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Research Article

A study on the Geocoridae (Hemiptera: Heteroptera: Lygaeoidea) fauna of Amasya Province, Turkey

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ABSTRACT: In this study, the research material consists of samples collected from 27 different localities in around Amasya province between 2020 and 2021. In Amasya province, as a result of the identification of the material collected revealed 6 species belonging to sub-genera *Geocoris* s.str., and one species belonging subgenera *Piocoris* of the genera *Geocoris* of the Geocoridae family were identified. Of them, the species *Geocoris ater*, *Geocoris grylloides*, *Geocoris lineola*, *Geocoris megacephalus*, *Geocoris pallidipennis* and *Geocoris pubescens* are new records for the research area of Amasya. The species *G. grylloides*, *G. megacephalus* and *G. pallidipennis* are also a new record for the Geocoridae faunae of Black Sea Region. The species *G. grylloides*, *G. lineola*, *G. megacephalus* and *G. pubescens* are rare species in the fauna of Amasya.

KEYWORDS: Heteroptera, Lygaeoidea, Geocoridae, new records, Amasya, Turkey.

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INTRODUCTION

The suborder Heteroptera Latreille, 1810 includes 24 superfamilies belonginging to seven infraorder in the world, of those superfamilie Lygaeoidea are known in the all zoogeographic regions and includes 4290 species belonging to 708 genera in 17 families. The superfamilie Lygaeoidea Schilling, 1829 has been listed by 1000

species belonging to 242 genera in 14 families from the Palearctic region and distributed in almost all habitable. The family Geocoridae Baerensprung, 1860 are known "Big-eyed Bugs" and they has been separated into 280 species belonging to 25 genera in the world and 75 species belonging to 7 genera distributed in the Palearctic region, of those, only the species of genera *Geocoris* Fallén, 1814 distributed in Turkey. Three subgenera (*Geocoris* s. str., *Piocoris* Stål, 1872, *Eilatus* Linnavuori, 1972) are currently recognized within the genera *Geocoris* in the Palaearctic Region. But, in Turkey genera *Geocoris* is represented with the subgeneras *Geocoris* and *Piocoris* (Péricart, 2001; Henry, 2017). In Turkey, 11 species from genera *Geocoris* has been reported (Péricart, 2001; Önder et al., 2006).

The species of Geocoridae are small insects approximately 2,7-4,5 mm. long and on nymphs as well as adults with prominent eyes a head that is broader of the pronotum. The smooth, calloused area in distal part of pronotum and punctate areas on pronotum, scutellum, hemelytra are striking. The species of the Geocoridae family are mainly polyphage predatory, that live on short plants, which they catch and eat aphids, caterpillars, and other insects but some species are partially plant-feeding on agricultural and ornamental crops. Therefore, the species of Geocoridae are very important as biological control agents. Sometimes these species are prey for spiders, invasive insects, birds and other creatures-however (Çakır & Önder, 1990; Péricart, 2001; Kıyak et al., 2020).

The species of Geocoridae live veriest of the biomes with moderate and warm climate and can be encounter also in utmost biotopes e. g. high mountains and deserts. Utmost species of this family are known from the tropical regions (Kóbor, 2020). The adults and nymphs specimens of family Geocoridae usually lives on the soil, between stones and in the lower parts of dwarf plants and they overwintering as adults under natural circumstances (Çakır & Önder, 1990; Kóbor, 2020).

Amasya has very rich areas in conditions of microclimate, several vegetation and particulars habitat. Amasya also shows a matchless feature of faunal elements.

Un to day only a species *Geocoris erythrocephalus* (Poisson & Serville, 1825) known from Amasya province (Merzifon), no detailed study has been carried out so far with family Geocoridae (Çakır & Önder, 1990). The purpose of this study is to give new records for family Geocoridae fauna of Amasya, to available ecological data for the recorded species in the province.

MATERIAL AND METHODS

The study material was obtained from 27 localities with different vegetation and habitat in Amasya province in the years from 2020 to 2021 (Fig. 1). The specimens were collected from under herbaceous vegetation and above ground with a sweep net. All samples were put in tubes in 70% ethanol and brought to the laboratory. In the laboratory, specimens were softened in hot water (80°C-100°C) for preparation of the male genitalia which was used for further identifications. The specimens were prepared and identified using the relevant diagnostic was investigated under a stereomicroscope (Leica EZ4) and keys of Stichel (1960), Çakır & Önder (1990) and Péricart, 1998). The material is deposited in the collection of Amasya University, Faculty of Science and Arts, Department of Biology (Amasya, Turkey).

RESULTS

Hemiptera Linnaeus, 1758
Heteroptera Latreille, 1810
Geocoridae Baerensprung, 1860
Genus: *Geocoris* Fallén 1814

Subgenus*: Geocoris* Fallén, 1814

***Geocoris (s.str.) ater* (Fabricius, 1787) (Figure 2a)**

Material examined: Amasya: Ziyaret, 19.04.2021, 1♀; Taşova: Boraboy Lake, 29.08.2021, 1♂; Hacıbey, 10.07.2000, 2♀♀; Suluova: Yüzbeyi, 28.06.2021, 1♀; Gümüşhacıköy: Yeniköy, 03.09.2021, 1♀; Gümüş Maden, 07.09.2021, 2♀♀; Hamamözü: 07.09.2021, 1♀, 1♂; Merzifon: Çayırköy, 14.09.2021, 1♀; Esentepe, 20.08.2021, 1♀.

Distribution in Turkey: Western Anatolia, Central Anatolia, Southern Anatolia, Southeastern Anatolia, Northeastern Anatolia and Black Sea Region (Önder et al., 2006).

Distribution in Palearctic Region: **Europe:** Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Byelorussia, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Kazakhstan, Latvia, Lithvania, Luxembourg?, Macedonia, Moldavia, The Netherlands?, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. **Asia**: Azerbaijan, Afghanistan, Armenia, China, Cyprus, Georgia, Iran, Irak, Israel, Jordan, Kazakhstan, Kirgizia, Lebanon, Mongolia, Russia, Syria, Tadzhikistan, Turkey, Turkmenistan, Uzbekistan (Pericart, 2001).

***Geocoris (s.str.) grylloides* (Linnaeus, 1761) (Figure 2b)**

Material examined: Merzifon: Esentepe, 20.08.2021, 3♂♂.

Distribution in Turkey: Diyarbakır, Isparta, Mardin, Muş (Wagner, 1959; Önder et al., 2006; Fent & Japoshvili, 2012).

Distribution in Palearctic Region: **Europe:** Albania, Andorra, Austria, Belgium, Bulgaria, Byelorussia, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Kazakhstan, Latvia, Liechtenstein, Lithvania, Luxembourg, Moldavia, The Netherlands, Polland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine. **Asia:** Armenia, China, Iran, Kazakhstan, Mongolia, Russia, Turkey, (Pericart, 2001).

***Geocoris (s.str.) lineola* (Rambur, 1839) (Figure 2c)**

Material examined: Taşova: Kızgüldüren, 10.07.2020, 1♀; Merzifon: Çobanören, 14.09.2021, 1♂.

Distribution in Turkey: Adana, Ankara, Antalya, Aydın, Balıkesir, Çorum, Denizli, Diyarbakır, Gaziantep, Hatay, İzmir, Kahramanmaraş, Kilis, Osmaniye, Mersin, Muğla (Kiritishenko, 1918; Çağatay, 1989; Önder et al., 2006; Abacıgil et all., 2010; Şerban, 2010; Kaçar & Dursun, 2015; Yence, 2019).

Distribution in Palearctic Region: **Europe:** Albania, Bosnia Hercegovina, Bulgaria, France, Greece, Italy, Spain, Portugal. **Asia:** Cyprus, Iran, Irak, Israel, Syria, Saudi Arabia, Turkey, Yemen. **North Africa:** Algeria, Canary Isles, Egypt, Libya, Madeira, Morocco, Tunisia (Pericart, 2001).

***Geocoris (s.str.) megacephalus* (Rossi, 1790) (Figure 2d)**

Material examined: Merzifon: Aktarla, 20.08.2021, 1♀.

Distribution in Turkey: Western, Central, Southern and Southeastern Anatolia

(Kıyak, 1993; Lodos et al., 1999; Özsaraç & Kıyak, 2001; Önder et al., 2006; Yazıcı, 2019).

Distribution in Palearctic Region: **Europe:** Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, France, Germany, Greece, Hungary, Italy, Malta, Macedonia, The Netherlands, Poland, Romania, Russia, Slovenia, Spain. **Asia:** Azerbaijan, Afghanistan, Armenia, Cyprus, Georgia, Iran, Irak, Israel, Jordan, Kirgizia, Syria, Tadzhikistan, Turkey, Turkmenistan, Uzbekistan. **North Africa**: Algeria, Egypt, Libya, Morocco, Tunisia (Pericart, 2001).

***Geocoris (s.str.) pallidipennis* (Costa, 1843) (Figure 2e)**

Material examined: Amasya: Yıldızköy, 25.08.2021, 1♀; Göynücek: Centrum, 03.09.2021, 1♂; Gümüşhacıköy: Yeniköy, 03.09.2021, 2♀♀, 1♂; Maden, 07.09.2021, 1♂; Gümüş, 07.09.2021, 1♀.

Distribution in Turkey: Adana, Adıyaman, Bursa, Diyarbakır, Gaziantep, Hatay, İzmir, Kahramanmaraş, Kilis, Manisa, Mardin, Mersin, Osmaniye, Şanlıurfa, Tunceli (Önder & Adıgüzel, 1979; Çakır & Önder, 1990; Büyük & Özpınar, 1999; Önder et al., 2006; Kaçar & Dursun, 2015; Bolu, 2020; Özgen, 2021).

Distribution in Palearctic Region: **Europe:** Albania, Bosnia Hercegovina, Bulgaria, Croatia, France, Greece, Italy, Macedonia, Romania, Spain, Switzerland, Portugal**. Asia:** Azerbaijan, China, Cyprus, Georgia, Iran, Irak, Israel, Korea, Saudi Arabia, Turkey. **North Africa:** Canary Isles, Egypt, Morocco, Tunisia**. Extralimital:** India, Pakistan (Pericart, 2001).

***Geocoris (s.str.) pubescens* (Jakovlev, 1871) (Figure 2f)**

Material examined: Gümüşhacıköy: Maden, 07.09.2021, 1♀; Taşova: Hacıbey, 10.07.2000, 1♀.

Distribution in Turkey: Ankara, Elazığ, Malatya, İzmir, Sinop (Pericart, 1998; Fent & Dursun, 2016; Çerçi & Özgen, 2021).

Distribution in Palearctic Region: **Europe:** Bulgaria, Greece, Moldavia, Romania, Russia, Ukraine. **Asia:** Azerbaijan, Armenia, Georgia, Irak, Kazakhstan, Saudi Arabia, Turkey, Yemen.**North Africa:** Algeria, Canary Isles, Egypt, Morocco, Tunisia. **Extralimital:** Cabo Verde Islands, Sudan (Pericart, 2001).

Subgenus*: Piocoris* Stål, 1872

***Geocoris* (*Piocoris*) *erythrocephalus* (Le Peletier & Serville, 1825) (Figure 2g)**

Material examined: Amasya: Tatar, 19.05.2021, 2♀♀, 1♂; Ezinepazar, 19.05.2021, 1♀; Boğazköy, 17.04.2020, 1♀; 28.06.2021, 1♀, 1♂; İlyasköy, 05.07.2021, 1♀; Sarıyar, 19.05.2021, 1♀; Saraycık, 28.04.2021, 1♂; Taşova: Yeşilyurt, 27.05.2021, 1♀; Sepetli, 27.05.2021, 2♀♀, 4♂♂; Çalkaya, 27.05.2021, 1♀; Göynücek: Çamurlu, 03.09.2021, 1♂; Gümüşhacıköy: Maden, 07.09.2021, 6♀♀, 2♂♂; Gümüş, 29.08.2000, 1♀; 07.09.2021, 3♀♀, 6♂♂; Merzifon: Alişar, 20.08.2021, 1♀; Suluova: Deveci, 20.08.2021, 1♂.

Distribution in Turkey: Almost all regions (Önder et al., 2006); Amasya Merzifon (Çakır & Önder, 1990; Yazıcı, 2019).

Distribution in Palearctic Region: **Europe:** Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, France, Portugal, Greece, Hungary, Italy, Kazakhstan, Macedonia, Moldavia, Romania, Russia, Slovakia, Slovenia, Spain, Turkey, Ukraine. **Asia:** Azerbaijan, Armenia, Cyprus, Georgia, Iran, Irak, Israel, Kazakhstan, Lebanon, Turkey. **North Africa:** Algeria, Morocco, Tunisia (Pericart, 2001).

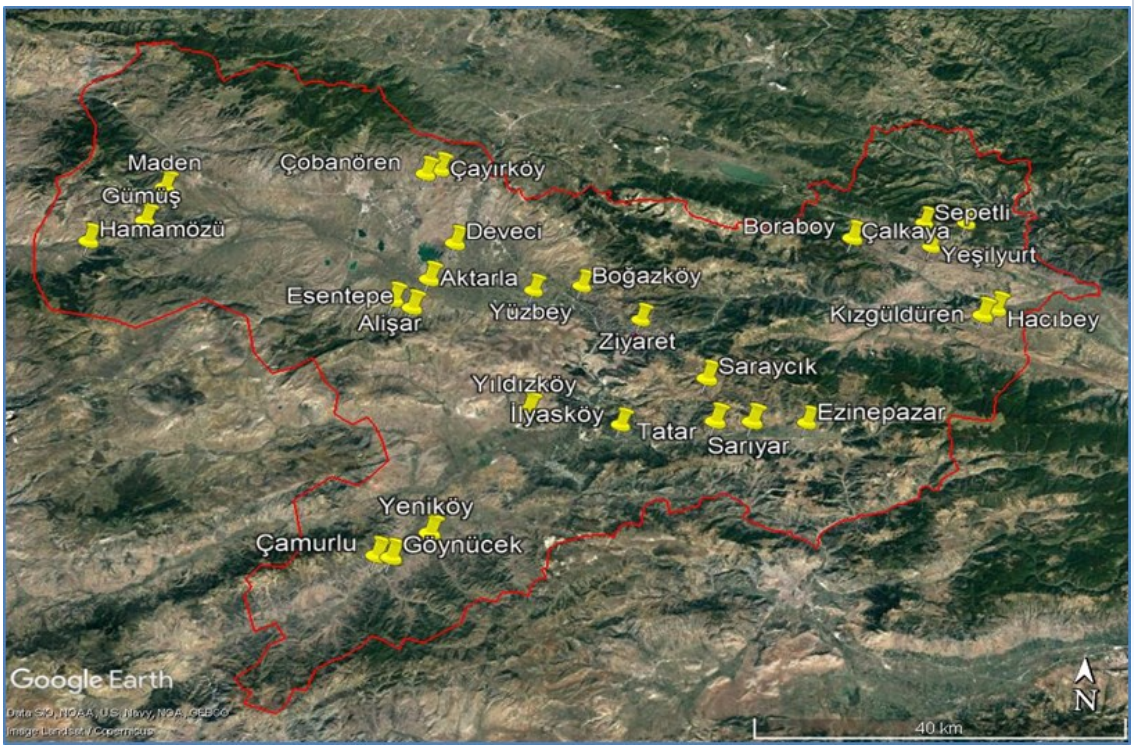

Figure 1. The area of study in Amasya (from google earth).

CONCLUSION AND DISCUSSION

In this study, as a result of the identification of the material collected from 27 different localities in around Amasya province between 2020 and 2021 revealed 6 species belonging to subgenera *Geocoris* s. str., and one species belonging subgenera *Piocoris* of the genera *Geocoris* of the Geocoridae family were reported. Of them, the species *Geocoris ater, Geocoris grylloides, Geocoris lineola, Geocoris megacephalus, Geocoris pallidipennis* and *Geocoris pubescens* are new records for the Geocoridae fauna of Amasya province, of those, the species *G. grylloides*, *G. megacephalus* and *G. pallidipennis* are also a new record for the Geocoridae faunae of Black Sea Region.

Among the species *G. ater*, *G. lineola* and *G. erytrocephalus* are widespread distributed and frequently found in Turkey and also in our present study are. Of those, *G. erythrocephalus* has been known one of the most common Euro-Mediterranean species and this species is distributed throughout the Palaearctic region (Kóbor, 2020). Although of those species *G. grylloides*, *G. lineola* and *G. megacephalus* are widespread reported and frequently founded in Turkey, the species were found rarely in research area. The species *G. pubescens* is rarely distributed in Turkey and also in our present study are.

G. erythrocephalus and *G. megacephalus* has been known as aphid predators and these species are very important for biological control agent (Yazıcı, 2019). Therefore, these species are necessary to

expand its used in the fight against pests in agricultural areas.

The microclimate areas has been known very important for the faunal component. The geographical location of Amasya is beetwen central Antolia and central Black sea region. Amasya is a dispersal corridor for different animal as Insect. Also the fact that 7 of 11 Geocoridae species in Turkey distributed in Amasya proves the importance of these microclimate areas. With the present additional records were contributed to the distribution of the family Geocoridae in Turkey the determination of biodiversity of this family in the surroundings of Amasya.

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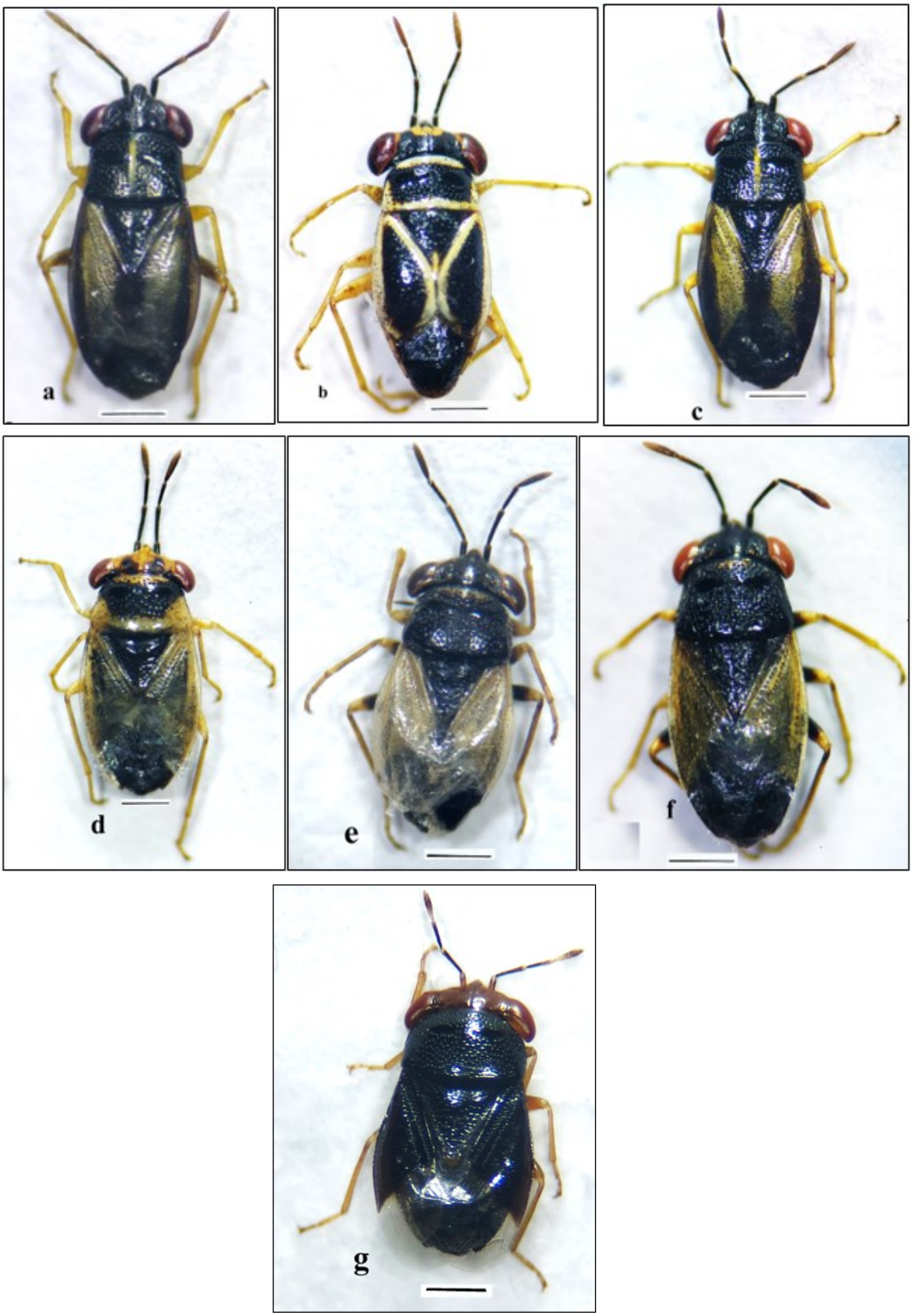

Figure 2. a- *Geocoris ater* (♀), b- *Geocoris grylloides* (♂), c- *Geocoris lineola* (♀), d- *Geocoris megacephalus* (♀), e- *Geocoris pallidipennis* (♀), f- *Geocoris pubescens* (♀),*g- Geocoris erythrocephalus* (♀). (Scale bar 1 mm.).