groupings did not form consistent groups at the species level. Isolates of *Photorhabdus luminescens* ssp. luminescens did not cluster closely with the other subspecies of *P. luminescens* (Fig. 1). In the constructed tree, all studied 16s-rRNA sequences of different species or subspecies made separate groups. The inconsistency of the species-level groupings in this analyses suggests that 16S rRNA gene sequence data are not suitable for the definition of species within the genus *Photorhabdus*, although they are useful at the subspecies level. This is because sequence differences are restricted to a few variable regions, and so the information content is not sufficient to provide reliable species-level groupings (Akhurst et al., 2004). Similar results were obtained earlier by Akhurst et al., 2004. The majority of branching points in Fig. 1 were supported by relatively high bootstrap values on terminal and low values for interior nods, this indicates that the branching order of the studied *Photorhabdus* isolates isn't settled using the database`(16S-rRNA) that was used to generate (Fig. 1) but although branch support is weak for the majority of nodes in the tree, the terminal taxa correspond closely with DNA homology groups (Fischer-Le Saux et al., 1999). Use of ribosomal subunit sequences for determining phylogenetic relationships has limitations. These genes can undergo lateral gene transfer across taxonomic groups or can be recombined, which could provide false evolutionary data (Yap et al., 1999). Therefore, bacterial phylogeny based solely on 16S rDNA sequence should be regarded as preliminary (Lerat et al., 2003). Dauga (2002) demonstrated that phylogeny based on the *gyr*B gene provided a more robust tree for determining intrageneric relationships among *Serratia* spp., whereas the 16S rDNA gene was effective for determining phylogenetic relationships among more distantly related enteric bacteria. Akhurst et al., 2004 in the study of different isolates of *P. asymbiotica* showed that although symbiotic isolate clustered consistently with *P. asymbiotica* in *gyr*B phylogenetic analyses, DNA–DNA hybridization indicated that this isolate does not belong to the species *P. asymbiotica* and that there is a clear distinction between symbiotic and clinical species of *Photorhabdus*. Therefore using a polyphasic approach that involved DNA–DNA hybridization, phylogenetic analyses of 16S rRNA and gyrB gene sequences and phenotypic characterization are necessary to define species but for sub-species identification one of the mentioned molecular markers are enough. Indeed, many molecular biologists and taxonomists believe that bacterial systematics will one day be based solely on the recognition of molecular patterns. However, the time has not yet come to discard morphology, metabolic properties, and other traditional approaches that have served systematists well in the last decades (Adams et al., 2006).

The interesting result was obtained in the case of two isolates including *P. luminescence* lumondii IRA3 and *P. luminescence* lumondii IRA2 which grouped together in separate sub-group within *P. luminescence* lumondi clade (Fig. 1). Both of these isolates are symbionts of *H. bacteriophora* isolates which belong to the nearest geographical regions with the similar soil type and vegetation compared other ones. There is a high degree of specificity imposed on the symbiotic relationship between the bacteria and the nematode. This specificity is generally more restrictive for the *Heterorhabditis–Photorhabdus* pair where one species of nematode retains one species of bacteria.

Maximum Parsimony constructed tree based on the 16s-rRNA showed that studied *Xenorhabdus* isolates fall in three different groups including *X. nematophilus* symbiont of *S. carpocapsae* IRA18, *Xennorhabdus bovienii* symbiont of different geographical isolates of *S. feltiae* and *X. budapestensis*

symbiont of *S. bicornutum* but among *X. bovienii* group, symbiotic bacteria of *S. feltiae* IRA22 named here *Xenorhabdus* sp. IRA22 made a nearly distinct branch in the group and therefore it is possible to represent new species (Fig. 2; Table 2) although the recognition of a phylogenetic substructure does not immediately imply that the description of new species is a straight forward process (Adams et al., 2006) and more studies should be carried out.

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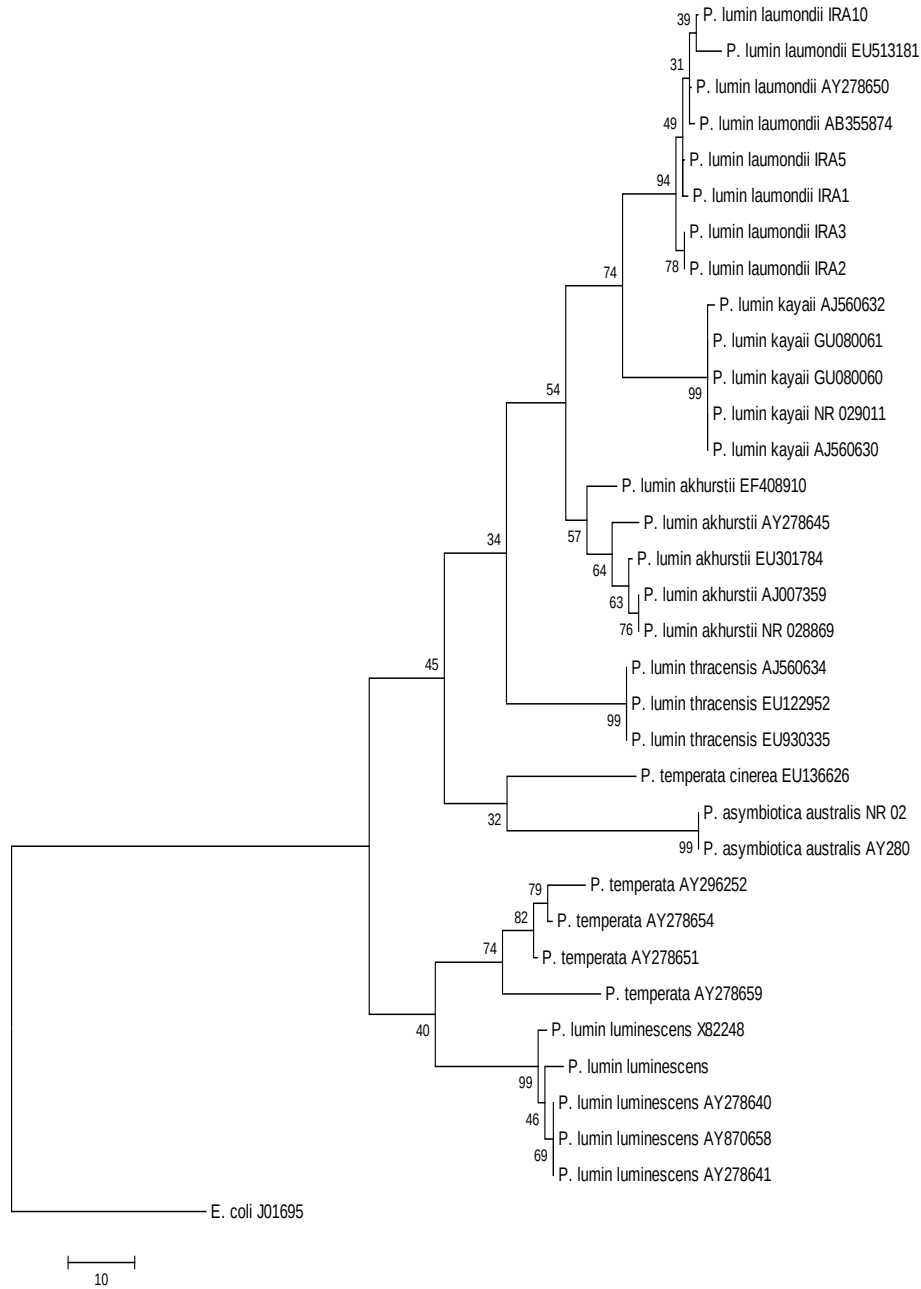

Figure 1. Phylogenetic relationship of studied isolates with other *Photorhabdus* species based on 16S-rRNA.

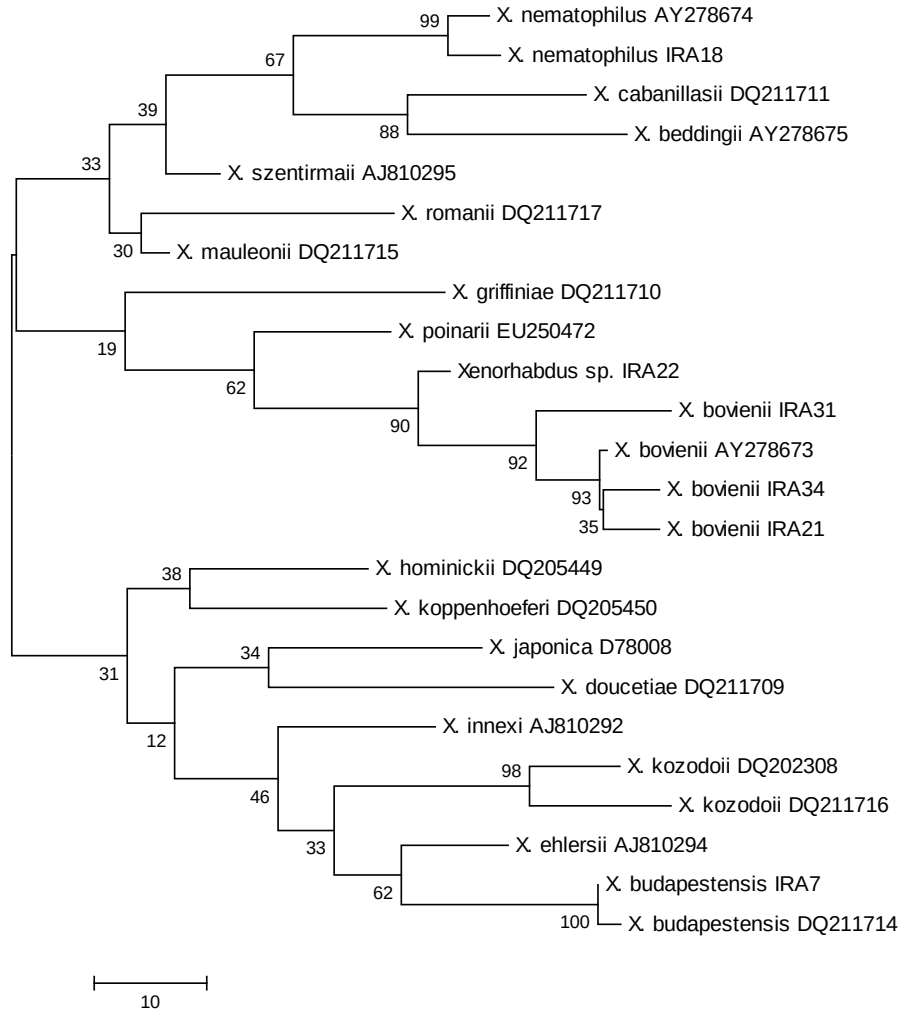

Figure 2. Phylogenetic relationship of studied isolates with other *Xenorhabdus* species based on 16S-rRNA.

Table 1. Pairwise distances between *Photorhabdus* species / subspecies.

	1	2	3	4	5	6
P. luminescens ssp. *kayaii*						
P. luminescens ssp. *thracensis*	0.030					
P. luminescens ssp. *akhurstii*	0.021	0.022				
P. luminescens ssp. *laumondii*	0.015	0.027	0.017			
P. temperate	0.040	0.026	0.038	0.040		
P. luminescens ssp. *luminescens*	0.029	0.037	0.028	0.029	0.024	
P. asymbiotica	0.035	0.044	0.035	0.034	0.042	0.036

Table 2. Pairwise distances between *Xenorhabdus* species.

	1	2	3	4	5	6	7	8	9	10
X. nematophilus AY278674										
X. nematophilus IRA18	0.006									
Xenorhabdus sp. IRA22	0.041	0.041								
X. budapestensis DQ211714	0.051	0.051	0.046							
X. bovienii AY278673	0.041	0.041	0.012	0.041						
X. bovienii IRA31	0.046	0.044	0.018	0.045	0.013					
X. budapestensis IRA7	0.049	0.050	0.044	0.002	0.040	0.044				
X. bovienii IRA34	0.046	0.047	0.018	0.044	0.006	0.017	0.044			
X. bovienii IRA21	0.046	0.046	0.017	0.044	0.005	0.016	0.043	0.008		
X. poinarii EU250472	0.039	0.039	0.021	0.043	0.032	0.034	0.041	0.036	0.035	
X. griffiniae DQ211710	0.049	0.054	0.035	0.047	0.045	0.050	0.044	0.050	0.050	0.030

SUBSTITUTE NAMES FOR SOME NEMATODA

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ABSTRACT: Five junior homonyms were detected amongst the nematod genus group names and the following replacement names are proposed: *Novadelonema* nom. nov. for *Adelonema* Holovachov & Sturhan, 2003; *Aborjinia* nom. nov. for *Australonema* Tchesunov & Spiridonov 1985; *Mukhina* nom. nov. for *Brevistoma* Mukhina, 1981; *Mooleptus* nom. nov. for *Metaleptus* Machida, Ogawa & Okiyama, 1982 and *Paradoxostrongylus* nom. nov. for *Parastrongylus* Yin, Jiang & Kung, 1986. Accordingly, new combinations are herein proposed for the species currently included in these genera: *Novadelonema camerunense* (Holovachov & Sturhan, 2003) comb. nov. from *Adelonema camerunense* Holovachov & Sturhan, 2003 (Diplopeltidae), *Aborjinia eulagiscae* (Tchesunov & Spiridonov, 1985) comb. nov. from *Australonema eulagiscae* Tchesunov & Spiridonov, 1985 (Marimermithidae), *Mukhina elegans* (Mukhina, 1981) comb. nov. from *Brevistoma elegans* Mukhina, 1981 (Panagrolaimidae), *Mooleptus rabuka* (Machida, Ogawa & Okiyama, 1982) comb. nov. from *Metaleptus rabuka* Machida, Ogawa & Okiyama, 1982 (Physalopteridae) and *Paradoxostrongylus paradoxus* (Yin, Jiang & Kung, 1986) comb. nov. from *Parastrongylus paradoxus* Yin, Jiang & Kung, 1986 (Strongylidae).

KEY WORDS: nomenclatural change, homonymy, replacement names, Nematoda.

Five proposed genus names in Nematoda are nomenclaturally invalid, as the genus group names has already been used by a different authors in different animal groups. In accordance with Article 60 of the International Code of Zoological Nomenclature, I propose substitute names for these genus group names.

Family DIPLOPELTIDAE
Genus *NOVADELONEMA* nom. nov.

Adelonema Holovachov & Sturhan, 2003. Russ. J. Nematology, 11 (2): 63. (Nematoda: Diplopeltidae). Preoccupied by *Adelonema* Mawson, 1978. Transactions R. Soc. S. Aust., 102 (8): 223. (Nematoda: Oxyuridae).

Remarks on nomenclatural change: Firstly, the monotypic genus *Adelonema* was described by Mawson (1978) with the type species *Syphacia trichosuri* Johnston & Mawson, 1938. It is still used as an available valid genus name in the family Oxyuridae (Nematoda).

Subsequently, the genus *Adelonema* was established by Holovachov & Sturhan (2003) with the type species *Adelonema camerunense* Holovachov & Sturhan, 2003 by original designation and monotypy. Also, it is still used as a valid generic name in the family Diplopeltidae (Nematoda).

Thus the genus *Adelonema* Holovachov & Sturhan, 2003 is a junior homonym of the valid genus name *Adelonema* Mawson, 1978. So I propose here that

Adelonema Holovachov & Sturhan, 2003 should be replaced with the new name *Novadelonema*, as a replacement name.

Etymology: The name derived from the preexisting genus name.

Summary of nomenclatural changes:

Novadelonema **nom. nov.**
pro *Adelonema* Holovachov & Sturhan, 2003 (non Mawson, 1978)

Novadelonema camerunense (Holovachov & Sturhan, 2003) **comb. nov.**
from *Adelonema camerunense* Holovachov & Sturhan, 2003

Family MARIMERMITHIDAE
Genus *ABORJINIA* nom. nov.

Australonema Tchesunov & Spiridonov 1985. Vestnik Zool. 1985 (2): 17. (Nematoda: Marimermithidae). Preoccupied by *Australonema* Tassell, 1980. Record Queen Viet. Mus. No. 69: 9. (Mollusca: Gastropoda: Oriostomatidae).

Remarks on nomenclatural change: Firstly, the fossil gastropod genus *Australonema* was described by Tassell (1980). It is still used as an available valid genus name in the family Oriostomatidae (Mollusca: Gastropoda).

Subsequently, the genus *Australonema* was erected by Tchesunov & Spiridonov (1985) with the type species *Australonema eulagiscae* Tchesunov & Spiridonov, 1985 by original designation and monotypy. Also, it is still used as a valid generic name in the family Marimermithidae (Nematoda).

Thus the genus *Australonema* Tchesunov & Spiridonov, 1985 is a junior homonym of the valid genus name *Australonema* Tassell, 1980. So I propose here that *Australonema* Tchesunov & Spiridonov, 1985 should be replaced with the new name *Aborjinia*, as a replacement name.

Etymology: The name is dedicated to Aborjins whose are the Australian residents.

Summary of nomenclatural changes:

Aborjinia **nom. nov.**
pro *Australonema* Tchesunov & Spiridonov, 1985 (non Tassell, 1980)

Aborjinia eulagiscae (Tchesunov & Spiridonov, 1985) **comb. nov.**
from *Australonema eulagiscae* Tchesunov & Spiridonov, 1985

Family PANAGROLAIMIDAE
Genus *MUKHINA* nom. nov.

Brevistoma Mukhina, 1981. In Eroshenko & Belogurov [Eds] [Free living and phytopathogenic nematodes of the Far East fauna]. Akademiya Nauk SSSR, Vladivostock: 49. (Nematoda: Panagrolaimidae: Panagrellinae). Preoccupied by *Brevistoma* Tjeder, 1967. S.Afr.anim.Life 13: 369. (Insecta: Neuroptera: Nemopteridae).

Remarks on nomenclatural change: Firstly, the genus *Brevistoma* was described by Tjeder (1967). It is still used as an available valid genus name in the family Nemopteridae (Insecta: Neuroptera).

Subsequently, the genus *Brevistoma* was erected by Mukhina in Eroshenko & Belogurov (1982) with the type species *Brevistoma elegans* Mukhina, 1981 by original designation and monotypy. Also, it is still used as a valid generic name in the family Panagrolaimidae (Nematoda).

Thus the genus *Brevistoma* Mukhina, 1981 is a junior homonym of the valid genus name *Brevistoma* Tjeder, 1967. So I propose here that *Brevistoma* Mukhina, 1981 should be replaced with the new name *Mukhina*, as a replacement name.

Etymology: The name is dedicated to Z. M. Mukhina.

Summary of nomenclatural changes:

Mukhina **nom. nov.**
pro *Brevistoma* Mukhina, 1981 (non Tjeder, 1967)

Mukhina elegans (Mukhina, 1981) **comb. nov.**
from *Brevistoma elegans* Mukhina, 1981

Family PHYSALOPTERIDAE
Genus *MOOLEPTUS* nom. nov.

Metaleptus Machida, Ogawa & Okiyama 1982. Bulletin natn. Sci. Mus. Tokyo (Zool.) 8 (1): 3. (Nematoda: Physalopteridae: Physalopterinae). Preoccupied by *Metaleptus* Bates, 1872. Trans. ent. Soc. London, 1872, 192. (Insecta: Coleoptera: Cerambycidae: Cerambycinae).

Remarks on nomenclatural change: Firstly, the genus *Metaleptus* was described by Bates (1872) with the type species *Purpuricenus angulatus* Chevrolat, 1834. It is still used as an available valid genus name in the family Cerambycidae (Insecta: Coleoptera).

Subsequently, the genus *Metaleptus* was erected by Machida, Ogawa & Okiyama (1982) with the type species *Metaleptus rabuka* Machida, Ogawa & Okiyama, 1982 by original designation and monotypy. Also, it is still used as a valid generic name in the family Physalopteridae (Nematoda).

Thus the genus *Metaleptus* Machida, Ogawa & Okiyama, 1982 is a junior homonym of the valid genus name *Metaleptus* Bates, 1872. So I propose here that *Metaleptus* Machida, Ogawa & Okiyama, 1982 should be replaced with the new name *Mooleptus*, as a replacement name.

Etymology: The name derived from the capital letters of the current author names of the preexisting genus.

Summary of nomenclatural changes:

Mooleptus **nom. nov.**
pro *Metaleptus* Machida, Ogawa & Okiyama, 1982 (non Bates, 1872)

Mooleptus rabuka (Machida, Ogawa & Okiyama, 1982) **comb. nov.**
from *Metaleptus rabuka* Machida, Ogawa & Okiyama, 1982

Family STRONGYLIDAE
Genus *PARADOXOSTRONGYLUS* nom. nov.

Parastrongylus Yin, Jiang & Kung, 1986. Acta Zootaxonomica Sin 11 (2): 142. (Nematoda: Strongylidae: Strongylinae). Preoccupied by *Parastrongylus* Baylis, 1928. Parasitology, 20, 284, 285. (Nematoda: Angiostrongylidae: *Angiostrongylus*).

Remarks on nomenclatural change: Firstly, the subgenus *Parastrongylus* was described by Baylis (1928) with the type species *Angiostrongylus tateronae* Baylis, 1928. It is still used as an available valid subgenus name of the genus *Angiostrongylus* Kamensky, 1905 in the family Angiostrongylidae. The subgenus has 9 species.

Subsequently, the genus *Parastrongylus* was established by Yin, Jiang & Kung (1986) with the type species *Parastrongylus paradoxus* Yin, Jiang & Kung, 1986 by original designation and monotypy. Also, it is still used as a valid generic name in the family Strongylidae.

Thus the genus *Parastrongylus* Yin, Jiang & Kung, 1986 is a junior homonym of the valid genus group name *Angiostrongylus* (*Parastrongylus*) Baylis, 1928. So I propose here that *Parastrongylus paradoxus* Yin, Jiang & Kung, 1986 should be replaced with the new name *Paradoxostrongylus*, as a replacement name.

Etymology: The name derived from current binominal combination of the preexisting species, *Parastrongylus paradoxus*.

Summary of nomenclatural changes:

Paradoxostrongylus **nom. nov.**
pro *Parastrongylus* Yin, Jiang & Kung, 1986 (non Baylis, 1928)

Paradoxostrongylus paradoxus (Yin, Jiang & Kung, 1986) **comb. nov.**
from *Parastrongylus paradoxus* Yin, Jiang & Kung, 1986

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Yin, P.-Y., Jiang, J.-S. & Kung, F.-Y. 1986. *Parastrongylus paradoxus* gen. et sp. nov., a new nematode from the large intestine of the rhinoceros (Nematoda, Strongylidae: Strongylinae). Acta Zootaxonomica Sinica, 11 (2): 139-143.

INSECTICIDAL ACTIVITY OF ESSENTIAL OIL OF *AGASTACHE FOENICULUM* AGAINST *EPHESTIA KUEHNIELLA* AND *PLODIA INTERPUNCTELLA* (LEPIDOPTERA: PYRALIDAE)

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[Ebadollahi, A., Safaralizadeh, M. H., Hoseini, S. A., Ashouri, S. & Sharifian, I. 2010. Insecticidal activity of essential oil of *Agastache foeniculum* against *Ephestia kuehniella* and *Plodia interpunctella* (Lepidoptera: Pyralidae). Munis Entomology & Zoology, 5 (2): 785-791**]**

ABSTRACT: In the present study, the essential oil isolated from aerial parts of *A. foeniculum* by Clevenger apparatus was analyzed by gas chromatography mass spectrometry. Methyl chavicol was main component of oil. Insecticidal activity of this essential oil was evaluated by fumigation method against *E. kuehniella* and *P. interpunctella*. Mortality was recorded daily for four days after treatment. *P. interpunctella* (LC_{50} = 16.535 µlL^{-1}) was more susceptible than *E. kuehniella* (LD_{50} = 23.075 µlL^{-1}) at 24 h after treatment. In general, mortality, increased as the doses of essential oil and exposure period increased. These results showed that the *A. foeniculum* oil could be used in grain storage in order to decrease detrimental effects and risk of utilization synthetic insecticides.

KEY WORDS: *Agastache foeniculum*, essential oil, fumigant toxicity, *Ephestia kuehniella, Plodia interpunctella*.

Current stored-product pest management has relied on the use of chemicals. However, chemical control methods using fumigants are restricted because of development of pest resistance, health hazards and risk of environmental contamination (Zettler & Cuperus, 1990; Tunc & Sahinkaya, 1998; Isman, 2000). Therefore, in the current scenario, there is an urgent need to develop safer, environmentally friendlier and efficient alternative that have potential to replace synthetic pesticides and are convenient to use. Essential oils are potential alternatives to current stored-grain fumigants because of their low toxicity to warm-blooded mammals and their high volatility (Shaaya et al., 1997; Li & Zou, 2001). Plant oils have insecticidal (Shaaya et al., 1997), antifungal (Kordali et al., 2008), nematicidal (Oka et al., 2000), virucidal (Schuhmacher et al., 2003), anti-bacterial (Kotan et al., 2008) effects.

Indian meal moth, *Plodia interpunctella* Hubner (Lepidoptera: Pyralidae), is distributed world-wide and is a serious stored-product pest of grain and seeds as well as flour and other milled products (Nansen et al., 2004). Mediterranean flour moth, *Ephestia kuehniella* Zeller (Lepidoptera: Pyralidae), is an important pest in stored products worldwide (Khebbeb et al., 2008).

The aim of this study was to analyze the chemical composition of essential oil extracted from aerial parts of blue giant hyssop, *Agastache foeniculum* (Pursh) Kuntze and to evaluate the insecticidal effect of this oil against *P. interpunctella* and *E. kuehniella*. It is hoped that this information will be useful in selection of plant-derived insecticides for control of insect pests.

MATERIALS AND METHODS

Aerial parts from 1.5 cm of top of *A. foeniculum* were collected at the flowering stage from plants grown in the experimental farm of the Department of Horticultural, University of Urmia, Urmia, Iran. The specimen plants were air dried in the shade at room temperature (26-28 °C) for 14 days. The essential oil was isolated from dried plant samples by hydrodistillation method using a Clevenger apparatus for 4 h. The oil was dried over anhydrous Na_2so_4.

The constituents of *A. foeniculum* essential oil were analyzed by gas chromatography mass spectrometry (GCMS) (Thermo-UFM). The GC-MS conditions were as follows: capillary column ph-5 (10 m × 0.1 mm, film thickness 0.4 μm); helium as the carrier gas (0.5 $mlMin^{-1}$); oven temperature program, initially 60 °C rising to 285 °C; injector and detector temperatures of 280 °C. The identification of individual compounds was based on comparison of their relative retention index with those of authentic samples on capillary column.

The colony of *P. interpunctella* was reared on a diet of 80% ground rice, 10% glycerin, 5% yeast and 5% honey and *E. kuehniella* were reared on a diet of a 10:2:1 mixture of oat bran: wheat germ: yeast in plastic containers (30 cm length × 20 cm width × 8 cm height). Mouth of the containers was covered with fine mesh cloth for ventilation as well as to prevent escape of the insects. The cultures were maintained in the laboratory at 27 ± 1 °C, 60 ± 5% Relative Humidity (RH) and 16:8 h light: dark. Adult insects, 1-2 days old, were used for fumigant toxicity tests. Parent adults were obtained from laboratory stock cultures maintained at the Entomology Department, University of Urmia, Iran. All experimental procedures were carried out under the same environmental conditions as the cultures.

To determine the fumigant toxicity of the *A. foeniculum* oil, filter papers (Whatman No. 1, cut into 3-cm diameter pieces) were impregnated with oil at doses calculated to give equivalent fumigant concentrations from 3 to 30 μlL^{-1} and 5 to 40 μlL^{-1} for *P. interpunctella* and *E. kuehniella*, respectively. Then the impregnated filter paper was attached to the under-surface of the screw cap of a glass jar (1 liter). No material was applied in control jars. The caps were screwed tightly on the jar containing fifteen moths of each species of insect separately. Each test was replicated three times. Mortality was recorded daily for four days after treatment. The insect will be considered as dead when they did not move, fly or response to gentle touch.

Percentage insect mortality was calculated using the Abbott correction formula for natural mortality in untreated controls (Abbott, 1925). To equalize variances, mortality percentages of insects were transformed using the square root of the arcsin. The experiments were arranged by completely randomize design. The data were analyzed with analysis of variance (ANOVA) by SAS. The means were separated by using the Tukey test, $\alpha = 0.05$. Probit analysis was used to estimate LC_{50} (Lethal concentration of 50% of population of insects) values with their fiducially limits by SPSS software.

RESULTS AND DISCUSION

Results of the GC-MS analysis for *A. foeniculum* essential oil are presented in Table 1. The four major constituents, in order of decreasing amounts, were methyl chavicol (94.003%) 1,8-cineole (3.334%), 1-octen-3-ol (0.461%) and germacrene D (0.430%) (Table 1).

The essential oil vapours of this plant species tested was toxic to both *P. interpunctella* and *E. kuehniella* pest species. According to the results of ANOVA, the effect of doses and exposure time interactions of the essential oil obtained from *A. foeniculum* on moths were significant at $P< 0.01$ (Table 2). There were significant differences in the mortality of *P. interpunctella* and *E. kuehniella* exposed to different concentrations of *A. foeniculum* oil for 24, 48, 72 and 96 hours (Fig 1).

The 24-h LC_{50} values against the moths were 16.535 and 23.075 μlL^{-1} for *P. interpunctella* and *E. kuehniella* respectively (Table 3). In general, mortality, increased as the doses of essential oil and exposure period increased. On the other hand, the LC_{50} decreased with the duration of exposure to the essential oil concentrations (Table 3 & Fig 1).

The essentials oil caused the highest mortality in 30 and 40 μlL^{-1} doses and at 96 h of exposure on *P. interpunctella* and *E. kuehniella* respectively. From the probit analyses, the calculated regression line equation of the fourth day data was $Y = 1.860X + 3.464$ for *P. interpunctella* and $Y = 2.328X + 2.191$ for *E. kuehniella*. In all of the times, *E. kuehniella* was noted to be relatively more tolerant than *P. interpunctella* (Table 3).

Many plant species produce various chemical compounds that could be repellent or deterrent or even toxic for plant feeding insects. Some of these compounds are also toxic to the plant itself, and therefore they are stored in special organs such as flowers and seeds. Phytophagous insects use plant volatiles to recognize their host plants. Therefore, the use of essential oils as a non-host volatile emission to repel insect pests is a viable alternative for control (Mauchline et al., 2005). Therefore, large quantities of plant material have to be processed in order to obtain essential oils in quantities sufficient for laboratorial and commercial scale tests.

Some constituents may exhibit a much higher activity than the whole essential oil. Mazza & Kiehn (1992) investigated characterization of essential oil of *A. foeniculum* and find out that methylchavicol was the major constituent this oil, which was confirmed in this study. Toxicity of methylchavicol was not detected against any insect pest of stored products, but 1,8-cineole (another major constituent of *A. foeniculum* oil) reported as a toxic agent against some of insect pests (Kordali et al., 2006; Stamopoulos et al., 2007).

The most promising botanical groups are Meliaceae, Rutaceae, Asteraceae, Annonaceae, Lamiaceae, Aristolochiaceae and Malvaceae (Regnault-Roger, 1997). *A. foeniculum* is perennial member in plants family Lamiaceae. The susceptibility of *P. interpunctella* and *E. kuehniella* against plant essential oils has been investigated to a limited extent (Tunc et al., 2000; Shojaaddini et al., 2008; Isikber et al., 2009) but toxicity of essential oil of *A. foeniculum* has not studied against these insects and others.

Conclusively, *A. foeniculum* essential oil showed potent fumigant toxicity against *P. interpunctella* and *E. kuehniella*. The essential oil of *A. foeniculum* could be used as an environmentally friend fumigant to control adults of moth pest on stored product.

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Table 1. Chemical components of the essential oil of *A. foeniculum*.

Component	Retention index	Percentage (%)
1-octen-3-ol	977	0.461
3-octanone	985	0.407
1,8-cineole	1058	3.334
octen-3-yl-acetete	1108	0.386
methyl chavicol	1200	94.003
α-copaene	1375	0.029
β-boarbonene	1386	0.084
E-caryophyllene	1418	0.058
germacrene D	1485	0.430
bicyclogermacrene	1500	0.020
spathulenol	1570	0.039
α-maurolol	1643	0.014
β-eudesmol	1650	0.015
dihydro eudesmol	1664	0.013
Total		99.293

Table 2. The results of ANOVA belonging to dose and time.

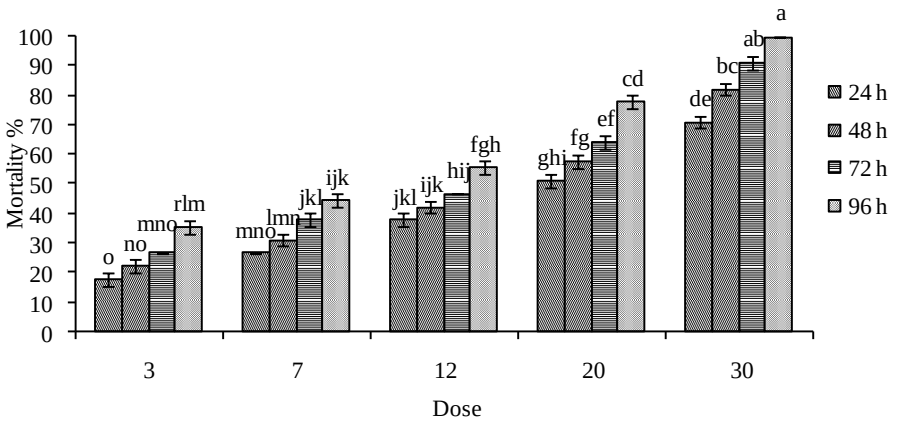
Source	*P. interpunctella*			*E. kuehniella*		
	df	Mean square	*F*	df	Mean square	*F*
Time (h)	3	642.380	61.040*	3	860.486	192.982*
Dose (μLl^{-1})	4	2980.138	283.179*	4	2607.301	584.741*
Time × Dose	12	59.644	5.669*	12	47.310	10.610*
Error	40	10.524		40	4.450	
Total	59			59		

*indicate significant difference at $P < 0.05$.

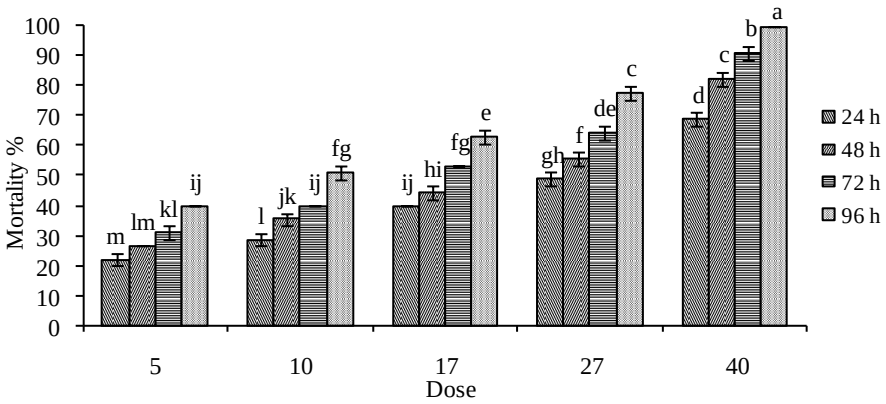
Table 3. LC_{50} calculated for mortality within 4 days of exposure of *p. interpunctella* and *E. kuehniella* on fumigation of essential oil of *A. foeniculum*.

Insects	Time [h]	LC50 (μlL^{-1})	95% Confidence Limits	χ^2 (df= 3)	Intercept [a]	Slope [b]
p. interpunctella	24	16.535	(12.545 – 24.079)	2.059 *	3.236	1.447
	48	12.343	(9.520 – 16.358)	4.685 *	3.286	1.570
	72	9.529	(2.596 – 22.727)	7.641 *	3.363	1.671
	96	6.690	(0.000 – 16.776)	12.448**	3.464	1.860
E. kuehniella	24	23.075	(17.188 – 35.658)	1.834 *	3.179	1.335
	48	16.358	(12.443 – 27.556)	4.772 *	3.161	1.514
	72	12.359	(3.804 – 23.148)	6.126 *	3.125	1.935
	96	8.60.56	(0.168 – 16.341)	9.273 **	3.190	1.935

*No heterogeneity factor is used in the calculation of confidence limits.
**A heterogeneity factor is used in the calculation of confidence limits.



P. interpunctella



E. kuehniella

Figure1. Percent mortality ± SE of *P. interpunctella* and *E. kuehniella* exposed to different concentrations of *A. foeniculum* oil for 24, 48, 72 and 96 hours. Different letters in the top of columns are significantly different at 5% level.

A BRIEF STUDY ON THE SCOLIIDAE IN IRAN (INSECTA: HYMENOPTERA)

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[Fallahzadeh, M. & Saghaei, N. 2010. A brief study on the Scoliidae (Insecta: Hymenoptera) in Iran. Munis Entomology & Zoology, 5 (2): 792-795**]**

ABSTRACT: The present paper mentions 9 species and subspecies belonging to 4 genera of the family Scoliidae (Insecta: Hymenoptera). They were collected from different parts of Fars province in the south of Iran. Of these, *Dasyscolia ciliata ciliata* (Fabricius, 1787) is new to the fauna of Iran and Near East. Additionally 4 species were recorded for the first time from Fars province. Synonyms and distributional data for each species are included.

KEY WORDS: Distribution, Fars, Fauna, Hymenoptera, Iran, Scoliidae.

The family Scoliidae belongs to the superfamily Vespoidea and contains approximately about 560 valid species, 220 subspecies distributed among 43 valid genera, 28 subgenera and 2 subfamilies (Osten, 2005b). They are solitary insect; both male and female are winged. They tend to be black, often marked with yellow or orange, and their wing tips are distinctively corrugated. The larvae are ectoparasitoids of the grubs of Scarabaeidae (Esmaili & Rastegar, 1954; Osten, 2000; Osten et al., 2003).

The faunistic and taxonomic papers treated the family in Iran have been conducted by Tkalcu (1987), Esmaili & Rastegar (1954), Chahartaghi Abineh (2002). The Scoliid fauna of West Palaearctic was monographed by Osten (2000), who also provided geographic distribution and keys, for all taxa. Osten et al. (2003) listed 43 taxa of this family for Iran.

Our present research is focused on scoliid wasps which have been collected from the different parts of Fars province. They have been preserved in the collection of Department of Entomology, Jahrom Islamic Azad University, Fars, Iran, but the data have not been published yet. The aim of this paper is to present the complete records of preserved material to researchers and relevant people. It includes insect synonyms, general distribution and previously recorded from Iran.

MATERIALS AND METHODS

The scoliids were collected at different localities in Fars province, Iran during 1998-2005. They were captured by sweep net in flight. The Fars province is located in southern Iran between 27°01′ and 31°51′N and between 50°27′ and 55°45′E, covering an area of 125,000 km². The climate of the province is arid to semiarid. The wasps were identified using published keys (Osten, 2000; Osten, 2004; Osten, 2005a). Classification, nomenclature and distributional data of Scoliidae suggested by Osten (2000; 2005 a; b) and Fauna Europaea Web Service (2004) have been followed. The specimens are deposited in the Insect Collection of the Islamic Azad University, Jahrom Branch.

RESULTS

In this study, 9 species and subspecies of 4 genera belonging to Campsomerini and Scoliini tribes of Scoliinae (Scoliidae) were reported in Fars province, Iran.

Scoliinae

Campsomerini

***Campsomeriella thoracica* (Fabricius, 1787)**

Scolia thoracica Fabricius, 1787

Synonym: *Scolia thoracica eriophora* Khalof, 1958 (Osten, 2000; Osten et al., 2003)

Material Examined: Shiraz: Maharlu, 5 July 1998, male; Shiraz: Dokohak 17 June 2000, female; Dasht-e Arzhan, 2 April 2001, female; Zarghan, 29 May 2001, female; Sarvestan, 30 April 2002, female; Lar, 1 August 2002, female, Arsanjan, 22 September 2003, female; Marvdasht: Fath Abad, 4 May 2004, female. This is a new record for the fauna of Fars province.

Distribution: Crete, Cyprus, Dodecanese Is., Greek mainland, Iran, Italian mainland, Malta, North Aegean Is., North Africa (Morocco), Sicily, Spanish mainland, Syria, Turkey.

Iranian records: Tehran province (Chahartaghi Abineh, 2002); Busher, Gilan, Golestan, Hormozgan, Kerman, Khuzestan, Lorestan, Sistan o Baluchestan, Tehran provinces (Osten et al., 2003).

***Dasyscolia ciliata araratica* (Radoskovsky, 1890)**

Tiphia ciliata Fabricius, 1787 [nominotypical subspecies]

Synonym: *Dielis araratica* Radoskovsky, 1890 (Osten, 2000; Osten et al., 2003).

Material Examined: Kazeron, 2 July 1999, female; Shiraz: Bamu, 8 September 2002, female; Jahrom: Hakan, 5 September 2003, female; Firoz Abad, 21 June 2003, female; Shiraz: Ab Barik 13 August 2004, female.

Distribution: Dodecanese Is., Greek mainland, Iran, Iraq, Israel, North Africa, Turkey.

Iranian records: Iran without more detailed data (Esmaili & Rastegar, 1954); Tehran province (Chahartaghi Abineh, 2002); Chahar Mahall o Bakhtiari, Esfahan, Fars, Golestan, Hamadan, Khorasan, Khuzestan, Mazandaran, Tehran provinces (Osten et al., 2003).

***Dasyscolia ciliata ciliata* (Fabricius, 1787)**

Tiphia ciliata Fabricius, 1787 [nominotypical subspecies]

Synonyms: *Scolia aurea* Fabricius, 1793; *Colpa rufa* Lepeletier, 1845 (Osten, 2005b).

Material Examined: Fasa: Mian-Jangle, 1 June 2000, female; Jahrom: Simakan, 17 May 2004, female. This is a new record for the fauna of Iran and Near East.

Distribution: Balearic Is., Greek mainland, Malta, North Africa (Egypt, Morocco) Portuguese mainland, Spanish mainland.

Scoliini

***Megascolia (Regiscolia) maculata maculata* (Drury, 1773)**

Sphex maculata Drury, 1773 [nominotypical subspecies]

Synonyms: *Solia haemorrhoidalis* Fabricius, 1787; *Scolia (Lacosi) versicolor* Sauaaure, 1859 (Osten, 2005 a; b).

Material Examined: Dasht-e Arzhan, 8 July 1998, female; Kazeron: Nodan, 23 August 1998, female; Sivand, 4 May 1999, male; Shiraz: Dokohak 17 June 2000, male; Sarvestan, 30 April 2000, male; Shiraz: Khanezenian, 14 May 2001, female; Arsanjan, 22 September 2001, male; Arsanjan, 12 June 2002, female; Shiraz: Akbar Abad, 16 July 2002, male; Jahrom: Markazi, 23 September 2003, female; Lar, 12 April 2003, male; Jahrom: Markazi, 22 October 2003, female; Jahrom: Markazi, 8 November 2003, female; Jahrom: Hakan, 19 October 2003, male; Jahrom: Hakan, 3 May 2004, male; Jahrom: Hakan, 1 May 2005, male; Jahrom: Hakan, 12 August 2005, male; Jahrom: Hakan, 24 April 2005, female.

Distribution: Albania, Austria, Bosnia and Herzegovina, Bulgaria, Crete, Croatia, Cyclades Is., Dodecanese Is., French mainland, Greek mainland, Iraq, Hungary, Macedonia, North Africa, Romania, Russia South, Turkmenistan, Slovenia.

Iranian records: Iran without more detailed data (Esmaili & Rastegar, 1954); Tehran province (Chahartaghi Abineh, 2002); Busher, Esfahan, Fars, Gilan, Golestan, Hormozgan, Khuzestan, Lorestan, Mazandaran, Sistan o Baluchestan, Tehran, provinces (Osten et al., 2003).

Scolia (Scolia) anatoliae Osten, 2004

Material Examined: Jahrom: Markazi, 7 September 2005, male. This is a new record for the fauna of Fars province.
Distribution: Crete, Dodecanese Is., Iran, Turkey, Turkmenistan, Uzbekistan, Syria.
Iranian record: Tehran province (Osten, 2004; Osten, 2005a).

Scolia (Scolia) fallax Eversmann, 1849

Misidentification: *Scolia galbula* (Pallas, 1771) (Betrem, 1935; Steinberg, 1962; Osten et al., 2003)
Synonyms: *Scolia moreana* Muche, 1962; *Scolia syriacola* Betrem, 1935; *Scolia tricolor* Bradley, 1972 (Osten, 2000; Osten et al., 2003; Osten, 2005a; b).
Material Examined: Dasht-e Arzhan, 10 July 2002, female; Arsanjan, 19 October 2002, female; Lar, 27 April 2003, male; Jahrom: Hakan, 28 April 2004, female; Jahrom: Markazi, 14 October 2004, female.
Distribution: Armenia, Azerbaijan, Dodecanese Is., Iran, Greek mainland, Turkmenistan, Turkey, Ukraine.
Iranian records: Tehran province (Chahartaghi Abineh, 2002); East Azerbaijan, Fars, Golestan, Kurdistan, Tehran provinces (Osten et al., 2003).

Scolia (Scolia) flaviceps Eversmann, 1846

Material Examined: Jahrom: Hakan, 11 August 1999, Female; Joum, 12 April 2000, Female.
Distribution: Crete, Cyprus, Iran, Iraq Tajikistan, Trans Caucasus, Turkmenistan, Uzbekistan.
Iranian records: Tehran province (Chahartaghi Abineh, 2002); East Azerbaijan, Fars, Gilan, Golestan, Hormozgan, Mazandaran, Tehran provinces (Osten et al., 2003).

Scolia (Scolia) sexmaculata sexmaculata (O. F. Müller, 1766)

Vespa sexmaculata O. F. Müller, 1766 [nominotypical subspecies]
Synonyms: *Scolia beiruti* Betrem, 1935; *Scolia bigittata* Fabricius, 1787; *Scolia dionysopolis* Tkalcu, 1988; *Scolia hispanica* Betrem, 1935; *Scolia montana* Steinberg, 1962; *Scolia quadripunctata* Fabricius, 1775; *Scolia violacea* Panzer, 1799 (Osten, 2000; Osten, 2005a, b).
Material Examined: Jahrom: Markazi, 16 March 2005, female; Shiraz: Dokohak 14 September 2005, female. This is a new record for the fauna of Fars province.
Distribution: Albania, Andorra, Austria, Balearic Is., Bosnia and Herzegovina, Bulgaria, Channel Is., Corsica, Croatia, Cyclades Is., Czech Republic, European Turkey, French mainland, Germany, Greek mainland, Kazakhstan, Kyrgyzstan, Hungary, Iran, Italian mainland, Macedonia, Malta, Moldova, North Aegean Is., North Africa, Portuguese mainland, Romania, Russia Central, Russia East, Russia South, Sardinia, Sicily, Slovakia, Slovenia, Spanish mainland, Switzerland, Turkmenistan, Ukraine, Yugoslavia.
Iranian records: Iran without more detailed data (Esmaili & Rastegar, 1954); Tehran province (Chahartaghi Abineh, 2002); East Azerbaijan, Golestan, Khorasan, Kurdistan, Markazi, Mazandaran, Tehran provinces (Osten et al., 2003).

Scolia (Scolia) sexmaculata orientalis (Steinberg, 1962)

Scolia (Scolia) quadripunctata orientalis Steinberg, 1962
Synonym: *Scolia (Scolia) sexmaculata steinbergi* Betrem, 1964
Material Examined: Jahrom: Simakan, 3 December 2002, male.
Distribution: Turkmenistan, Georgian, Iran.
Iranian records: Tehran province (Chahartaghi Abineh, 2002); Fars, Gilan provinces (Osten et al., 2003).

DISCUSSION

Although Dr. T. Osten studied the fauna of Scoliidae in Iran and adjacent regions (Osten, 2000; Osten et al., 2003; Osten, 2005a), but co-evolution and biology of almost species and their hosts are unknown. we expect that a large number of species remain to be discovered though many will already be described. The species of Scoliidae are important in biological control of Scarabaeidae larvae (Osten et al., 2003), so further study of their occurrence, distribution and biology in Iran should be encouraged.

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SPHECID WASPS FROM EAST AZARBAIJAN PROVINCE, IRAN (HYMENOPTERA: SPHECIDAE)

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ABSTRACT: Thirty eight species of sphecid wasps from East Azarbaijan Province are listed. Two genera (*Diploplectron* Fox, *Tracheliodes* Morawitz) and four species (*Psenulus pallipes* (Panzer, 1798), *Ropalum coarctatum* Scopoli 1763, *Ectemnius sexcinctus* (Fabricius, 1775) and *Cerceris rybyensis* (Linnaeus, 1771) are new records for the fauna of Iran.

KEY WORDS: Sphecidae, Iran, Fauna, East Azarbaijan.

East Azarbaijan Province is one of the 30 provinces of Iran and is located in the northwest of the country, bordering Armenia and Republic of Azerbaijan. The province covers an area of 45846.572 km² (excluding Urmia lake) (Figure 1).

Sphecidae treated as one large family is a paraphyletic entity and based on some phylogenetic analysis, was subdivided into four families: Heterogynaidae, Ampulicidae, Sphecidae and Crabronidae (Bohart & Menke, 1976; Brothers, 1999; Melo, 1999). Sphecids can be distinguished by the posterior margin of the pronotum which is a straight line and terminates laterally into a rounded lobe that does not reach the tegula (Bohart & Menke, 1976). The sphecid fauna of Iran has received relatively little attention and only Esmaili & Rastegar (1974), Ebrahimi (1993, 2004) and de Beaumont (1957) have studied this family in Iran. The fauna of sphecid wasps has not been comprehensively studied in East Azarbaijan Province, and only a few species has been listed by Esmaili & Rastegar (1974) and Ebrahimi (1993, 2004). In this study a list of sphecid wasps in East Azarbaijan Province is given including previously recorded species by mentioned authors.

MATERIALS AND METHODS

In a faunistic survey in East Azarbaijan Province during 2003-2008, the materials were collected using sweeping nets, Malaise and Pan traps. The materials from Hayk Mizayans Insect Museum (HMIM) are also included. Terminology and classification follow Bohart & Menke (1976) and also Richards (1980). In this study sphecids are treated as one large family including 11 subfamilies. The subfamilies and genera are ordered as in Bohart & Menke (1976).

RESULTS

The list of sphecids includes 39 species belonging to 7 subfamilies (Sphecinae, Pemphredoninae, Astataninae, Larrinae, Crabroninae, Nyssoninae, Philanthinae) of which two genera (*Diploplectron* Fox, *Tracheliodes* Morawitz) and four species

(*Psenulus pallipes* (Panzer, 1798), *Rhopalum coarctatum* Scopoli, 1763, *Ectemnius sexcinctus* (Fabricius, 1775), *Cerceris rybyensis* (Linnaeus, 1771) are new records for the fauna of Iran. All the identified species are new for the fauna of East Azarbaijan Province except *Sceliphron destillatorium* (Illiger), *Sphex flavipennis* Fabricius, *Sphex pruinosus* Germar, *Ammophila heydeni* Dahlbom, *Podalonia hirsuta* (Scopoli), *Bembix bidentata* Vander Linden and *Philanthus triangulum* (Fabricius) which were previously reported by Ebrahimi (1993, 2004).

I-Subfamily Sphecinae

Members of this subfamily are conspicuous because of their large size and distinctive cylindrical petiole in reference to which they are called "thread waisted wasps". They are found almost everywhere and prey on insect larvae that are real or potential enemies of man so are of economic importance. In this study nine species from this subfamily were identified.

***Chalybion femoratum* (Fabricius, 1781)**

Material: Tabriz; Sardroud, 14.VII.2004. leg. Iranipour, 1♀. Marand; Yam, 1750m, 26.VI.2005, leg. Ghazi-Soltani, pan trap, 1♀. Jolfa; Siahroud, 1400m., 11.VIII.2005, leg. Gilasian and Ebrahimi, 2♂1♀. Tabriz; Khosrow-Shahr, IV-V.2008. leg. Lotfalizadeh, Malaise trap, 3♂.

This species was reported from the north of Iran by de Beaumont in 1957 (Pulawski 2007).

***Sceliphron destillatorium* (Illiger, 1807)**

Material: Tabriz; Khalatpoushan, 1570m, 5.X.1994 and 1.I.1996, 2♀. Shahsavar 31.VIII.1997, 1♀. Osku; Kandovan, 8.VII.2005. 2800m, leg. Gilasian and Ebrahimi, 1♀. Tabriz; Shadbad, 18,IV.1954, 1♀.

This species was firstly reported from Iran by Radoszkowski in 1871 from Astarabad in Gorgan Province (Pulawski 2007). Recently Ebrahimi (1993) has reported it from Shadabad in East Azarbaijan Province.

***Sphex flavipennis* Fabricius 1793**

Material: Maragheh; Shorsou, 26.VIII.2004, leg. Azarifam, 1♀. Ahar: 20.VII.1968, leg. Abaii and Modjib, 1♀.

Ebrahimi (1993) reported it from Ahar. This species is distributed in Mediterranean region, United Arab Emirates, Iran and Afghanistan (Menke & Pulawski 2000).

***Sphex pruinosus* Germar 1817**

Material: Tabriz; Duzal, 15.VIII.1961, leg. Damanabi, 1♀.

This material is kept in HMIM, identified by Z. Bouček in 1971 and is reported for East Azarbaijan by Ebrahimi (1993).

***Prionyx songaricus* (Eversmann, 1849)**

Material: Jolfa; Siahroud, 24.VIII.2005, leg. Ghazi-Soltani, 1♀.

It occurs in Turkey, Israel, Iran, Iraq and Afghanistan according to Bohart & Menke (1976).

***Prionyx* sp.**

Material: Tabriz; Khalatpoushan, VII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀.

This specimen has creamy bands around gasteral segments and it may be *P. kirbii* (Vander Linden) or a related species.

***Podalonia hirsuta* (Scopoli, 1763)**

Material**:** Aylakhli; Jegha village, VI.2005, leg. Ghazi-Soltani, 1♀. Jolfa; Daran, V.2005, leg. Ghazi-Soltani, 1♀. Dare- Livghvan, 31.VII.2004, leg. Ghazi-Soltani, 1♀. Mamaghan, 25.V.2004, leg. Ghazi-Soltani, 1♀. Varzeghan; Aghababadash, 30.VII.2004, leg. Ghazi-

Soltani, 1♀. Bonab, VII.2005, leg. Ghazi-Soltani Malaise trap, 1♀. Marand; Mishab mountains, 22.VI.2004, leg. Ghazi-Soltani, 1♀.
This species, previously reported from East Azarbaijan, Lighvan (Ebrahimi 1993) is widely distributed and occurs abundantly in the province. These specimens with entirely black body belong to subspecies *Podalonia hirsuta mervensis* Rad (de Beamont 1967).

Ammophila sabulosa Linnaeus 1758

Material: Beiragh village, 17.VII.2004, leg. Iranipour, 1♂. Maragheh; Khormazard, 4.VII. 2004. leg. Ghazi-Soltani, 1♂. Tabriz; Bostanabad, VI.2005, leg. Ghazi-Soltani, 1♂.
De Beaumont (1957) reported it from north of Iran.

Ammophila heydeni Dahlbom 1845

Material: Tabriz; Dand mountain, 4.VIII.2004, leg. Ghazi-Soltani, 1♀. Jolfa; Siahroud, 24.VIII.2005, leg. Ghazi-Soltani, 1♀. Tabriz; Khalatpoushan, XI.2005, leg. Ghazi-Soltani, Malaise trap, 2♀. Sarab, 15.VII.1970, leg. Naiimi, 1♀.
Ebrahimi (1993) reported it from East Azarbaijan, Sarab.

II-Subfamily Pemphredoninae

The pemphredonines are recognized by one or more of the following characters: a stem like sternal petiol, a cuboidal head and enlarged forewing stigma. Pemphredoninae contains two tribes of nearly equal size: Psenini and Pemphredonini (Bohart & Menke, 1976). In East Azarbaijan Province three species occur (2 undetermind species) in three genera.

Mimesa sp.

Material: Tabriz; Khalatpoushan, IX.2006, leg. Ghazi-Soltani, Malaise trap. ♂.
The genus *Mimesa* was treated as a subgenus of *Psen* Latreille (Richards 1980), but Bohart & Menke (1976) considered it as a separate genus. Based on a key to males presented by Richards (1980), this species resembles *M. bicolor* (Jurine) because of absence of flagellar segments keeled beneath, and to *M. lutarius* Fabricius in having mesopleuron less strongly and at most only rather closely punctured. The only species of *Mimesa* from Iran is *Mimesa grandii* Maidl (Pulawski 2007).

Passaloecus sp.

Material: Tabriz; Khalatpoushan, 13.XI.2006, leg. Ghazi-Soltani, Malaise trap, 1♀. Maragheh; Alavian, 24.VI.2006 leg. Ghazi-Soltani, 1♀.
These specimens are easily identified as a *Passaloecus* by the following characters: episternal sulcus well developed, extending from subalar fossa to hypersternaulus and beyond, hypersternaulus horizontal and these specimens have well-defined scrobal sulcus, parallel to hypersternaulus. Inner orbits are parallel. Two spices of *Passaloecus* reported from Iran are*: P. turionum* Dahlbom and *P. gracilis* (Curtis) by de Beaumont in 1957 and Ebrahimi in 2007 respectively (Pulawski 2007).

Psenulus pallipes (Panzer, 1798)

Material: Marand; Yam, 15.VIII.2005, leg. Ghazi-Soltani, Malaise trap, ♀.
In these female specimens, second gasteral sternite has a large well-defined, shallow depression on its basal half and gasteral sterna IV and V have pale fringes of hairs. This species is the first record for Iran.

III-Subfamily Astataninae

The Astataninae is a small group which retains many characters of the archaic sphecid stock. This group has been treated variously as a subfamily or as a tribe, usually in the Larrinae (Bohart & Menke, 1976). From this subfamily three species were found in East Azarbaijan Province with a new generic record for Iran.

Members of this subfamily were abundantly captured in the Malaise traps installed in Khalatpoushan.

***Astata kashmirensis* Nurse 1909**

Material: Tabriz**;** Khalatpoushan, 13.VIII.2005, leg. Ghazi-Soltani, Malaise trap, ♂.
These specimens were identified by comparing them with the material in HMIM which was previously identified by W. J. Pulawski in 1974 as *Astata stecki* de Beaumont 1942. According to Bohart & Menke (1976), distributional region of it is north-west of India.

***Dryudella* sp.**

Material: Tabriz; Khalatpoushan, VII.2005, leg. Ghazi-Soltani, pan trap and Malaise trap, 2♂.
The specimens have a white bilobed spot in front of midocellus and two white spots on gasteral tergum I. De Beaumont (1957) has recorded only one species from Iran as *D. tricolor*.

***Diploplectron* sp.**

Material: Tabriz; Khalatpoushan, 16.VIII. 2005, leg. Ghazi-Soltani, Malaise trap, ♀.
This genus had not been reported from Iran. The genus *Diploplectron* Fox was identified by the following characters: first recurrent vein interstitial, clypeus tridentate and propodeal enclosure granulate. Its identification was postponed until more materials are collected.

IV-Subfamily Larrinae

This is the largest subfamily in Sphecidae, with over 2,000 species (Bohart & Menke, 1976). For the most part they are fairly compact, often dark colored wasps.

***Larra anathema* Rossi, 1790**

Material: Maragheh; Checkan, 4.VI.2004, leg. Ghazi-Soltani, 2♀. Varzeghan; Sarand, 30.VI.2004, leg. Ghazi-Soltani, 1♀.
This species was reported for Iran by Esmaili & Rastegar in 1974.

***Liris niger* (Fabricius, 1775)**

Material: Marand; Yam, III.2005, leg. Ghazi-Soltani, pan trap, 1♀.
The species was previously recorded for Iran by Ebrahimi (2004). It has been mentioned as *Liris nigra* by Bohart & Menke (1976).

***Trypoxylon scutatum* Cheverier, 1876**

Material: Marand; Yam, 12.VII.2006, leg. Ghazi-Soltani, pan trap, 1♀. Tabriz; Khosrow-Shahr, IV-V.2008. leg. Lotfalizadeh, Malaise trap,1♀.
It occurs in Europe (Bohart & Menke, 1976) and de Beaumont reported it from Iran in 1957 (Pulawski 2007).

***Trypoxylon clavicerum* Lepeletier & Serville, 1828**

Material: Mianeh; Gharechaman, VI.2005 leg. Ghazi-Soltani, 1♀2♂.
It occurs in the whole Palearctic Region.

***Miscophus* sp.**

Material: Tabriz; Khalatpoushan, IX.2005, leg. Ghazi-Soltani, Malaise trap, 1♀.
The characters that allow identification of this specimens as a *Miscophus* are: strong precoxal sulcus, laterally excised free clypeal margin, presence of two submarginal cells; second petiolate. Reported species from Iran are M. *bicolor* Jurine and M. *pretiosus* Kohl by de Beaumont (1957) and *M. ater* Lepeletier de Saint Fargeau by Ebrahimi (2004).

V-Subfamily Crabroninae

The crabronins show a great variety of forms and are recognized especially by the cuboidal head and the single discrete submarginal cell of the forewing. The subfamily contains two tribes, Crabronini and Oxybelini that are separated by the fusion of the forewing submarginal cell with the first discoidal cell in the latter (Bohart & Menke, 1976). Seven genera and six species are identified from the region.

***Oxybelus latro* Olivier 1811**

Material: Tabriz; Khalatpoushan, 27.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀. Bonab, V-VI.2005, leg. Ghazi-Soltani, Malaise trap, 1♀.
De Beaumont (1957) has reported it for the first time from the north of Iran.

***Lindenius* sp.1**

Material: Tabriz; Khalatpoushan, 27.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀. Marand; Yam, 4.VII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀.
Frons with a prominence between the antennal sockets, mandibles, scape, pronotal collar, scutellum, tibia and tarsi yellow. Four species of this genus have been reported from Iran: *L. anatolicus* de Beaumont, *L. armatus* (Vander Linden), *L. iranius* Leclercq, and *L. sardashti* Leclercq. The two latter species are reported from Sardasht of Azarbaijan-e Gharbi (West Azarbaijan) Province (Pulawski 2007).

***Lindenius* sp.2**

Material: Maragheh; Checkan, 24.VI.2006, leg. Ghazi-Soltani, Malaise trap, 1♀.
This species can be distinguished from later by its entirely black body.

***Rhopalum coarctatum* Scopoli, 1763**

Material: Marand; Yam, 4.VIII.2005, leg. Ghazi-Soltani, Malaise trap, ♀.
It has a strong prominence between the antennal sockets, the first gasteral segment longer than the hind femur and the clypeus strongly pointed. It is the first record for the fauna of Iran.

***Crossocerus tarsatus* Shuckard 1837**

Material: Marand; Yam, VI.2005, leg. Ghazi-Soltani, pan trap, ♂.
Dollfuss (2006) reported it for Iran in (Pulawski 2007).

***Crossoserus quadrimaculatus* (Fabricius, 1793)**

Material: Tabriz; Khalatpoushan, 19.VI.2005, leg. Ghazi-Soltani, pan trap, 1♂. Osku; Kandovan, 4.IX.2004, leg. Ghazi-Soltani, 2♂.
De Beaumont (1957) reported it from the north of Iran.

***Tracheliodes* sp.**

Material: Marand; Yam, 4.VIII.2005, leg. Ghazi-Soltani, ♀.
Its morphological characters are as follow: Palpal formula 6-3, fore trochanter slender and elongate, clypeus with a vertical prominence. This genus has 15 species distributed worldwide without any record from Iran (Pulawski 2007).

***Ectemnius sexcinctus* (Fabricius, 1775)**

Material: Marand; Yam, 4.VII.2005, leg. Ghazi-Soltani, Malaise trap, ♂.
Its central tooth beneath third antennal segment has a few curled hairs. It is a new record for Iranian fauna.

***Lestica clypeata* Schreber, 1759**

Material: Mianeh; Gharechaman, 2005, on Crucifera, leg. Ghazi-Soltani, 1♂. Kaleybar, 2006, on Crucifera, leg. Ghazi-Soltani, 1♂. Maragheh; Checkan, 2006, on Euphorbiacae, leg.

Ghazi-Soltani, 1♂. Mianeh,VI.2003, leg. Abasi Yanbolagh, 1♂. Marand; Yam, VI.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 2♀. Tabriz; Khalatpoushan, 1.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀. Tabriz; Sardroud, 15.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 10♀.
This species is distributed in whole Palaearctic region.

VI-Subfamily Nyssoninae

Bohart & Menke (1976) have included seven tribes and 71 genera in the subfamily. The majority are medium-small to medium-large wasps. The variety of shapes, sizes and markings within the subfamily makes it impossible to visualize a typical nyssonine. The following species from this family are all from HMIM.

Bembix bidentata Vander Linden, 1829

Material: Kaleibar; Vinagh, 800m, 7-8.VIII.1992, leg. Parchami and Badii, 6♀. Tabriz, Sarab, 25.VII.1970, leg. Naim, 1♀.
It recorded from north of Iran by Handlirsch in 1895 (Pulawski 2007).

Bembix oculata Panzer, 1801

Material: Kaleybar; Gheshlagh, 1280m, 9.VII.2005, leg. Gilasian and Ebrahimi, 1♀.
This species is distributed in Europe, Middle East, Iran and Afghanistan (Bohart & Menke, 1976) and Morice has reported it from Bandar-e-Anzali (on the coast of Caspian Sea) in 1921 (Pulawski, 2007).

Bembix bicolor Radoszkowski, 1877

Material: Tabriz; Vaniar, 28.VI.1975, 3♂, 15.VIII.1972, 1♂.
Iran, Middle East to Afghanistan and Mongolia are distributional region of this species (Bohart & Menke, 1976). It was reported from Iran by de Beamont in 1957 (Pulawski 2007).

Harpactus leavis (Latreille, 1792)

Material: Marand; Yam, 24.VI,4.VIII.2005, leg. Ghazi-Soltani, pan trap, 2♀1♂. Tabriz; Khosrow-Shahr, IV-V.2008. leg. Lotfalizadeh, Malaise trap, 1♀1♂.
Ebrahimi (2004) reported it for Iran (Pulawski 2007).

VII-Subfamily Philanthinae

As the subfamily name implies, the philanthines are commonly found on or about flowers. Over three-fourths of these are contained in *Cerceris*, the largest sphecid genus. The Philanthinae contain six tribes and 11 genera. Five species in 2 genera occur in East Azarbaijan Province.

Philanthus triangulum (Fabricius, 1775)

Material: Tabriz; Khalatpoushan, 15.VIII.2005, leg. Ghazi-Soltani, Malaise trap, 3♀. Osku; Kandovan, 4.IX.2004, leg. Ghazi-Soltani, 1♀. Marand; Yam, 4.VIII.2004, leg. Ghazi-Soltani, 1♀. Varzeghan; Abesh Ahmad- Horand, 1100m. 26.VII.2005, leg. Ghazi-Soltani, 1♀. Varzeghan; Sarand, 29.VII.2004, leg. Ghazi-Soltani, 1♀.
This species reported for Iran by Morice in 1921 from Bandar-e Anzali.

Cerceris sp.

Material: Tabriz; Azarshahr,2004, leg. Vaez, 1♂.
According to the key of Guichard (1993), this species resembles *C. eugenia* Schletterer in having lateral spines on 6th gasteral sternite.

Cerceris tricolorata Mochi, 1838

Material: Marand; Yam, VIII.2005, leg. Ghazi-Soltani, 1♀.
It is widely distributed in the Palearctic region (Bohart & Menke, 1976).

Cerceris rybyensis (Linnaeus, 1771)

Material: Marand; Zal, 19.VIII.2004, leg. Ghazi-Soltani, ♀ ♂.
This species which is the new record for Iranian fauna is widely distributed in Palearctic region (Bohart & Menke, 1976).

Cerceris quadricincta (Panzer, 1799)

Material: Marand; Yam, 26.VII.2005, leg. Ghazi-Soltani, Malaise trap, 1♀. Mianeh, VI. 2003. leg. Abbasi Yanbolagh, 1♀. Jolfa; Siahroud, 1400m. 11.VIII.2005, leg. Gilasian and Ebrahimi, 1♀. Kaleybar; Geshlagh, 1280m. 9. VIII. 2005, leg. Gilasian and Ebrahimi, 1♀.
It is widely distributed in the Palearctic region (Bohart & Menke, 1976).

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Abbreviation	County (Shahrestan)
A	Ahar (Arasbaran)
B	Bonab
B	Bostan Abad
H	Heris
HR	Hashtrood
K	Kalibar
Md	Marand
Mn	Mianeh
Mq	Maraqeh
S	Sarab
Sh	Shabestar
T	Tabriz

Figure 1. East Azarbaijan Province and the location of its counties (From Wikipedia, the free encyclopedia at: http://en.wikipedia.org/wiki/East_Azerbaijan).

NEW NAMES FOR THE PREOCCUPIED SPECIFIC AND SUBSPECIFIC EPITHETS IN THE GENUS *PHEIDOLE* WESTWOOD, 1839 (HYMENOPTERA: FORMICIDAE)

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[Özdikmen, H. 2010. New names for the preoccupied specific and subspecific epithets ın the genus *Pheidole* Westwood, 1839 (Hymenoptera: Formicidae). Munis Entomology & Zoology, 5 (2): 804-806**]**

ABSTRACT. According to the International Code of Zoological Nomenclature (ICZN, 1999), *Pheidole longipes* (Smith, 1857); *Pheidole longiscapa* Zhou & Zheng, 1999; *Pheidole pallidula inermis* Stitz, 1917 and *Pheidole pallidula tristis* Forel, 1907 are not correct because the specific or subspecific epithets are illegitimate. The author request the replacement names of the specific and subspecific epithets *longipes* Smith, 1857; *longiscapa* Zhou & Zheng, 1999; *inermis* Stitz, 1917 and *tristis* Forel, 1907 and he suggest *singaporensis* nom. nov., *neolongiscapa* nom. nov., *selenia* nom. nov. and *tasdelenia* nom. nov. resppectively. Accordingly, new combinations are herein proposed for the species and subspecies: *Pheidole singaporensis* nom. nov. pro *Pheidole longipes* (Smith, 1857) syn. n., *Pheidole neolongiscapa* nom. nov. pro *Pheidole longiscapa* Zhou & Zheng, 1999 syn. n., *Pheidole pallidula selenia* nom. nov. pro *Pheidole pallidula inermis* Stitz, 1917 syn. n. and *Pheidole pallidula tasdelenia* nom. nov. pro *Pheidole pallidula tristis* Forel, 1907 syn. n..

KEY WORDS. Nomenclatural change, homonymy, replacement name, Hymenoptera, Formicidae, *Pheidole*.

Family FORMICIDAE
Genus *PHEIDOLE* WESTWOOD, 1839
Sp. *PHEIDOLE SINGAPORENSIS* nom. nov.

Pheidole longipes (Smith, 1857). J. Proc. Linn. Soc. London, Zool., 2: 70. Preoccupied by *Pheidole longipes* (Latreille, 1802). Hist. nat. fourm. rec. mem. ..... Paris. p. 233. (Hymenoptera: Vespoidea: Formicidae).

The specific epithet *longipes* was initially introduced by Latreille (1802) with the original combination *Formica longipes* Latreille, 1802 from Cayenne, French Guiana. It is still used as a valid species name. Subsequently, Smith (1857) described a new species *Pheidole longipes* from Singapore, Borneo with the same specific epithet as *Myrmica longipes* Smith, 1857 by original combination. *Pheidole longipes* (Latreille, 1802) has priority over *Pheidole longipes* (Smith, 1857). The name *Pheidole longipes* (Smith, 1857) is a secondary junior homonym of the name *Pheidole longipes* (Latreille, 1802). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *longipes* Smith, 1857 the replacement name *singaporensis* nom. nov..

Etimology: The name is dedicated to the type locality of the preexisting species.

Summary of nomenclatural changes:

Species *Pheidole singaporensis* **nom. nov.**

pro *Pheidole longipes* (Smith, 1857) **syn. n.** [nec *Pheidole longipes* (Latreille, 1802)]

[orig. comb.: *Myrmica longipes* Smith, 1857 from Singapore, Borneo]

Sp. *PHEIDOLE NEOLONGISCAPA* nom. nov.

Pheidole longiscapa Zhou & Zheng, 1999. Acta Zootax. Sin., 24 (1): 85. Preoccupied by *Pheidole longiscapa* Forel, 1901. Ann. Soc. Ent. Belg., 45: 358. (Hymenoptera: Vespoidea: Formicidae).

The specific epithet *longiscapa* was initially introduced by Forel (1901) with the original combination *Pheidole longiscapa* Forel, 1901 from Venezuela. It is still used as a valid species name. Subsequently, Smith (1857) described a new species from Guangxi, China with the same specific epithet as *Pheidole longiscapa* Zhou & Zheng, 1999 by original combination. *Pheidole longipes* (Latreille, 1802) has priority over *Pheidole longiscapa* Zhou & Zheng, 1999. The name *Pheidole longiscapa* Zhou & Zheng, 1999 is a primary junior homonym of the name *Pheidole longipes* (Latreille, 1802). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the specific epithet *longiscapa* Zhou & Zheng, 1999 the replacement name *neolongiscapa* nom. nov..

Etimology: The name derived from the current specific epithet.

Summary of nomenclatural changes:

Species *Pheidole neolongiscapa* **nom. nov.**

pro *Pheidole longiscapa* Zhou & Zheng, 1999 **syn. n.** [nec *Pheidole longiscapa* Forel, 1901]

[orig. comb.: *Pheidole longiscapa* Zhou & Zheng, 1999 from Guangxi, China]

Sp. *PHEIDOLE PALLIDULA* (Nylander, 1849)
Ssp. *PHEIDOLE PALLIDULA SELENIA* nom. nov.

Pheidole pallidula inermis Stitz, 1917. Mitt. Zool. Mus. Berl., 8: 340. Preoccupied by *Pheidole inermis* Mayr, 1870. Verh. Zool.-Bot. Ges. Wien, 20: 979, 982, 984. **(**Hymenoptera: Vespoidea: Formicidae).

The specific epithet *inermis* was initially introduced by Mayr (1870) with the original combination *Pheidole inermis* Mayr, 1870 from Mexico. It is still used as a valid species name. Subsequently, Stitz (1917) described a new variety of the species *Pheidole pallidula* from E Messina, Italy with the same subspecific epithet as *Pheidole pallidula* var. *inermis* Stitz, 1917 by original combination from Algeria. *Pheidole inermis* Mayr, 1870 has priority over *Camponotus Pheidole pallidula inermis* Stitz, 1917. The name *Pheidole pallidula inermis* Stitz, 1917 is a primary junior homonym of the name *Pheidole inermis* Mayr, 1870. According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *inermis* Stitz, 1917 the replacement name *selenia* nom. nov..

Etimology: The name is dedicated to Selen Çatak (Turkey).

Summary of nomenclatural changes:

Species *Pheidole pallidula* (Nylander, 1849)

[orig. comb.: *Myrmica pallidula* Nylander, 1849 from E Messina, Italy]

Subspecies *Pheidole pallidula selenia* **nom. nov.**

pro *Pheidole pallidula inermis* Stitz, 1917 **syn. n.** [nec *Pheidole inermis* Mayr, 1870]

[orig. comb.: *Pheidole pallidula* var. *inermis* Stitz, 1917 from Algeria]

Sp. *PHEIDOLE PALLIDULA* (Nylander, 1849)
Ssp. *PHEIDOLE PALLIDULA TASDELENIA* nom. nov.

Pheidole pallidula tristis Forel, 1907. Ann. Soc. Ent. Belg., 51: 204. Preoccupied by *Pheidole tristis* (Smith, 1858). Catalogue of the hymenopterous insects in the collection of the British Museum. Part VI. Formicidae**.** London. p. 132. (Hymenoptera: Vespoidea: Formicidae).

The specific epithet *tristis* was initially introduced by Smith (1858) with the original combination *Myrmica tristis* Smith, 1858 from Rio de Janeiro. It is still used as a valid species name. Subsequently, Forel (1907) described a new variety of the species *Pheidole pallidula* from E Messina, Italy with the same subspecific

epithet as *Pheidole pallidula* var. *tristis* Forel, 1907 by original combination from Tunusia. *Pheidole tristis* (Smith, 1858) has priority over *Pheidole pallidula tristis* Forel, 1907. The name *Pheidole pallidula tristis* Forel, 1907 is a primary junior homonym of the name *Pheidole tristis* (Smith, 1858). According to Article 60 of the International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no synonym. So I propose for the subspecific epithet *tristis* Forel, 1907 the replacement name *tasdelenia* nom. nov..

Etimology: The name is dedicated to Semiha Taşdelen (Turkey).

Summary of nomenclatural changes:

Species *Pheidole pallidula* (Nylander, 1849)
[orig. comb.: *Myrmica pallidula* Nylander, 1849 from E Messina, Italy]
Subspecies *Pheidole pallidula tasdelenia* **nom. nov.**
pro *Pheidole pallidula tristis* Forel, 1907 **syn. n.** [nec *Pheidole tristis* (Smith, 1858)]
[orig. comb.: *Pheidole pallidula* var. *tristis* Forel, 1907 from Tunusia]

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SUSTAINABLE USE OF LEAFCUTTING BEE HIVES FOR ALFALFA POLLINATION

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[Elfattah, M. S. A. 2010. Sustainable use of leafcutting bee hives for alfalfa pollination. Munis Entomology & Zoology, 5 (2): 807-811**]**

ABSTRACT: The pollination of flowering plants is an important ecological service in natural and agricultural ecosystems. The majority of angiosperm plants rely on animals for pollination. The coevoulution of bees and flowers has resulted in special morphological adaptations for both insects and plants, and the need of some plants for pollination by bees are absolute. One of the major forage corps in Egypt and other part of the world is alfalfa. The leafcutting bees are very important pollinator of alfalfa, different natural nests had been found in Eastern part of Egypt but these nests under a high risk due to construction of news house instead of old mud wall houses. Foam nests had been created yearly from 2003 and used as hives for conservation of bees and used it for alfalfa pollination. The impact of using leafcutting hives proved a high seed production and easy to handle by farmers, the hives are very easy for preservation, storage and reuse.

KEY WORDS: Alfalfa, Pollination, Seed Production, Leafcutting bees.

One of the major problems that face most of the newly reclaimed areas is the relatively low production of crops due to the lack of insect pollinators. The same problem is found also in the certain areas of the old cultivated land due to the wide use of pesticides. The mechanization of agriculture affected on the wild pollinators as well as the honey bees industry. Also the concrete houses have been moved quickly to replace the old mud houses in the villages. Alfalfa, *Medicago sativa* (L., 1753), is a high quality forage and green manure crop that originated in the Middle East. Varieties are available and are being bred that are well-adapted to reclaimed agricultural lands in Egypt. Solitary bees and bumble bees are most efficient pollinators of alfalfa. Honey bee efficiency on the other hand is low after opening alfalfa flowers several times honey bee "learns" to collect nectar without tripping them, owing to the specific structure of alfalfa flower. For that reason, despite the abundance of honey bee in alfalfa fields, seed yield per hectare may be very poor when solitary bees and bumble bees are not present. For instance, low alfalfa seed yields were recorded in the most agriculturally developed countries, which were the first to apply pesticides and the first to destroy the natural habitats of native solitary bees by introducing monocultures over vast areas. This soon resulted in thinning the fauna of native pollinators and caused a drastic reduction in alfalfa seed yields. The problem was successfully overcome for the first time in the USA and Canada with the domestication and utilization of the solitary bee *Megachile rotundata* (Fabricius, 1793) (Stephen, 1961; Bohart, 1962; Klostermeyer, 1964; Hobbs, 1965; Free, 1976). Alfalfa flowers require visiting bees to trip the sexual column, there by providing pollination and subsequent pod and seed set. However, tripping done by a specialized group of bees which enter the flowers and press their keel by their own weight there by releasing male and female organs to distribute pollen and effect cross- pollination (Abrol, 1993). Natural nests of leafcutting bees had been found at Eastern part of Egypt (Fig.1)

but these nests under a big risk because most farmers exchange the old mud houses with new concert houses (Kamel et al., 2007). These areas have many natural nests of leafcutting bees which are very important for alfalfa pollination in the world (Shebl et al., 2009a).

The goal of this research is to develop self-sufficiency and stable high yields in seed production for locally adapted, high quality alfalfa varieties for reclaimed lands. To attain this goal, management protocols for one or more native solitary bee species that pollinate clover and alfalfa must be developed.

Artificial bee nests were prepared in March 2006 and transformed to natural nest sites in Tel El Kebir and El- Huseiniya (30°33' 30"N, 31°56' 13"E) about 50km west of Ismailia on the Delta of River Nile (Kamel et al., 2007) (Fig. 1).The natural nests transferred to the experimental field by the end of July and August for overwintering period. The artificial nests preserved and kept from any damage or attack by ants or any other pests during all seasons. The artificial which used for nesting bees were prepared by using foam nests. Each hive consists of 50 pieces of foam (50 cm length; 12 cm width and 2 cm thickness). In each piece of foam were 26 holes (10 cm depth; 6 mm diameter). After sticking the foam pieces above each other holes were created in this block and the hive was performed, paper tubes (10 cm in length; 5.2 mm internal diameter), inserted in each hole. All hives were painted with black color for imitation of the natural nests (Fig. 2). The artificial nests transferred to the natural nests sites in different villages of Tel El Kebir in April till the end of July 2006.

Nesting activities of leacutting bees first appeared just shortly after the emergence of females i.e. during mating period and continued to the end of the activity season. The emergency of bees was started on April (females activity was from April to June) The female usually hovers around the nests to select suitable nesting site for herself. After selecting the nest, she started cleaning it before inhabiting it (Fig. 3) (Shoukry et al., 2007; Shebl et al., 2008a). Using artificial nests showed good results and big variation between different hives was clear. This is easily explained because of suing different localities of natural nests and different biotic factors specially wind. The percentages of nesting obtained were 32.04 % in 2005 and 48.3% in 2006.

Alfalfa, *Medicago sativa*, had a blooming period in the experimental farm of about 8 weeks from late March till the end of May. During the blooming period leafcutting bees visited and pollinated the alfalfa flowers. Observations indicated that males of leaf-cutting bees start flying a few days before the females but there is no role for the males in the tripping of alfalfa flowers (Fig. 3). The female bees have special characters on the ventral side on abdomen, group of hairs (scopa) for collecting pollens from alfalfa flowers, this character lacked in males and other bees (honey bees the scopa on the hind leg) (Fig. 3). In this way the male has no efficiency in the pollination of alfalfa (Cane, 2002). Bees start to visit alfalfa flowers around 9 am, the number of bees increased considerably at 10 am; bees were most active around 1 pm (Fig. 4).

The influence of temperature and light intensity at the beginning of flight of males and females was studied. Bees start foraging under conditions of low temperature and high light intensity or vice versa. The females spend the night in the nest, faced inward. As temperatures rise in the morning, they turn around and face the entrance but do not come out and fly only when the temperature exceeds 20°C. Bees stopped foraging in the evening bees fly approximately ¼ mile to find food (Peterowski, 1991).

Results indicated that there were no significant differences between the average numbers of flowers per inflorescence per plant, but numbers of pods

significant differences between the treatments were found. The maximum high production of alfalfa seeds was in the plants so close to the nest then production becomes less due to the distance from artificial nests (Shebl et al., 2008b; Shebl et al., 2009b) (Table. 2).

The impact of flower abundance and pollinator movement on seed or fruit yield is of economic importance, and may have implications for crop pollinator management. The number of open flowers and nectar availability declined more rapidly close to bee shelters than at a distance. Interrupted the rapid decline in floral resources partly as a result of steady pollination over time (Strickler & Freitas,1999) (Fig. 5).

CONCLUSION

Relying on honeybees for crop pollination may be will lead to decrease of seed production. It is mandatory searching for other bee pollinators, conservation of wild bees will solve this problem. Recently honeybees affected by many problems and disease, especially colony collapse disorder. Using and conserving lefacutting bees will increase alfalfa seed production and other crops as well. Using artificial hives so recommended to framers for many reasons easy to handle, storage and reuse. In addition, by using the hives it could help for keep these bees in nature and save it from disappear. However, the high seed production had been shown by the recent and previous studies. 1/3 of human diets are responsible of bee pollination; recommending farmers which such kind of information of wild bees hopefully will increase crop production and better life.

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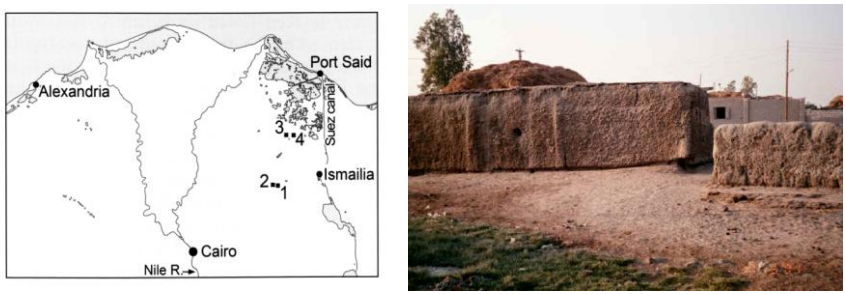

Figure 1. Positions of natural leafcutting bee nests, 1- 2 (Tel El-Kebir); 3 -4 (El- Huseiniya).

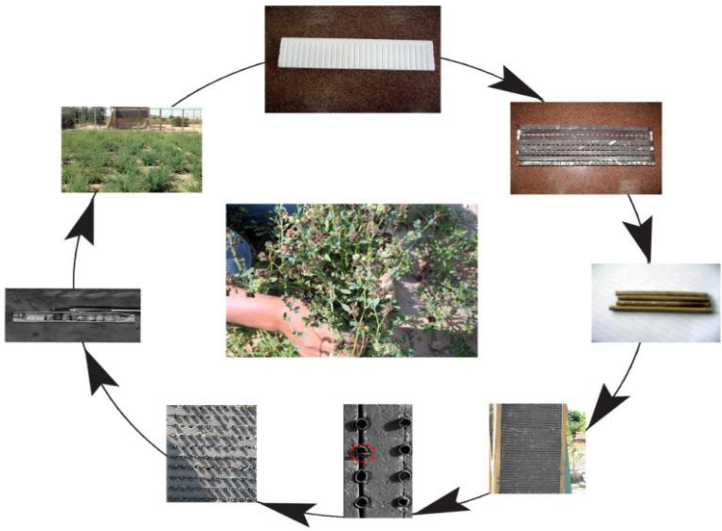

Figure 2.The manufacture processing of leafcutting bees hives.

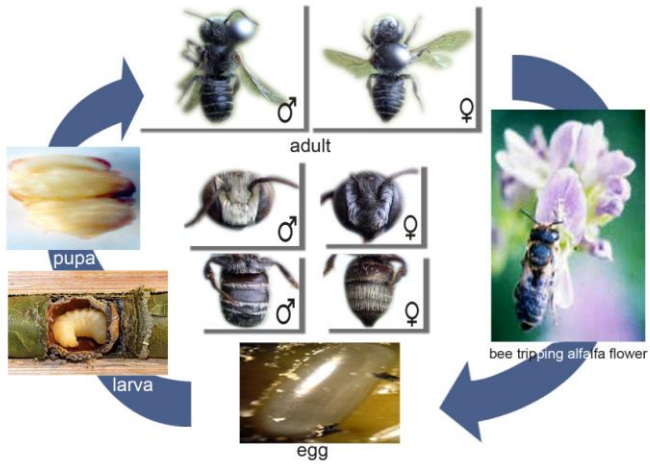

Figure 3. Lefacutting bees life cycle.

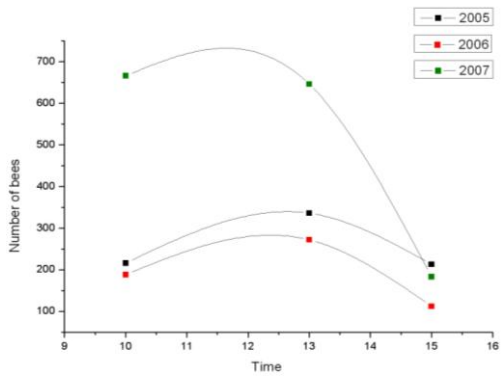

Figure 4. The total number of bees at three times per day at 2005, 2006 and 2007.

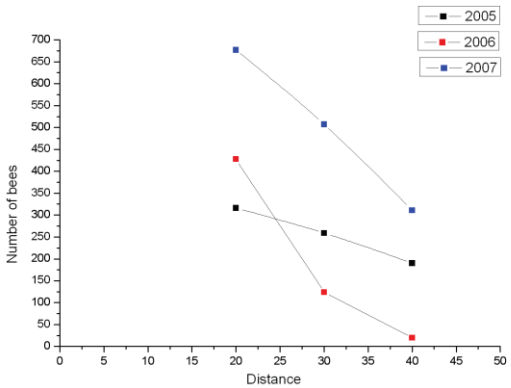

Figure 5. The total number of bees at three distances from the nest at 2005, 2006 and 2007.

PROPOSED CONSERVATION OF THE SPECIFIC NAME *RHAMNUSIUM BICOLOR* (SCHRANK, 1781) THREATENED BY AN OLDER NAME WITH COMMENTS ON SUBSPECIFIC STATUS (COLEOPTERA: CERAMBYCIDAE: LEPTURINAE)

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[Özdikmen, H. & Turgut, S. 2010. Proposed conservation of the specific name *Rhamnusium bicolor* (Schrank, 1781) threatened by an older name with comments on subspecific status (Coleoptera: Cerambycidae: Lepturinae). Munis Entomology & Zoology, 5 (2): 812-818**]**

ABSTRACT: Proposed conservation of the specific name *Rhamnusium bicolor* (Schrank, 1781) threatened by an older name with comments on subspecific status (Coleoptera: Cerambycidae: Lepturinae).

KEY WORDS: Conservation of name, *Rhamnusium bicolor,* Lepturinae, Cerambycidae.

First of all, the genus *Rhamnusium* Latreille, 1829 had been a classification problem on tribal rank until recent times. Traditionally, it was placed by authors in the tribe Rhagiini Kirby, 1837. Vives (2000) separated the genera *Rhamnusium* Latreille, 1829 and *Rhagium* Fabricius, 1775 from other Rhagiini and he grouped the others in the tribe Toxotini Mulsant, 1839. However, the genus *Rhamnusium* was given by Althoff and Danilevsky (1997) under the tribal name Rhamnusiini Danilevsky, 1997 firstly. Several tribes (Rhamnusiini, Oxymirini, Enoploderini) were named in Althoff and Danilevsky (1997). However, the tribal names Rhamnusiini Danilevsky, 1997 and Enoploderini Danilevsky, 1997 was not available according to the Art. 13.1 of ICZN (1999). The same opinion was shared by Vitali in Zicha et al. (2009). He also mentioned that Enoploderini and Rhamnusiiini compared only in electronic papers. In addition to this, the separation as Rhamnusiini Danilevsky, 1997 seems to be required. According to Sýkorová (2008), the three lepturine genera [*Enoploderes, Rhamnusium* and *Sachalinobia*] probably should not be included in any of the existing tribes (Xylosteini, Oxymirini, Rhagiini s.l., Lepturini). Therefore, Rhamnusiini required as valid tribe name.

Finally, Sama in Sama & Sudre (2009) described tribe Rhamnusiini with the type genus *Rhamnusium* Latreille, 1829.

Tribe RHAMNUSIINI Sama, 2009
(Type genus: *Rhamnusium* Latreille, 1829)

Genus *RHAMNUSIUM* Latreille, 1829
(Type species: *Callidium salicis* Fabricius, 1787 [=*Cerambyx bicolor* Schrank, 1781 nec Voet, 1778]).

As commonly accepted that the palaearctic genus *Rhamnusium* has five species in the world fauna as *Rhamnusium algericum* Pic, 1896; *R. bicolor* (Schrank, 1781); *R. graecum* Schaufuss, 1862; *R. rugosipenne* Pic, 1939 and *R.*

testaceipenne Pic, 1897. *R. algericum* Pic, 1896 is endemic to Algeria and *R. rugosipenne* Pic, 1939 is endemic to China. The remaining species have more or less distributional areas. *R. bicolor* (Schrank, 1781) has European chorotype, *R. graecum* Schaufuss, 1862 has Turano-Mediterranean (Turano-Apenninian) chorotype and *R. testaceipenne* Pic, 1897 has Turanian (Ponto-Caspian) chorotype.

In Europe and Turkey, this genus includes 3 species as *R. bicolor* (Schrank, 1781); *R. graecum* Schaufuss, 1862 and *R. testaceipenne* Pic, 1897. According to Bense (1995), it is represented by one species, *R. bicolor* (Schrank, 1781), in Europe. He stated that *Rhamnusium gracilicorne* (Théry, 1894) and *R. graecum* Schaufuss, 1862 are chromatic variations of *R. bicolor* (Schrank, 1781). Nevertheles, Althoff and Danilevsky (1997) gave three species as mentioned above for Europe. Sama (2002) also accepted one species, *R. bicolor* (Schrank, 1781), for Europe. According to him, all taxa [*R. bicolor* (Schrank, 1781); *R. ruficollis* (Herbst, 1784); *R. graecum* Schaufuss, 1862 and *R. juglandis* Fairmaire, 1866 (=*R. testaceipenne* Pic, 1897)] could be only geographic variations of one species. He also supposed *R. testaceipenne* Pic, 1897 is a synonym of *R. juglandis* Fairmaire, 1866, but according to Plavilstshikov (1936) var. *juglandis* is a red form of *R. graecum* Schaufuss, 1862. However, three species were presented by Sama for Europe in Fauna Europeae (2009). The old records from Turkey of *R. graecum* and *R. testaceipenne* summarized in Ozdikmen (2007 and 2008). *R. bicolor* (Schrank, 1781) was firstly recorded by Cebeci & Özdikmen (2010) for Anatolian fauna.

Rhamnusium bicolor (Schrank, 1781)

Schrank, Enum. Ins. 1781: 132. - Mulsant, Col. Fr. Long. ed. 2, 1863: 450. - Fairmaire, Gen. Col. d'Eur. IV, 1864, t. 56, f. 264. - Ganglbauer, Best.-Tab. VII, 1881: 717. - Seidlitz, Fauna Balt. ed. 2, 1891: 741. - Everts, Col. Neerl. II, 1, 1901: 349. - Pic, Longic. III, 3, 1901: 31. - Csiki, Rov. Lapok X, 1903: 103. - Jacobson. Käfer Russl. 1910, t. 63, f. 10. – Pickard, Faun. Fr. Col., 1929: 66. - Plavilstshikov, Faun. URSS, 1936: 148. - Villiers, Faun. Col. Fr., 1978: 89. – Svacha & Danilevsky, 1988: 36. - Bense, Long. Beet., 1995: 109. - Althoff & Danilevsky, Check. Long. Beet. Eur., 1997: 9. - Sama, Atl. Cer. Eur. Med., 2002: 11. - Brustel el al., Ann. Soc. ent. Fr., 2002: 445. - Cebeci & Özdikmen, Mun. Ent. Zool., 2010: 133.

Original combination: *Cerambyx bicolor* Schrank, 1781
Type locality: Austria: Vienna

Some important synonyms: *Cerambyx virgo* Voet, 1778: 13, t. 11, f. 47; *Cerambyx glaucopterum* Schaller, 1783: 284; *Rhagium schranki* Laicharting, 1784: 118; *Stenocorus ruficollis* Herbst, 1784: 92; *Callidium salicis* Fabricius, 1787: 154; *Cerambyx rubroviolaceus* Geoffroy, 1785: 86; *Rhagium etruscum* Rossi, 1790: 149; *Rhamnusium bicolor* ab. *ambustum* Heyden, 1876: 77; *Rhamnusium bicolor* var. *atripenne* Bedel, 1892: 43; *Rhamnusium bicolor* var. *humerale* Bedel, 1892: 43; *Rhamnusium gracilicorne* Théry, 1894: 265; *Rhamnusium gracilicorne* ab. *limbatum* Pic, 1897: 30; *Rhamnusium bicolor* ab. *capitale* Pic, 1898: 2; *Rhamnusium gracilicorne* ab. *occipitale* Plavilstshikov, 1936: 152; *Rhamnusium bicolor* var. *bergeri* Villiers, 1978: 90 (nomen nudum); *Rhamnusium bicolor* var. *bedeli* Villiers,1978: 90 (nomen nudum).

Rhamnusium gracilicorne Théry, 1894 is a synonym of *Rhamnusium bicolor* (Schrank, 1781). Since, both described from Austria (Vienna env.). Although it was regarded as a separate species by some authors (e.g., Aurivillius, 1912; Plavilstshikov, 1936; Villiers, 1978; Pesarini & Sabbadini, 1994). Théry (1894) stated that it is very close to *R. bicolor* and he also mentioned perhaps it is a smaller sized variety in his original description. However, he described by using

some characters as a separate species. He used only some antennal features (completely brown colored antennae and less thick, more cylindrical and externally less angled antennal segments in the first half of the antennae). Plavilstshikov (1936) also separated it from *R. bicolor* in his key on the base of the same distinguishing characters. Villiers (1978) and Pesarini & Sabbadini (1994) added the shape of temples to these characters. Nevertheless, as commonly accepted that *R. gracilicorne* Théry, 1894 is a synonym of *R. bicolor* (Schrank, 1781). All distinguishing characters listed by authors seem to be wrong. These features are in the variability of the species.

Historical usage of *Rhamnusium virgo* (Voet, 1778) and reversal of precedence

The name *virgo* was firstly introduced by Voet (1778) in page 13. Then, Panzer (1794) used the name *virgo* in page 33, t. 11, f. 47. Later, many authors used the name *Rhamnusium bicolor* (Schrank, 1781) as a valid name (e.g., Mulsant, 1863; Fairmaire, 1864; Ganglbauer, 1881; Seidlitz, 1891; Everts, 1901; Pic, 1901; Csiki, 1903; Jacobson, 1910; Aurivillius, 1912; Pickard, 1929; Plavilstshikov, 1936). On the contrary of prevailing usage of the name, *Rhamnusium bicolor* (Schrank, 1781), Silfverberg (1977) replaced the name with the oldest synonym name *Rhamnusium virgo* (Voet, 1778). Since he regarded *Cerambyx bicolor* Schrank, 1781 as a junior primary homonym of *Cerambyx bicolor* Voet, 1778 (now in the genus *Chydarteres* Hüdepohl, 1985 in Tachyderini). Nevertheles, Villiers (1978: 89) used *Rhamnusium bicolor* (Schrank, 1781) as the specific name without mention the name *virgo* Voet, 1778. Bílý & Mehl (1989: 39) gave *Cerambyx virgo* Voet, 1778 as an unavailable name under the name *Rhamnusium bicolor* (Schrank, 1781), but did not give any interpretation on it. In 1994, the name *Rhamnusium virgo* (Voet, 1778) was formalized by Pesarini & Sabbadini again.

The name *virgo* was originally given by Voet (1778) in page 13 with the specific epithet *melanocephalus,* at the end of the genus *Cerambyx*. He stated that its type locality is India Occidentali. He also gave the specific epithets *fasciatus* and *magnificus* in page 14. These four specific epithets have not a generic name. They are uninominal (catalogical names). In his catalogue, the all other names of *Cerambyx* by this author and by Linnaeus or Fabricius were presented as binominal. Voet's (1778) original description as follows:

48.VIRGO.

Indica haec beftiola cinnamomei coloris caput habet rotundius, collum anguftius;thorax prominentias habet duas mammiformes.
Habitat in India Occidentali.

Therefore, these uninominal names by Voet (1778) must be regarded only as catalogical names, and should not be accepted as available names according to the principle of binominal nomenclature recommended by the article 5 of ICZN (1999). The same opinion was shared by Brustel et al. (2002) and Sama (2002). Moreover Sama (2002) stated that "*the identity of Cerambyx virgo Voet, 1778 appears extremely doubtful*". Even Vitali in Zicha et al. (2009) claimed that „*Cerambyx virgo is invalid since it does not respect the binomial nomenclature, can not be accepted, since "virgo" clearly belongs to the genus Cerambyx. Nonetheless, the identity of C. virgo with the well-known European species is very uncertain, since the original description mentions a completely red beetle, with two bulges on the pronotum, inhabiting in West Indies*". Also we agree somewhat with these approaches. Status of the species *C. virgo* Voet, 1778 is

unclear now. Anyway, Aurivillius (1912) gave the name *virgo* Voet, 1778 under the species *Rhamnusium bicolor* (Schrank, 1781) with the question mark.

Remarks on the subspecific status

The species has European chorotype (from Spain to European Russia and Kazakhstan). As commonly accepted that *Rhamnusium bicolor* (Schrank, 1781) has two subpecies in the world fauna as the nominotypical subspecies and *R. bicolor demaggii* Tippmann, 1956. *R. bicolor demaggii* was described by Tippman (1956) from Italy (Lazio = Latium) as the original combination *Rhamnusium bicolor* var. *demaggii*. Even he also described an aberration of this variety as *Rhamnusium bicolor* var. *demaggii* ab. *aeneomicans* Tippmann, 1956 from Italy. After that, *Rhamnusium bicolor* var. *demaggii* was regarded as a subspecies for Italy by authors (e.g., Villiers, 1978 and Sama, 2002). Nevertheles, it was synonymized with *R. bicolor* by Pesarini & Sabbadini (2005) ex Vitali in Zicha et al. (2009), but Pesarini & Sabbadini stated that we never synonymized it with *R. bicolor* according to personel communication (February 2010). Besides, according to Biscaccianti (2007) gave it as a synonym of *R. bicolor*. However, we think that it should be regarded as a subspecies of *R. bicolor*. Since, Villiers (1978) mentioned that the subspecies has rough elytral punctuation, and abdominal segments black spotted under blue colored elytra. These characters are enough to separate it as a subspecies (especially the rough elytral punctuation is characteristic) (Fig. 1A, C). This subspecies which has a local distributional area is distributed only in Italy (Lazio and Abruzzo).

ACKNOWLEDGEMENTS

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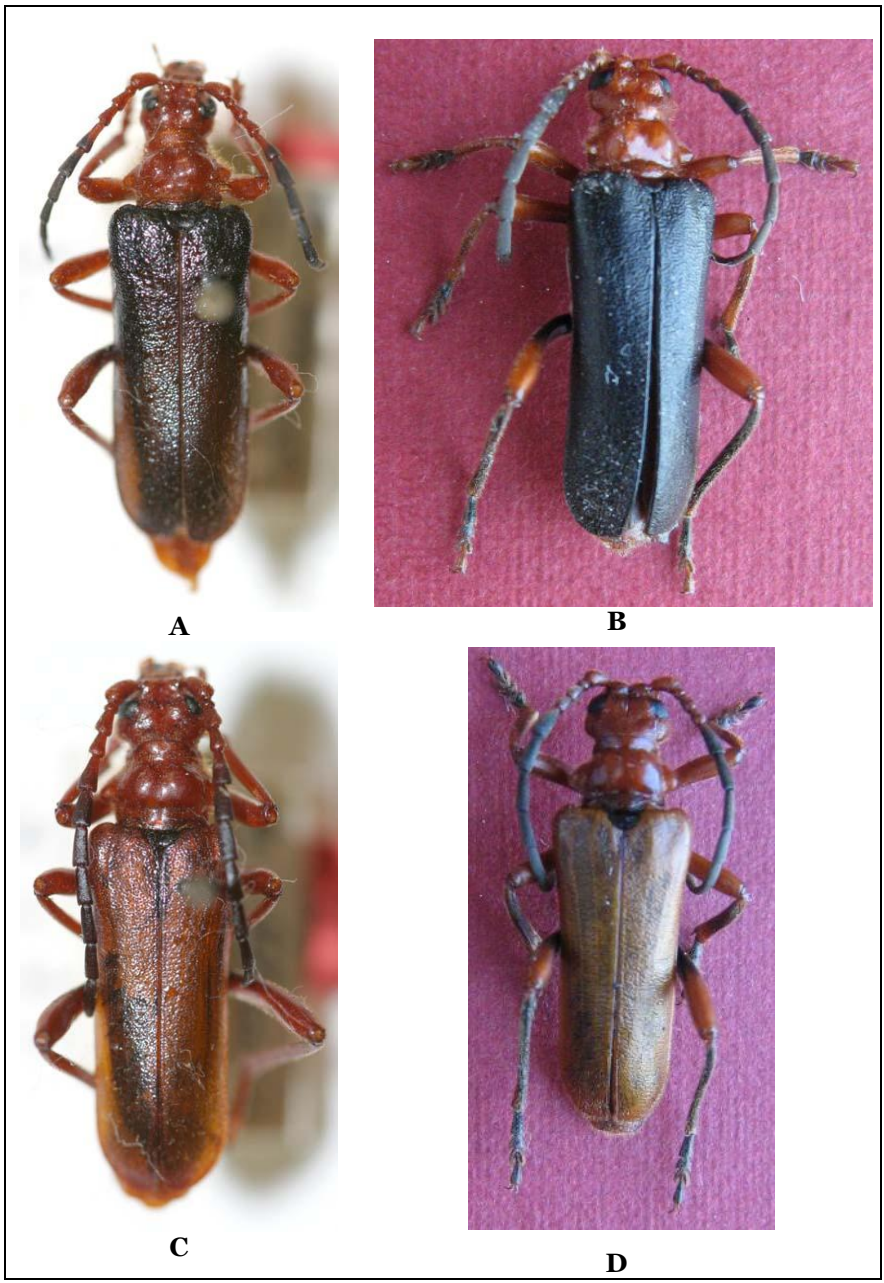

Figure 1. A. Holotype of *Rhamnusium bicolor var. demaggii* Tippmann, 1956 from Italy (from Lingafelter et al., 2010) B. *Rhamnusium bicolor bicolor* (Schrank, 1781) male from Turkey (from Cebeci & Özdikmen, 2010) C. Holotype of *Rhamnusium bicolor var. demaggii* ab. *aeneomicans* Tippmann, 1956 from Italy (from Lingafelter et al., 2010) D. *Rhamnusium bicolor bicolor* (Schrank, 1781) female from Turkey (from Cebeci & Özdikmen, 2010).

SCIENTIFIC NOTE

A REPLACEMENT NAME FOR THE SPECIFIC EPITHET *IRANICUS* IN *PARANOTHROTES IRANICUS* (RAMME, 1951) (ORTHOPTERA: PAMPHAGIDAE)

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[Özdikmen, H. 2010. A replacement name for the specific epithet *iranicus* in *Paranothrotes iranicus* (Ramme, 1951) (Orthoptera: Pamphagidae). Munis Entomology & Zoology, 5 (2): 819-820**]**

ABSTRACT. According to Rules of Principles of the International Code of Zoological Nomenclature (ICZN, 1999), *Paranothrotes iranicus* (Ramme, 1951) is not correct because the specific epithet is illegitimate. The author request a replacement name of the specific epithet *iranicus* and he suggest *rammei* nom. nov.. He also request that the specific epithet *iranicus* in *P. iranicus* be rejected. Accordingly, new combination is herein proposed for the species: *Paranothrotes rammei* comb. nov..

KEY WORDS. Nomenclatural change, homonymy, replacement name, Orthoptera, Pamphigidae, *Paranothrotes iranicus*.

Family PAMPHIGIDAE
Subfamily TROPIDAUCHENINAE
Genus *PARANOTHROTES* Mishchenko, 1951
Species *PARANOTHROTES RAMMEI* nom. nov.

Paranothrotes iranicus (Ramme, 1951). Mitt. Zool. Mus. Berlin, 27, 289. (Orthoptera: Caelifera: Acridoidea: Pamphigidae: Tropidaucheninae). Preoccupied by *Paranothrotes iranicus* (Ramme, 1939). Mitt. Zool. Mus. Berlin, 24, 41-150. (Orthoptera: Caelifera: Acridoidea: Pamphigidae: Tropidaucheninae).

The names *Paranothrotes iranicus* (Ramme, 1951) and *Paranothrotes iranicus* (Ramme, 1939) were included in the family Pamphigidae.

The specific epithet *iranicus* was initially introduced by Ramme (1939) with the original combination *Tropidauchen iranicus* Ramme, 1939 in the family Pamphigidae (Orthoptera: Caelifera: Acridoidea). Shumakov (1963) [in *Horae Soc. Entomol. Union. Sov.*, 49: 54] transferred it to the genus *Paranothrotes* Mishchenko, 1951 as the combination *Paranothrotes iranicus* (Ramme, 1939). It is still used as a valid name (Eades & Otte, 2010).

Subsequently, Ramme (1951) described a new species with the same specific epithet as *Nocaropsis iranicus* Ramme, 1951 by original combination in the family Pamphigidae. Shumakov (1963) [in *Horae Soc. Entomol. Union. Sov.*, 49: 54] transferred also it to the genus *Paranothrotes* Mishchenko, 1951 as the combination *Paranothrotes iranicus* (Ramme, 1951). It is also still used as a valid name (Eades & Otte, 2010).

Paranothrodes iranicus (Ramme, 1939) has priority over *Paranothrodes iranicus* (Ramme, 1951). Thus, *Paranothrodes iranicus* (Ramme, 1951) is illegitimate and consequently can not be correct. The name *Paranothrodes iranicus* (Ramme, 1951) is a secondary junior homonym of the name *Paranothrodes iranicus* (Ramme, 1939). According to Article 60 of the

International Code of Zoological Nomenclature (1999), it must be rejected and replaced. It has no specific synonym. So I propose for the specific epithet *iranicus* Ramme, 1951 the replacement name *rammei* nom. nov..
Etimology: The name is dedicated to W. Ramme who is the current author of the preexisting species *P. iranicus*.

Summary of nomenclatural changes:

Paranothrotes rammei **nom. nov.**
pro *Paranothrotes iranicus* (Ramme, 1951) **syn. n.**, Shumakov, 1963 ex *Nocaropsis iranicus* Ramme, 1951 [nec *Paranothrotes iranicus* (Ramme, 1939), Shumakov, 1963 ex *Tropidauchen iranicus* Ramme, 1939]
Nocaropsis iranicus Ramme, 1951 [original combination]

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SCIENTIFIC NOTE

A NEW SYNONYM OF THE GENUS *STIRELLUS* OSBORN & BALL, 1902 (HEMIPTERA: CICADELLIDAE: DELTOCEPHALINAE)

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[Xing, J. & Li, Z. 2010. A new synonym of the genus *Stirellus* Osborn & Ball, 1902 (Hemiptera: Cicadellidae: Deltocephalinae). Munis Entomology & Zoology, 5 (2): 821-822**]**

The leafhopper genus *Stirellus* was established by Osborn & Ball (1902), and *Athysanus bicolor* Van Duzee, 1892 was designated as its type species. In the subfamily Deltocephalinae, many generic names are invalid, as they are junior homonyms of the name *Stirellus* Osborn & Ball respectively. Emeljanov (1962) synonymised 15 genera: *Doratulina*, *Phrynophyes*, *Anemochrea*, *Arya*, *Trebellius*, *Campbellinella*, *Bituitus*, *Paternus, Volusenus*, *Nandidrug*, *Paivanana*, *Bella*, *Sunda*, *Pseudaconura* and *Umesaona* with *Stirellus*. But, Vilbaste (1965) discussed the similarity of *Doratulina* Melichar, 1903 to some genera, including *Phrynophyes*, *Arya*, *Campbellinella*, *Bituitus*, *Paternus*, *Volusenus*, *Nandidrug, Allectus*, *Galerius*, *Paivanana*, *Bella*, *Sunda*, *Aconura* and *Umesdena*, and synonymised all these genera. Oman, Knight & Nielson (1990) synonymised 15 genera: *Phrynophyes*, *Arya*, *Campbellinella*, *Bituitus*, *Paternus, Volusenus*, *Nandidrug*, *Allectus*, *Galerius*, *Paivanana*, *Bella*, *Sunda*, *Pseudaconura*, *Umesaona* and *Trebellius* with *Doratulina*. Later, Day & Fletcher (1994) followed Emeljanov (1962) and listed 18 synonyms genera of *Stirellus*: *Doratulina*, *Phrynophyes*, *Anemochrea*, *Arya*, *Trebellius*, *Campbellinella*, *Bituitus*, *Paternus*, *Volusenus*, *Nandidrug*, *Allectus*, *Galerius*, *Paivanana*, *Bella*, *Penestirellus*, *Sunda*, *Pseudaconura* and *Umesaona*.

As *Stirellus* is the oldest name, we followed Day & Fletcher (1994), all the above 18 genera should be treated as its junior synonyms. The leafhopper genus *Viridomarus* was established by Distant (1918), with the type species *V. capitatus* Distant,1918. Xing, Dai & Li (2009) revised this genus and added two new species. Recently, during study on the male genitalia of the genus *Viridomarus*, we considered *Viridomarus* Distant, 1918 is a junior synonym of the genus *Stirellus* Osborn & Ball, 1902. It can not be used validly for taxa under the Law of Priority of the ICZN. Consequently, we proposed here *Viridomarus* Distant, 1918 as invalid name and junior objective synonym of *Stirellus* Osborn & Ball, 1902. And, three new combinations: *Stirellus capitatus* (Distant, 1918) **comb. nov.**, *Stirellus brevialatus* (Xing, Dai & Li, 2009) **comb. nov.** and *Stirellus laticellus* (Xing, Dai & Li, 2009) **comb. nov.** are proposed.

Genus *Stirellus* Osborn & Ball, 1902

Stirellus Osborn & Ball, 1902: 250. Type species: *Athysanus bicolor* Van Duzee, 1892.
Doratulina Melichar, 1903: 198. Type species: *Doratulina jocosa* Melichar, 1903.
Phrynophyes Kirkaldy, 1906: 327. Type species: *Phrynophyes phrynophyes* Kirkaldy, 1906.
Anemochrea Kirkaldy, 1906: 329. Type species: *Anemochrea mitis* Kirkaldy, 1906.
Arya Distant,1908: 338. Type species: *Arya rubrolineata* Distant, 1908.
Trebellius Distant, 1918: 52. Type species: *Trebellius albifrons* Distant, 1918.

Campbellinella Distant, 1918: 69. Type species: *Campbellinella illustrata* Distant, 1918.
Bituitus Distant, 1918: 70. Type species: *Btiuitus projectus* Distant, 1918.
Paternus Distant, 1918: 71. Type species: *Paternus pusanus* Distant, 1918.
Volusenus Distant, 1918: 72. Type species: *Volusenus lahorensis* Distant, 1918.
Nandidrug Distant, 1918: 74. Type species: *Nandidrug speciosum* Distant, 1918.
Allectus Distant, 1918: 75. Type species: *Allectus notatus* Distant, 1918.
Galerius Distant, 1918: 78. Type species: *Galerius indicatrix* Distant, 1918.
Paivanana Distant, 1918: 95. Type species: *Paivanana indra* Distant, 1918.
Bella Singh Pruthi, 1930: 44. Type species: *Bella apicalis* Singh Pruthi, 1930.
Penestirellus Beamer & Tuthill, 1934: 21. Type species: *Penestirellus catalinus* Beamer & Tuthill, 1934.
Sunda Singh Pruthi, 1936: 112. Type species: *Sunda ribeiroi* Singh Pruthi, 1936.
Pseudaconura Linnavuori, 1952: 182. Type species: *Pseudoconura luxorensis* Linnavuori, 1952.
Umesaona Ishihara, 1961: 246. Type species: *Umesaona asiatica* Ishihara, 1961.
Viridomarus Distant, 1918: 69. Type-species: *Viridomarus capitatus* Distant, 1918. **syn. nov.**

Stirellus capitatus (Distant, 1918) **comb. nov.**
Viridomarus capitatus Distant 1918: 70
Viridomarus capitatus Distant, Zhang 1990: 91-92.
Viridomarus capitatus Distant, Xing, Dai & Li 2009: 590-591.
Distribution. India, China (Hainan).

Stirellus brevialatus (Xing, Dai & Li, 2009) **comb. nov.**
Viridomarus brevialatus Xing, Dai &Li 2009: 590-591.
Distribution. China (Hainan).

Stirellus laticellus (Xing, Dai & Li, 2009) **comb. nov.**
Viridomarus laticellus Xing, Dai &Li 2009: 592-593.
Distribution. China (Hainan).

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SCIENTIFIC NOTE

TWO GENERA AND FIVE SPECIES AS NEW RECORDS FOR FRUIT FLIES FAUNA OF IRAN FROM EAST AZARBAIJAN PROVINCE

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[Zarghani, E., Khaghaninia, S., Pour Abad, R. F. & Gharali, B. 2010. Two genera and five species as new records for fruit flies fauna of Iran from East Azarbayjan province. Munis Entomology & Zoology, 5 (2): 823-824**]**

Tephritidae (true fruit flies) is a large family of the order Diptera with more than 4400 described species over the world. Considering their damage on fruit plantations, they are important insects from the agricultural point of view as well as forest entomology (Merz, 2001). Some of species are important as one of the biological agents in weeds control programs (White & Elson-Harris, 1992). This family consist of small to medium flies in 2–12 mm long, fronto-orbital plate usually bears one or more frontal bristles, antennae with bare or plumose arista, wings usually with a pattern consisting of brown strips and spots, costal vein with two interruptions (White & Elson-Harris, 1992). These flies are important widespread pests of crop fruits and vegetables, which infest a great variety of native and exotic fruits (White, 1988). A few species induce the formation of galls in the upper or subterranean parts of stems of Asteraceae (Freidberg, 1984; Korneyev, 2003). The fruit fly fauna of Iran was studied by Becker (1913), Parchami (1995), Gharali et al. (2006), Karimpour & Merz (2006), Gilasian & Merz (2008), Mohamadzade & Rasoulian (2009), Mohamadzade, Nozari & Rasoulian (2010), Mohamadzade & Nozari (2010). So far the Tephritid fauna of Arasbaran forests, which are registered as biosphere in East Azarbaijan Province, remained poorly studied.

Fruit flies of Arasbaran forests was the subject of this present study revealed two genera (marked with an asterisk) and five species previously not recorded from Iran as follows:

***Acinia biflexa* (Loew, 1844)**
Material examined. 2♂♂: Chichekli; 38°35' N 46°14' E, 1223 m, 21 Jul. 2009 (Collected by S. Khaghaninia, Deposited at Insect Museum of Tabriz University).

***Campiglossa absinthii* (Fabricius, 1805)**
Material examined: 1♂, 1♀: Aynalu; 38°39' N 46°15' E, 1272 m, 2 Jun. 2009 (Collected by S. Khaghaninia, Deposited at Insect Museum of Tabriz University).

***Noeeta pupillata* (Fallén, 1814)**
Material examined: 1♂: Chichekli; 38°41' N 46°31' E, 2163 m, 21 Jul. 2009 (Collected by S. Khaghaninia, Deposited at Insect Museum of Tabriz University).

***Tephritis dioscurea* (Loew, 1865)**
Material examined: 1♂: Uskuli; 38°51' N 46°59' E, 1367 m, 1 Jul. 2009 (Collected by S. Khaghaninia, Deposited at Insect Museum of Tabriz University).

***Tephritis hyoscyami* (Linnaeus, 1758)**
Material examined: 1♂: Qaradervish; 38°56' N 47°27' E, 1439 m, 31 May. 2009 (Collected by S. Khaghaninia, Deposited at Insect Museum of Tabriz University).

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