

## A FAUNISTIC STUDY OF TRUE BUGS (HETEROPTERA) FROM HORAND GRASSLANDS, NW IRAN

**Samad Khaghaninia\***, **Reza Farshbaf Pour Abad\***,  
**Omid Askari\*\*** and **Mohammad Havaskary\*\*\***

\* Department of Plant Protection, Faculty of Agriculture, University of Tabriz, IRAN.

\*\* Agricultural organization of Zanjan Province, Zanjan, IRAN.

\*\*\* Young Researchers Club, Tehran Central branch, Islamic Azad University, Tehran, IRAN.

**[Khaghaninia, S., Farshbaf Pour Abad, R., Askari, O. & Havaskary, M. 2013. A faunistic study of true bugs (Heteroptera) from Horand grasslands, NW Iran. Munis Entomology & Zoology, 8 (1): 468-474]**

**ABSTRACT:** In order to study of Heteroptera fauna of Horand region in East Azerbaijan province, a survey was conducted during 2008-2009. Out of 650 collected specimens, 29 species belonging to 12 families including Anthocoridae, Miridae, Tingidae, Nabidae, Lygaeidae, Pyrrhocoridae, Coreidae, Stenocephalidae, Rhopalidae, Cydnidae, Scutelleridae, Pentatomidae were identified. In addition to the faunistic survey, distributions of the all species are reviewed.

**KEY WORDS:** Heteroptera, Fauna, Horand, East Azerbaijan province, Iran.

In the recent classification, the true bugs (Heteroptera) has been regulated as a suborder rank in order of Hemiptera and some differences are happened between traditional and modern classification base on phylogenetic investigations. Heteroptera can be as serious crop pests, harmful to humans or valuable as biological control agents (Carver et al., 1991; Havaskary, 2010; Schaefer & Panizzi, 2000; Triplehorn & Johnson, 2005). Although some researchers have been performed to determine the Heteropteran fauna of East Azarbaijan province (Modarres Awal, 1997a,b; Farshbaf Pour Abad, 2000; Khaghaninia et al., 2010a,b, 2011; Khalilzadeh et al., 2007, 2008; Hassanzadeh et al., 2009a,b; Havaskary, 2012; Nikdel, 2011; Sadeghi, 2004, 2009; Sadeghian et al., 2002, 2004) but the true bugs' fauna of this region has not been studied so it subjected for the present study. The studied grasslands is situated at northwest of Arasbaran forests in the East Azarbaijan province of Iran with UTM (Universal Transfer Mercator) coordinate system; X 690447.57 to 709176.87 E; Y 4304419.14 to 4317039.59 N.

### MATERIAL AND METHODS

The specimens were collected during 2008-2009 from 22 different localities of Horand grasslands by sweeping net, malaise trap and some of them captured by hand (Fig. 1). Their recognition was based on morphological structure and male genital inspections especially pygophores and parameres. For determining the materials, the following papers by Anufriev et al. (1988), Baker (1931), Kment & Jindra (2008), Borror (1989), Carapezza & Jindra (2008), Lodos (1959), Thomas (1994), Ribes et al. (2007, 2008), Rider (1989), Siddiqui (2000), were used. The system, nomenclature and unmentioned references in distribution ranges followed from Aukema & Rieger (2001, 2006).

## RESULTS

In this research 29 species dependent to 12 families were identified which all of them are being newly reported for the studied area. The list of the verified species, their examined material, GPS position and their distribution are given in below.

### Family Anthocoridae Amyot and Serville, 1843

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

Material Examined: 25 specimens, (10 ♂♂, 15 ♀♀); 26 May 2008, N38 57.937, E47 17.277.  
Distribution in Iran: Generally distributed in north and central provinces. Fars (Modaress Awal, 1997; Ostovan & Niakan, 2000), Yazd (Modaress Awal, 1997) from S Iran. Range: Palaearctic (Pericart, 1996).

#### *Anthocoris nemoralis* (Fabricius, 1794)

Material Examined: 16 specimens, (8 ♂♂, 8 ♀♀); 26 June 2009, N38 58.467, E47 18.198.  
Distribution in Iran: Generally distributed in north and central provinces, also two provinces including Fars and Yazd from S Iran (Ostovan & Niakan, 2000). Range: Holarctic (Pericart, 1996).

### Family Miridae Hahn, 1833

#### *Adelphocoris lineolatus* (Goeze, 1778)

Material examined: 25 specimens, (11 ♂♂, 14 ♀♀); 5 June 2009, N38 57.082 E 47 17.058.  
Distribution in Iran: Widespread (Modaress Awal, 1997). Range: Holarctic.

#### *Lygus rugulipennis* (Poppius, 1911)

Material examined: 28 specimens, (5 ♂♂, 23 ♀♀); 8 July 2009, N38 57.111 E47 17.006.  
Distribution in Iran: EastAzarbaijan, Hamedan (Modarres Awal, 1997), Ardabil, Golestan, Tehran, Zanjan, Khorasan (Havaskary et al., 2010). Range: Holarctic.

#### *Deraeocoris punctulatus* (Fallen, 1801)

Material examined: 23 specimens, (8 ♂♂, 15 ♀♀); 2 August 2009, N38 57.097 E47 17.021.  
Distribution in Iran: Ardabil, Fars, Isfahan (Modaress Awal, 1997), Gilan, Tehran, Zanjan, Khorasan (Havaskary, 2010). Range: Euro-Siberian (Linnavouri, 2007a).

#### *Notostira elongata* (Geoffroy, 1785)

Material examined: 82 specimens, (43 ♂♂, 39 ♀♀); 12 July 2008, N38 56.138 E47 27.665, (31 ♂♂, 18 ♀♀); 5 June 2009, N38 57.111 E47 17.006, (12 ♂♂, 21 ♀♀).  
Distribution in Iran: East Azarbaijan (Modaress Awal, 1997; Hassanzadeh et al., 2009).

### Family Tingidae Laporte de Castelnau, 1833

#### *Stephanitis (Stephanitis) oschanini* Vasiliev, 1935

Material examined: 37 specimens, (15 ♂♂, 22 ♀♀); 26 May 2009, N38 56.723 E47 27.145.  
Distribution in Iran: Widespread. Range: Armenia, Azerbaijan, Afghanistan, Georgia, Iraq, Iran, Turkey and Central Asia (Golub, 2002; Kment & Jindra, 2005).

### Family Nabidae A. Costa, 1853

#### *Nabis Pseudoferrus* (Remane, 1949)

Material examined: 19 specimens, (8 ♂♂, 11 ♀♀); 12 July 2008, N38 57.060 E47 17.286.  
Distribution in Iran: Northern and central provinces, mainly introduced from Khorasan in different papers (Havaskary, 2010; Heiss, 2002; Kerzhner, 1987; Linnavouri & Modaress Awal, 1998; Modaress Awal, 2008). Range: Iran and Turkmenistan (Kerzhner, 1996).

### Family Lygaeidae Schilling, 1829

#### *Emblethis ciliatus* (Horváth, 1875)

Material Examined: 24 specimens, (15 ♂♂, 9 ♀♀); 5 June 2009, N38 53.838 E47 16.988.

Distribution in Iran: This species introduced from North (East Azarbaijan, Guilan, Tehran Khorasan Razavi), West (Kurdistan), and S Iran (Fars, Kerman). Range: Russia to Middle East.

***Scolopostethus affinis* (Sch., 1823)**

Material examined: 13 specimens, (12♂♂, 1♀); 26 May 2008, N38 56.723 E47 27.145.

Distribution in Iran: West Azarbaijan (Sakenin et al., 2010), Hamedan (Samin et al., 2011). Range: Asia.

**Family Pyrrhocoridae Dohrn, 1859**

***Pyrrhocoris apterus* (Linnaeus, 1768)**

Material examined: 20 specimens, (16♂♂, 11♀♀); 12 July 2008, N38 53.169 E47 15.784.

Distribution in Iran: Widespread. Range: Holarctic.

***Pyrrhocoris marginatus* (Kolenati, 1845)**

Material examined: 20 specimens, (8♂♂, 12♀♀); 26 June 2009, N38 49.558 E47 23.683.

Distribution: North of Iran. Range: Palaearctic.

**Family Coreidae Leach, 1815**

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

Material examined: 13 specimens, (8♂♂, 5♀♀); 26 May 2008, N38 53.169 E47 15.784.

Distribution in Iran: Widespread. Range: Holarctic.

***Coriomeris affinis* (Herrich-Schäffer, 1839)**

Material examined: 15 specimens, (9♂♂, 6♀♀); 26 May 2008, N38 54.926 E47 16.935.

Distribution in Iran: Widespread in N Iran. Range: Holomediterranean, extending to Central Europe and the Middle East.

**Family Stenocephalidae Dallas, 1852**

***Dicranocephalus setulosus* (Ferrari, 1874)**

Material examined: 27 specimens, (15♂♂, 12♀♀); 5 August 2008, N38 56.723 E47 27.145.

Distribution of Iran: Northern and Western provinces of Iran. Range: Holomediterranean, extending to Israel, Iraq, and Turkey (Aukema & Rieger, 2006; Linnavouri, 2007b).

**Family Rhopalidae Amyot & Serville, 1843**

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

Material examined: 11 specimens, (4♂♂, 7♀♀); 16 April 2009, N38 57.111 E47 17.006.

Distribution in Iran: Widespread. Range: Holarctic.

***Maccevethus caucasicus* (Kolenati, 1845)**

Material examined: 12 specimens, (9♂♂, 3♀♀); 26 June 2009, N38 56.723 E47 27.145.

Distribution in Iran: Widespread. Range: Palaearctic.

**Family Cydnidae Billberg, 1820**

***Cydnus aterrimus* (Foster, 1771)**

Material examined: 19 specimens, (11♂♂, 8♀♀); 26 May 2008, N38 57.111 E47 17.006.

Distribution in Iran: Northern and Southern provinces. Range: European, widely distributed in the Middle East, Middle Asia, and the Oriental region.

**Family Scutelleridae Leach, 1815**

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

Material examined: 20 specimens, (13♂♂, 7♀♀); 2 August 2009, N38 56.723 E47 27.145.

Distribution in Iran: East and West Azarbaijan, Gorgan, Mazandaran (Modaress Awal, 1997), Khorasan (Linnavouri, 2008), Zanjan (Akari et al., 2009). Range: Euro-Siberian.

**Family Pentatomidae Leach, 1815*****Aelia rostrata* (Bohemann, 1852)**

Material examined: 16 specimens, (11♂♂, 5♀♀); 26 June 2009, N38 49.558 E47 23.683.  
Distribution in Iran: Northern and central provinces. Range: Holarctic.

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

Material examined: 14 specimens, (13♂♂, 11♀♀); 16 April 2009, N38 55.985 E47 18.034.  
Distribution in Iran: Kermanshah, Fars, Lorestan, Markazi, Hamedan, Zanjan, Khorasan and other provinces in N Iran (Havaskary et al., 2012). Range: EUROPE; Bulgaria, Turkey, Greece, Macedonia, Uzbekistan. ASIA; Azerbaijan, Armenia, Turkey (Asian part), Israel, Lebanon, Syria.

***Antheminia lunulata* (Goeze, 1778)**

Material examined: 10 specimens, (6♂♂, 4♀♀); 12 July 2008, N38 56.723 E47 27.145.  
Distribution in Iran: Ardabil, Fars, Ghazvin, Gilan, Golestan, Kerman, Khorasan Razavi, Khorasan Shomali, Mazandaran, Semnan, Yazd and Zanjan provinces (Hoherlandt, 1995; Linnavuori, 2008). Range: Euro-Siberian (Linnavuori, 2008).

***Ancyrosoma leucogrammes* (Gmelin, 1790)**

Material examined: 8 specimens, (3♂♂, 5♀♀); 26 May 2009, N38 50.764 E47 22.661.  
Distribution in Iran: Gilan, Khorasan (Linnavuori, 2008), Zanjan, East Azarbaijan, West Azarbaijan, Ardabil. Range: Holomediterranean, extending to Central Europe, the Middle East and Central Asia (Linnavuori, 2008).

***Apodiphus amygdali* (Germar, 1817)**

Material examined: 16 specimens, (7♂♂, 9♀♀); 8 July 2009, N38 55.985 E47 18.034.  
Distribution in Iran: East Azarbaijan Fars, Tehran, Markazi, Kerman, Hormozgan, Semnan, Balouchestan, Esfahan, Khorasan (Havaskary et al., 2012). Range: EUROPE; Albania, Bosnia Herzegovina, Bulgaria, Croatia, Turkey, Greece, Italy, Macedonia, Yugoslavia. ASIA; Azerbaijan, Armenia, Turkey (Asian Part) Georgia, Iraq, Israel, Lebanon, Syria, Turkmenistan.

***Carpocoris coreanus* (Distant, 1899)**

Material examined: 10 specimens, (3♂♂, 7♀♀); 26 May 2009, N38 53.169 E47 15.784.  
Distribution in Iran: Ardabil, East Azarbaijan, Gilan, Semnan, Tehran, Zanjan (Havaskary et al., 2012). Range: Eastern Palaearctic Asia, extending to southern Russia, the Middle East and Pakistan.

***Dolycoris baccarum* (Linnaeus, 1758)**

Material examined: 21 specimens, (14♂♂, 7♀♀); 5 August 2008, N38 56.723 E47 27.145.  
Distribution in Iran: Ardabil, East Azarbaijan, Fars, Isfahan, Gilan, Golestan, Tehran, West Azarbaijan, Zanjan (Havaskary et al., 2012). Range: Holarctic, also in India and Pakistan.

***Eurydema ornata* (Linnaeus, 1758)**

Material examined: 26 specimens, (11♂♂, 15♀♀); 5 August 2008, N38 53.399 E47 12.110.  
Distribution in Iran: Ardabil, Azarbaijan, Sistan and Balouchestan, Esfahan, Gilan, Golestan, Kerman, Kermanshah, Khorasan Razavi, Northern Khorasan, Khuzestan, Lorestan, Mazandaran, Tehran and Zanjan provinces (Havaskary et al., 2012). Range: Holarctic.

***Graphosoma lineatum* (Linnaeus, 1758)**

Material examined: 8 specimens, (3♂♂, 5♀♀); 5 June 2008, N38 53.169 E47 15.784.  
Distribution in Iran: Northern and central provinces. Range: Holomediterranean, extending to Central Europe, the Middle East and Central Asia (Linnavuori, 2008).

***Neottiglossa leporina* Herrich-Schäffer, 1830**

Material examined: 9 specimens, (4♂♂, 5♀♀); 26 May 2008, N38 57.111 E47 17.006.

Distribution in Iran: Tehran, Golestan, Khorasan, Razavi, West Azarbaijan, East Azarbaijan (Havaskary et al., 2012). Range: Europe and Asia.

### LITERATURE CITED

- Anufriev, G. A., Danzing, E. M., Emeljanov, A. F., Kanyukova, V. B., Kerzhner, I. M., Konovalova, Z. A., Pashchenko, N. F., Tshernova, G. P. & Vinokurova, N. N.** 1988. Key to the Insect of the Far East of the USSR, Volume II. Homoptera and Heteroptera, Akademy of Science of the USSR Far East Branch Institute of Biology and Soil science, Leningrad Nauka Publishing House. Hereoptera section, 250 pp.
- Aukema, B. & Rieger, C.** 2001. Catalogue of the Heteroptera of the Palaearctic region, vol. 4: Pentatomomorpha I. The Netherlands Entomological Society edit., Wageningen, 2001, xiv + 346 p.
- Aukema, B. & Rieger, C.** 2006. Catalogue of the Heteroptera of the Palaearctic Region. Volume 5. Pentatomomorpha II[M]. Amsterdam: The Netherlands Entomological Society. 550 pp.
- Baker, A. D.** 1931. A study of the male genitalia of Canadian species of Pentatomidae. I-VIII. Canadian Journal of Research, 4 (2): 148-179.
- Borror, D. J., Triplehorn, C. A. & Johnson, N. F.** 1989. An introduction to the study of Insects. VI. Ed. Saunders College Publishing, U.S.A., 875 pp.
- Carapezza, A. & Jindra, Z.** 2008. *Graphosoma* (*Graphosomella* subgen. nov.) *nexpectatum* sp. nov. from Syria. Naturalista sicil., S. IV, 32 (3-4): 471-478.
- Carver, M., Gross, G. F. & Woodward, T. E.** 1991. Hemiptera (bugs, leafhoppers, cicadas, aphids, scale insects, etc.). In: The insects of Australia - a Textbook for students and research workers. Volume 1. Melbourne University Press, Melbourne.
- Golub, V. B.** 2002. On the status, synonymy and distribution of *Stephanitis oschanini* Vasiliev with corrected data on the distribution of *S. pyri* (Heteroptera: Tingidae). Zoosystematica Rossica, 11: 154.
- Havaskary, M., Hosseinpour, F. & Modaress Awal, M.** 2010. Cimicomorpha and Pentatomomorpha of Alfalfa from Mashhad and vicinity, NE Iran. Munis Entomology & Zoology, 5 (1): 253-261.
- Havaskary, M., Farshbaf Pour Abad, R. & Kazemi, M. H.** 2012. A contribution to the stink bugs from Khodafarin, NW Iran (Heteroptera: Pentatomidae: Pentatominae). Munis Entomology & Zoology, 7 (1): 607-616.
- Kerzhner, I. M.** 1996. Family Nabidae A. Costa 1983 – damsel bugs. Pp. 84–107. In: Aukema B. & Rieger, CH. (eds): Catalogue of the Heteroptera of the Palaearctic Region. Vol. 2. The Netherlands Entomological Society, Amsterdam, xiv + 360 pp.
- Kerzhner, I. M.** 1987. Results of the Czechoslovak-Iranian entomological expeditions to Iran 1970, 1973 and 1977. Heteroptera, Nabidae. Acta Entomologica Musei Nationalis Pragae, 42: 379-390.
- Khaghaninia, S., Farshbaf Pour Abad, R., Askari, O. & Fent, M.** 2010a. 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.
- Khaghaninia, S., Askari, O., Farshbaf Pour Abad, R. & Shahim, K.** 2010b. Some additional notes about Heteroptera fauna of Qaradag forests-Iran. Munis Entomology & Zoology, 5 (2): 513-518.
- Khaghaninia, S., Farshbaf Pour Abad, R. & Askari, O.** 2011. A contribution to the Heteroptera fauna of Zunuz region, northwest of Iran. North-Western Journal of Zoology, 7 (1): 35-38.
- Khalilzadeh, A.** 2008. Identification of Heteroptera fauna of alfalfa fields in Azarshahr region of Azarbayejan-e-sharqi province, Iran. Journal of New Agricultural Science, Islamic Azad University, Myaneh Branch, p. 5.
- Khalilzadeh, A. R., Farshbaf Pour Abad, R., Kazemi, M. H. & Ostovan, H.** 2007. Fauna of Heteroptera in pasture of Azarshahr, East Azarbaijan. Forest and Pasture, 76 & 77: 77-83.

- Kment, P. & Jindra, Z.** 2008. New records of *Eurydema fieberi* from Czech Republic with corrections to some previously published records of Palaearctic *Eurydema* species (Hemiptera: Heteroptera: Pentatomidae), *Acta Musei Moraviae, Scientiae biologicae* (Brno), 93: 11-27.
- Linnavuori, R. E.** 2007a. Studies on the Miridae (Heteroptera) of Gilan and adjacent provinces in northern Iran. II. List of species. *Acta Entomologica Musei Nationalis Pragae*, 47: 17-56.
- Linnavuori, R.** 2007b. Studies on the Piesmatidae, Berytidae, Pyrrhocoridae, Stenocephalidae, Coreidae, Rhopalidae, Alydidae, Cydnidae, and Plataspidae (Heteroptera) of Gilan and the adjacent provinces in northern Iran. *Acta Entomologica Musei Nationalis Pragae*, 47: 77-91.
- Linnavuori, R. E.** 2008. Studies on the Acanthosomatidae, Scutelleridae and Pentatomidae (Heteroptera of Gilan) and the adjacent Provinces in Northern Iran, *Acta Entomologica Musei Nationalis Pragae*, 48 (1): 1-21.
- Linnavuori, R. E. & Modaress Awal, M.** 1998. Studies on the Heteroptera of the Khorasan province in N.E.Iran.1. Nepomorpha, Gerromorpha, Leptopodomorpha, Cimicomorpha (Nabidae and Anthocoridae), and Pentatomorpha [sic!] (Coreoidea). *Entomologica Fennica*, 9: 237-241.
- Lodos, N.** 1959. A new species of *Graphosoma* from Turkey (Heteroptera-Pentatomidae). *Annals & Magazine Natural History, Series 13*, 1 (1958): 711-713.
- Modarres Awal, M.** 1997a. Determination of some fauna of Cimicomorpha and Pentatomorpha (Het.) in Tabriz area. *Journal of Agriculture & Science Technology, University of Mashhad*, 7 (3 & 4): 43-56.
- Modarres Awal, M.** 1997b. List of agricultural pests and their natural enemies in Iran. Ferdowsi University Press, 429 pp.
- Modarres Awal, M.** 1998. Fauna of Cimicomorpha and Pentatomorpha (Het.) in Tabriz. Proceedings of 13th Iranian Plant Protection Congress, Campus of Agriculture and Natural Resources, University of Tehran, Karaj, p. 238.
- Modarres Awal, M.** 2008. Contribution to Heteroptera fauna of Khorasan Razavi province of Iran. *Türkiye Entomoloji Dergisi*, 32: 243-253.
- Nikdel, M., Dordaei, A. A. & Matocq, A.** 2011. Faunistic study on Hemiptera in Arasbaran area (East Azarbaijan province, Iran). *Munis Entomology & Zoology*, 6 (1): 389-395.
- Ostovan, H. & Niakan, J.** 2000. Some bugs of the subfamily Anthocorinae (Hemiptera: Anthocoridae) collected in Fars province, Iran. *Journal of the Agricultural Sciences*, 5: 5-14 (in Persian with English summary).
- Pericart J.** 1996. Family Anthocoridae Fieber, 1836 – flower bugs, minute pirate bugs. Pp. 108-140. In: Aukema B. & Rieger Ch. (eds.): *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 2. Cimicomorpha I.* The Netherlands Entomological Society, Amsterdam, xiv + 361 pp.
- Ribes, J., Gapon, D. A. & Pagola-Cardé, S.** 2007. On some species of *Carpocoris* Kolenati, 1846: New synonymies (Heteroptera: Pentatomidae: Pentatominae). *Mainzer Naturwissenschaftliches Archiv, Beiheft*, 31: 187-198.
- Ribes, J., Pagola-Cardé, S. & Zabalegui, I.** 2008. On some Palaearctic Carporcorini (Hemiptera: Pentatomidae: Pentatominae). *Heteropterus Revista de Entomología*, 8 (2): 155-169.
- Rider, D. A.** 1989. Review of the New World species of the genus *Neottiglossa* Kirby (Heteroptera: Pentatomidae). *Journal of the New York Entomological Society*, 97 (4): 394-408.
- Sadeghi, R., Farshbaf Pour Abad, R., Kazemi, H. & Hassanzadeh, M.** 2009. Introduction of some Heteroptera of Quirigol (Iran). *Munis Entomology & Zoology*, 4 (2): 498-500.
- Sadaghian, B., Dordaei, A. A. & Nokdel, M.** 2002. Faunistic study on Heteroptera order in Arasbaran forests. Proceedings of 15th Iranian Plant Protection Congress, Razi University of Kermanshah, p. 180.
- Sadaghian, B., Dordaei, A. A. & Nikdel, M.** 2004. An investigation on some Heteroptera in Arasbaran forests. Proceedings of 16th Iranian plant protection congress, Tabriz University, p. 128.

**Sakenin, H., Samin, N., Rastegar, J., Havaskary, M., Imani, S. & Linnavuori, R. E.** 2010. A faunistic survey on Heteroptera (Insecta) of Western Iran. *Linzer Biologische Beiträge*, 42: 861-872.

**Samin, N., Sakenin, H., Linnavuori R., Havaskary M. & Mohebbi H. R.** 2011. A faunistic survey of Heteroptera (Insecta) from western Iran. *Calodema*, 146: 1-12.

**Schaefer, C. W. & Panizzi, A. R.** 2000. *Heteroptera of economic importance*. CRC Press, 856 pp.

**Siddiqui, A. B.** 2000. A Revision of Strachni Genera (Hemiptera: Pentatomidae: Pentatominae), PhD. Thesis, University of Krachi- Pakistan. 260 Pp; Pages 105-106.

**Thomas, D. B.** 1994. Taxonomic synopsis of the Old World asopine genera (Heteroptera: Pentatomidae). *Journal of Insecta Mundi*, 8 (3-4): 144-212.

**Triplehorn, C. A. & Johnson, N. F.** 2005. *Borror and DeLong's introduction to the study of insects* (7th Edition). Peter Marshall Publication, 864 pp.

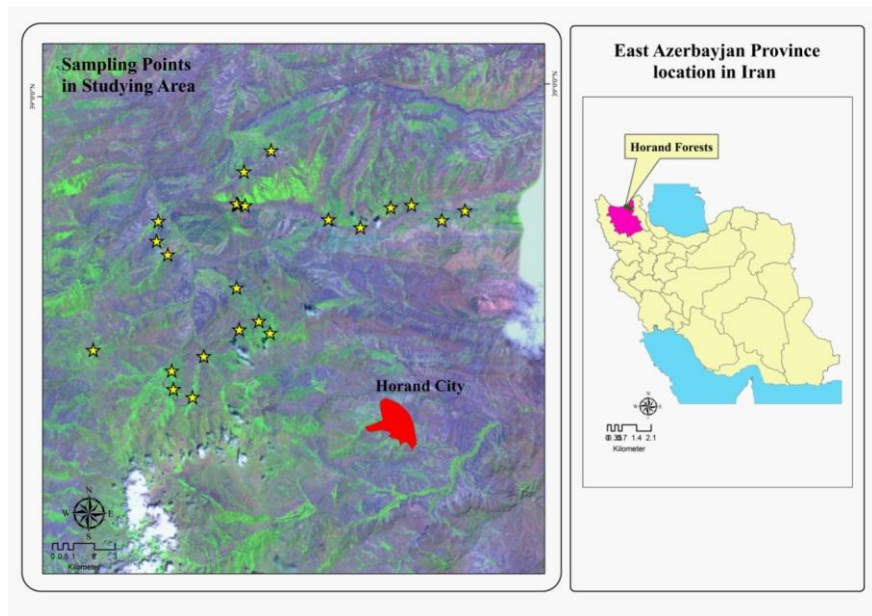


Figure 1. Map of the sampling areas in Horand grasslands, East Azarbaijan Province, northern west of Iran based on satellite images (SPOT).