CONTRIBUTION TO THE KNOWLEDGE OF ANTHOCORIDAE, MIRIDAE, LYGAEIDAE, REDUVIIDAE AND TINGIDAE FAUNA FROM FRUIT ORCHARDS IN IĞDIR PLAIN OF TURKEY

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ABSTRACT: This study is based upon material of Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae collected from different localities in Iğdır between 2013 and 2018. In this study, five species belonged to four genera from family Anthocoridae, eight species of seven genera from family Miridae, 10 species of eight genera from family Lygaeidae, one species of one genus from family Reduviidae and four species of three genera from family Tingidae were recorded from Iğdır Province. In total, 28 species from 23 genera of families Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae were recorded from Iğdır. Among them, *Lygus rugulipennis* Poppius, 1911, *Nagusta goedelii* (Kolenati, 1857), *Monosteira unicostata* (Mulsant & Rey, 1852) and *Stephanitis* (*Stephanitis*) *pyri* (Fabricius, 1775) were found the most abundant and widespread species on fruit orchards in Iğdır Plain.

KEY WORDS: Hemiptera, Anthocoridae, Miridae, Lygaeidae, Reduviidae, Tingidae, Fruit orchards fauna

Faunistic and systematic studies are important to protect biodiversity and maintain the balance of the ecosystem (Bulak Korkmaz & Yıldırım, 2021). The family Anthocoridae (Hemiptera: Heteroptera) contains between 400 and 600 species distributed worldwide, chiefly on the continents but also on oceanic islands (Lattin, 1999). Biological control offers a safe alternative to the use of pesticides. Anthocorid bugs have received considerable attention as biological control agents, partly due to their omnivorous nature, which is an advantage since they are not wholly reliant on pest populations for survival (Gitonga et al., 2002). Miridae are the most populated family of Hemiptera order, with approximately 11.020 described species (Cassis & Schuh, 2012). Miridae is known as Plant bugs (Wheeler, 2001). Miridae are mostly phytophagous, but some species are predacious or with mixed feeding (zoophytophages); most phytophagous species prefer generative organs of plants (flowers, ovaries and fruits), some may feed on mature seeds (Lehr, 1988). Lygaeidae family is a large family that includes small and medium-sized, elongated oval-shaped, dark and brightly colored species. Nearly 3000 species are known around in the worldwide (Zobar & Kıvan, 2005). Lygaeidae are mostly feed on plants, especially plant seeds. Most of their species are generally found on the soil surface, under stones and debris and on low plants

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(Lodos & Önder, 1986). Reduviidae are more common in tropical and subtropical zones and constitute a group of nearly 6900 species divided in 23 clear cut subfamilies (Weirauch & Munro, 2009; Putshkov & Moulet, 2009). Most species are predators of insects or other arthropods, either specialized on certain groups of prey organisms or apparently relatively unspecialized, but Triatominae are haematophagous on vertebrates and are known as vectors of Chagas Disease in humans (Weirauch, 2008). Tingidae are small herbivorous insects found mainly on woody plants, where they feed on leaves. Most species are host specific (Mutun, 2009). Tingidae are group of Cimicomorpha with worldwide distribution and consisting of nearly 2600 species. Some Tingidae are agricultural pests when attacking orchards particularly trees (Yıldırım et al., 2017). The aim of this paper is to bring new collect and biological data on Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae in Turkey. Although there are many faunistic records of Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae in literature, they are very little information about Igdır fauna. The study was carried on with the aim of contributing to Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae species on fruit orchards in Iğdır Plain, pioneering one related to the subject.

MATERIALS AND METHODS

Study area: This study was conducted in Iğdır province, located in Eastern Turkey (Fig. 1) and it has a microclimate with a continental climate close to the Mediterranean climate. Iğdır Plain altitudes range from 817 to 1577 m. samples were collected from stone (*Prunus* spp.) and pome fruits (*Malus* spp.) orchards during the seasons of spring, summer and autumn of 2013-2018.

Sampling method: Samples were randomly collected as shown in Table 1 (Lazarov & Grigorov, 1961). The samples were taken from leaves and fruits of the trees from the four cardinal directions. The specimens were collected (April and November) sweeping net, aspirator, handpicking, knocking. The specimens collected from different localities were separated, killed (with ethyl acetate), pinned and each specimen was labeled with location and date information.

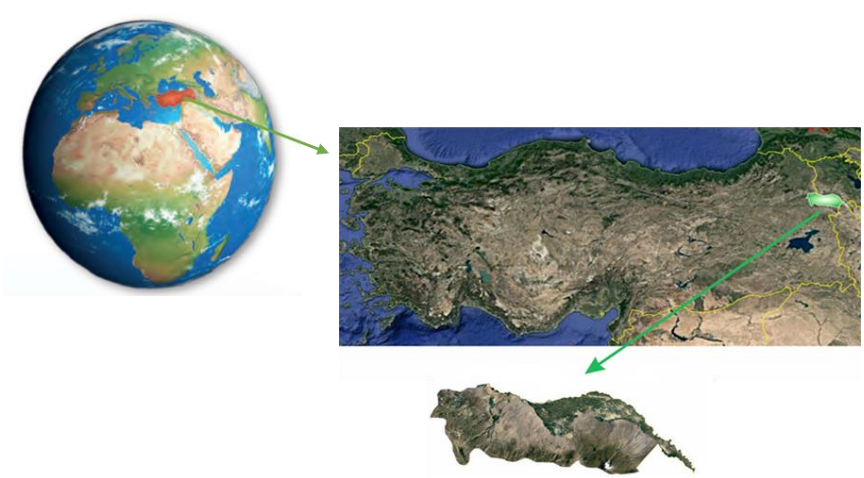

Figure 1. Location of study area.

Table 1. The number of trees controlled in the sampled fields.

Number of total trees	Number of control trees samples
1-20	All trees
21-70	10-30
71-150	31-40
151-500	41-80
501-1000	15% of all trees
More than 1000	5% of all trees

RESULTS

Superfamily Cimicoidea
Family Anthocoridae

Anthocoris nemoralis (Fabricius, 1794)

Material examined: Turkey: Iğdır: N 39°56.278', E 044°00.454', 873 m, 17.VI.2018, ♀, 2♂♂, Aralık, Köprüler, N 39°52.698', E 044°30.710', 817 m, 02.X.2017, 2♀♀, Karakoyunlu, Zülfikar, N 39°59.152', D 044°09.507', 855, 08.VI.2015, ♀, Tuzluca, Bahçecik, N 40°05.244', E 043°26.803', 1093 m, 17.VI.2018, ♀, ♂. **Remarks:** Collected from apricot and cherry.

Elatophilus* (*Elatophilus*) *nigricornis (Zetterstedt, 1838)

Material examined: Turkey: Iğdır: Kadıkışlak, N 40°01.358', e 044°03.643', 873 m, 19.VIII.2014, ♀, ♂, Tuzluca, N 40°06.386', E 043°27.106', 1036 m, 22.VI.2016, ♀, Gaziler, N 40°06.129', E 043°28.623', 1025 m, 20.VII.2015, ♂. **Remarks:** Collected from apricot.

Orius* (*Dimorphella*) *agilis (Flor, 1860)

Material examined: Turkey: Iğdır: Aralık, Köprüler, N 39°52.698', E 044°30.710', 817 m, 02.X.2017, ♀, Tuzluca, Eğrekdere, N 39°58.498', E 043°39.234', 1485 m, 12.VII.2015, 2♀♀, N 39°56.182', E 043°26.751', 1058 m, 14.VII.2015, ♂. **Remarks:** Collected from apricot.

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

Material examined: Turkey: Iğdır: Karakoyunlu, Fatih, N 39°58.856', E 044°09.964', 844 m, 02.VII.2016, ♀, Tuzluca, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 29.IX.2013, ♀, ♂. **Remarks:** Collected from apricot.

Xylocoris* (*Stictosynechia*) *lativentris (J. Sahlberg, 1870)

Material examined: Turkey: Iğdır: Karakoyunlu, Fatih, N 39° 58.856', E044° 09.964', 844 m, 02.X.2017, ♀, ♂. **Remarks:** Collected from apricot.

Superfamily Cimicoidea
Family Miridae

Adelphocoris lineolatus (Goeze, 1778)

Material examined: Turkey: Iğdır: Kazancı, N 40°00.117', E 044°01'.748', 858 m, 09.V.2015, ♀, ♂, Melekli, N 39°56.043', E 044°05.039', 855 m, 16.VII.2013, ♀♀. **Remarks:** Collected from apricot and peach.

Agnocoris rubicundus (Fallen, 1807)

Material examined: Turkey: Iğdır: Tuzluca, Eğrekdere, N 39°58.242', E 043°39.311', 1477 m, 09.IX.2014, ♀, 2♂♂. **Remarks:** Collected from apricot.

Campylomma verbasci (Meyer-Dür, 1843)

Material examined: Turkey: Iğdır: Tuzluca, Gaziler, N 40°06.131', E 043°28.624', 1034 m, 03.X.2013, 2♀♀. **Remarks:** Collected from apricot.

Deraeocoris* (*Knightocapsus*) *lutescens (Schilling, 1837)

Material examined: Turkey: Iğdır: Hakveyis, N 39°56.239', D 044°01.228', 805 m, 24.VII.2013, 12♀♀, 5♂♂. **Remarks:** Collected from apricot.

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Deraeocoris* (*Camptobrochis*) *serenus (Douglas & Scott, 1868)
Material examined: Turkey: Iğdır: Hakveyis, N 39°56.239', E 044°01.228', 865 m, 24.VII.2013, ♀, Karakoyunlu, Fatih, N 39°58.856', E 044°09.964', 844 m, 02.X.2013, ♂. **Remarks:** Collected from apricot.

Liocoris tripustulatus (Fabricius, 1781)
Material examined: Turkey: Iğdır: Alikamerli, N 39°56.265', E 044°00.477', 858 m, 13.IX.2015, 3♀♀, Tuzluca, Eğrekdere, N 39°59.623', E 043°38.800', 1383 m, 16.VIII.2018, 5♀♀, 2♂♂. **Remarks:** Collected from apricot.

Lygus rugulipennis Poppius, 1911
Material examined: Turkey: Iğdır: Alikamerli, N 39°56.261', E 044°00.482', 865 m, 23.V.2018, 8♀♀, 5♂♂, Çalpala, N 40°00.744', E 043°53.380', 897 m, 16VIII.2018, 12♀♀, ♂, Karakoyunlu, Fatih, N 39°58.856', E 044°09.964', 844 m, 28.VII.2017, ♀,Tuzluca, N 40°02.775', E 043°39.944', 1105 m, 17.VIII.2018, ♀, 3♂♂, Eğrekdere, N 39°59.970', E 043°38.638', 1344 m, 16.VIII.2018, 4♀♀, 2♂♂, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 16.VIII.2018, 2♀♀, ♂, Üçkaya, N 39°95.328', E 043°3265.901', 1498 m, 16.VIII.2018, 2♀♀, 4♂♂. **Remarks:** Collected from apricot and apple.

Orthops* (*Orthops*) *basalis (A. Costa, 1853)
Material examined: Turkey: Iğdır: Aralık, Köprüler, N 39°52.698', E 044°30.710', 817 m, 02.X.2017, ♀, Tuzluca, N 40°02.775', E 043°39.944', 1105 m, 17.VIII.2018, 6♀♀", ♂. **Remarks:** Collected from apricot.

Superfamily Lygaeoidea
Family Lygaeidae

Arocatus melanocephalus (Fabricius, 1798)
Material examined: Turkey: Iğdır: Aralık, Aşağı Aratan, N 39°50.153', E 044°32.716', 826 m, 16.VII.2013, 2♀♀. **Remarks:** Collected from apricot.

Emblethis dilaticollis (Jakovlev, 1874)
Material examined: Turkey: Iğdır: N 39°32.599', E 044°01.012', 850 m, 27.V.2013, ♀. **Remarks:** Collected from apricot.

Heterogaster artemisiae Schilling, 1829
Material examined: Turkey: Iğdır: Aralık, Aşağı Aratan N 39°50.153', E 044°32.716', 826 m, 16.VII.2013, ♀, ♂, Tuzluca, Gaziler, N 40°06.129', E 043°28.623', 1025 m, 20.VII.2015, ♂. **Remarks:** Collected from apple.

Heterogaster cathariae (Geoffroy, 1785)
Material examined: Turkey: Iğdır: Tuzluca, Karabulak, N 39°59.240', E 043°42.968', 1360 m, 19.VIII.2015, ♂. **Remarks:** Collected from apple.

Lygaeus equestris (Linnaeus, 1758)
Material examined: Turkey: Iğdır: Şehitler, N 39°950.97', E 044°051.678', 867 m, 12.IV.2014, ♀, Tuzluca, Eğrekdere, N 39°59.614', E 043°38.803', 1373 m, 19.VIII.2015, ♂, N 39°59.970', E 043°38.638', 1344 m, 20.V.2018, 2♀♀, Üçkaya, N 39°56.819', E 043°39.174', 1577 m, 15.IX.2014, ♀, 2♂♂, N 39°95.896', E 043°326.915', 1505 m, 08.VIII.2018, ♀, ♂. **Remarks:** Collected from apricot and plum.

Lygaeus simulans Deckert, 1985
Material examined: Turkey: Iğdır: Tuzluca, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 29.IX.2017, ♀. **Remarks:** Collected from apricot.

Nysius thymi (Wolff, 1804)
Material examined: Turkey: Iğdır: Tuzluca, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 29.IX.2017, ♀. **Remarks:** Collected from apricot.

Paromius gracilis (Rambur, 1839)
Material examined: Turkey: Iğdır: Tuzluca, Ağabey, N 40°11.229', E 043°51.738', 1020 m, 03.VII.2015, ♂. **Remarks:** Collected from apricot.

Rhyparochromus vulgaris (Schilling, 1829)
Material examined: Turkey: Iğdır: Eğrekdere, N 39°59.970', E 043°38.638', 1344 m, 20.V.2015, ♀, ♂. **Remarks:** Collected from apple.

Xanthochilus minusculus (Reuter, 1885)
Material examined: Turkey: Iğdır: Eğrekdere, N 39°59.970', E 043°38.638', 1344 m, 20.V.2015, 7♀♀, 3♂♂. **Remarks:** Collected from apple.

Superfamily Reduvioidea
Family Reduviidae

Nagusta goedelii (Kolenati, 1857)
Material examined: Turkey: Iğdır: Çalpala, N 40°07.650', E 043°50.321', 899 m, 02.IX.2018, ♀, Evci, N 39°59.858', E 044°04.915', 886 m, 21.VIII.2017, 5♀♀, 2♂♂, Tuzluca, Eğrekdere, N 40°59.417', E 043°63.367', 1200 m, 29.V.2018, ♂, N 39°59.623', E 043°38.800', 1383 m, 11.VIII.2018, ♂, N 40°06.129', E 043°28.624', 1027 m, 01.IX.2017, 2♀♀, 4♂♂, N 40°14.343', E 043°61.108', 1293 m, 31.VIII.2018, 4♀♀, N 39°59.624', E 043°38.800', 1365 m, 17.IX.2017, 3♀♀, ♂, N 39°59.614', E 043°38.803', 1373 m, 17.IX.2017, ♀, Gaziler, N 40°06.131', E 043°28.624', 1034 m, 28.VII.2018, ♀, N 40°06.386', E 043°27.106', 1036 m, 05.IX.2017, ♀, 28.VII.2018, 2♀♀, N 40°06.131', E 043°28.634', 1037 m, 19.VIII.2017, 5♀♀, ♂,N 40°09.427', E 043°18.201', 1031 m, 30.VIII.2018, 2♀♀, İncesu, N 40°06.855', E 043°25.366', 1039 m, 30.VIII.2018, 2♀♀, ♂, N 40°06.580', E 043°25.603', 1039 m, 28.VII.2018, 2♂♂, N 40°06.586', E 043°15.590', 1048 m, 30.VIII.2018, 3♀♀, 2♂♂. **Remarks:** Collected from apple and apricot.

Superfamily Tingoidea
Family Tingidae

Catoplatus carthusianus (Goeze, 1778)
Material examined: Turkey: Iğdır: Tuzluca, Pirli, N 40°02.938', E 043°46.036', 1055 m, 03.X.2013, ♀. **Remarks:** Collected from apricot.

Monosteira unicostata (Mulsant & Rey, 1852)
Material examined: Turkey: Iğdır: N 39°58.542', E 044°17.560', 872 m, 11.V.2018, 2♀♀, 4♂♂, 24.VII.2018, 16♀♀, 10♂♂, Alikamerli, N 39°56.261', E 044°00.482', 865 m, 23.V.2018, 2♂♂, 8♂♂, Çalpala, N 40°00.534', E 043°53.663', 895 m, 03.X.2018, 4♀♀, 2♂♂, N 40°01.021', E 043°52.035', 894 m, 31.VIII.2018, 9♀♀, 2♂♂, Küllük, N 39°59.767', E 043°54.537', 896 m, 18.08.2018, 20♀♀, 10♂♂, Tuzluca, N 40°02.775', E 043°39.944', 1105 m, 16.VIII.2018, 13♀♀, 12♂♂, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 16.08.2018, 2♀♀, 6♂♂. **Remarks:** Collected from apricot and cherry plum.

Stephanitis caucasica (Kiritchenko,1939)
Material examined: Turkey: Iğdır: N 39°56.831', E 043°58.949', 866 m, 19.VIII.2015, ♂. **Remarks:** Collected from apple.

Stephanitis (Stephanitis) pyri (Fabricius, 1775)
Material examined: Turkey: Iğdır: Alikamerli, N 39°56.261', E 044°00.482', 865 m, 23.V.2018, 5♀♀, Çalpala, N 40°00.744', E 043°53.380', 897 m, 16.VIII.2018, 4♀♀, 2♂♂, Sarıçoban, N 40°01.096', E 044°00.662', 867 m, 23.VIII.2018, 10♀♀, 3♂♂, Küllük, N 39°59.767', E 043°54.537', 896 m, 18.VIII.2018, 3♂♂, Tacirli, N 39°81.751', E 044°32.207', 863 m, 08.VI.2018, 17♀♀, 8♂♂,Tuzluca, N 40°02.775', E 043°39.944', 1105 m, 17.VIII.2018, 4♀♀, 2♂♂, Eğrekdere, N 39°59.970', E 043°38.638', 1344 m, 16.VIII.2018, 2♀♀, Köprübaşı, N 40°02.955', E 043°43.697', 1020 m, 16.VIII.2018, 5♀♀, ♂, Üçkaya, N 39°95.328', E 043°3265.901', 1498 m, 16.VIII.2018, 9♀♀, 2♂♂. **Remarks:** Collected from apple, cherry, cherry plum and pear.

In this study, 28 species of Anthocoridae, Miridae, Lygaeidae, Reduviidae and Tingidae are recorded from Iğdır. Among these five species of genera *Anthocoris* Fallen, 1814, *Elatophilus* Reuter, 1884, *Orius* Wolff, 1811 and *Xylocoris* Dufour, 1831 from family Anthocoridae, eight species of genera *Adelphocoris* Reuter, 1896, *Agnocoris* Reuter, 1875, *Campylomma* Reuter, 1878, *Deraeocoris* Kirschbaum, 1856, *Liocoris* Fieber, 1858, *Lygus* Hahn, 1833 and *Orthops* Fieber,

1858 from family Miridae, ten species of genera *Arocatus* Spinola, 1837, *Emblethis* Fieber, 1860, *Heterogaster* Schilling, 1829, *Lygaeus* Fabricius, 1794, *Nysius* Dallas, 1852, *Paromius* Fieber, 1860, *Rhyparochromus* Hahn, 1826 and *Xanthochilus* Stål, 1872 from family Lygaeidae, one species of genus *Nagusta* Stål, 1859 from family Reduviidae, four species of genera *Catoplatus* Spinola, 1837, *Monosteira* A. Costa, 1862 and *Stephanitis* Stål, 1873 from family Tingidae were recorded fruit orchards in Iğdır. In these species *Lygus rugulipennis* Poppius, 1911, *Nagusta goedelii* (Kolenati, 1857), *Monosteira unicostata* (Mulsant & Rey, 1852) and *Stephanitis* (*Stephanitis*) *pyri* (Fabricius, 1775) were found the most abundant and widespread species on fruit orchards in Iğdır Plain. All these data contribute to a better knowledge of Turkish fauna and may serve determination of insect biodiversity in the fruit orchard.

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