



## Overview of the Zoogeographical Distribution of Aquatic and Semi-Aquatic Heteroptera (Hemiptera) in Turkey

Gülten Yazici\*

Directorate of Plant Protection Central Research Institute, 06172 Yenimahalle, Ankara, Turkey.

**ABSTRACT.** The aim of this study is to review the faunistic and systematic studies on aquatic and semi-aquatic Heteroptera of Turkey and to make an analysis on the distribution and zoogeographically of the Turkish fauna. In this study, one species of Enicocephalomorpha, one species of Dipsocoromorpha, 51 species in 13 genera of Gerromorpha, four species in three genera of Leptopodomorpha and 55 species in 19 genera of Nepomorpha are reviewed. In total, 112 species belonging to 37 genera of five Infraorders are discussed from Turkey. Besides, all specimens were collected between 2009 and 2018 by the author and the specimens deposited in the Nazife Tuatay Plant Protection Museum (Ankara) were also included in. It was determined that 94 species are distributed from Mediterranean, 57 species from Europe-Siberia and 90 species from Irano-Turanian. It was determined that nine species and subspecies comprising 8% of Turkish aquatic and semi-aquatic Heteroptera are endemic are located in Turkey. In addition, new locality records are given for the species that have been collected and diagnosed. Species composition, diversity and proportion of endemism varies considerably among the zoogeographic regions of the country.

**Key words:** Heteroptera, Zoogeography, Palaearctic region, species diversity

**Received:**  
26 November, 2019

**Accepted:**  
05 March, 2020

**Published:**  
14 March, 2020

**Subject Editor:**  
Ali Asghar Talebi

**Citation:** Gülten, Y. (2020) Overview of the Zoogeographical Distribution of Aquatic and Semi-Aquatic Heteroptera (Hemiptera) in Turkey. *Journal of Insect Biodiversity and Systematics*, 6 (2), 135–155.

### Introduction

Turkey is divided into three zoogeographical zones which were allocated according to their climate, flora and fauna, location, agricultural diversities, topography, human habitat, transportation et al., First region is called the Mediterranean along the seaside in the Mediterranean Region, the Marmara Region and the Aegean Region. Second region is named the Euro-Siberian along coast of the Black Sea. The other region is named Irano-Turanian according to their location in Anatolia (Central, Eastern and Southeastern Anatolia Regions). The Anatolian diagonal, which has been recognised as a biogeographic boundary between the central and eastern Anatolian flora and fauna is one of the most distinctive biogeographic features that helps in understanding the biodiversity of Anatolia (Gür, 2016). The topographical and climatic structure gives the opportunity to host a rich and varied fauna to the Turkey (Fig. 1).

Corresponding author: Gülten Yazici, E-mail: [gultenkulekci@hotmail.com](mailto:gultenkulekci@hotmail.com)

**Copyright** © 2020, Gülten Yazici. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY NC 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Turkey would occupy Asia Minor (Anatolia) between the Black Sea and the Mediterranean Sea and extends up to the European continent. It has a rich fauna of Aquatic and Semi-Aquatic Heteroptera. Thus, some faunistic and systematic studies have been carried by both foreign and native researchers in Turkey. However, there are no studies to determine the distribution and biogeography of Aquatic and Semi-Aquatic Heteroptera in Turkey. Yet, make such a study in the West Palearctic region is very important for researchers working in this field.

In this study, the publications on the aquatic and semi-aquatic Heteroptera in Turkey are reviewed (Banbal & Fent, 2016; Dursun, 2011, 2012, 2017; Fent et al., 2011; Hoberlandt, 1948, 1952, 1956; Kıyak et al., 2004a, 2004b, 2007, 2008; Kment & Jindra, 2005; Küçükbasmacı & Kıyak, 2015; Önder & Adıgüzel, 1979; Önder et al., 1981, 1984, 2006; Salur & Mesci, 2009; Seidenstücker, 1957, 1959; Topkara et al., 2010, 2011; Topkara, 2013; Topkara & Ustaoglu, 2014, 2015; Wagner, 1966, 1976; Yıldırım et al., 2013) and their zoogeographical distribution are analyzed and discussed.

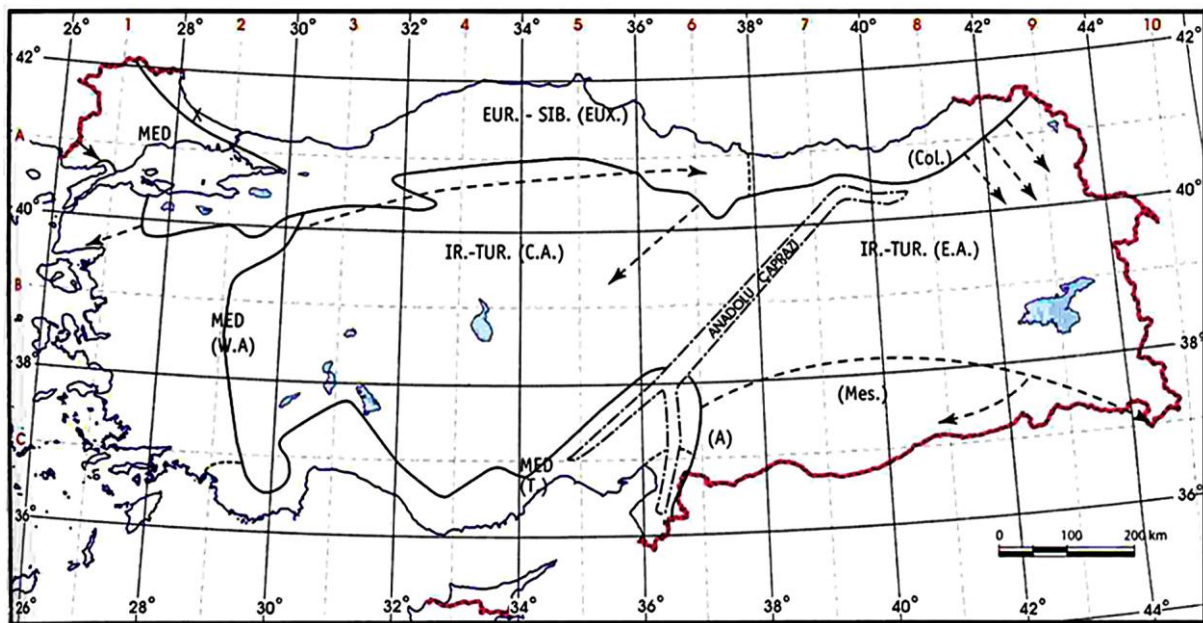


Figure 1. The map of Turkey's zoogeographical regions (Çokçalışkan, 2014).

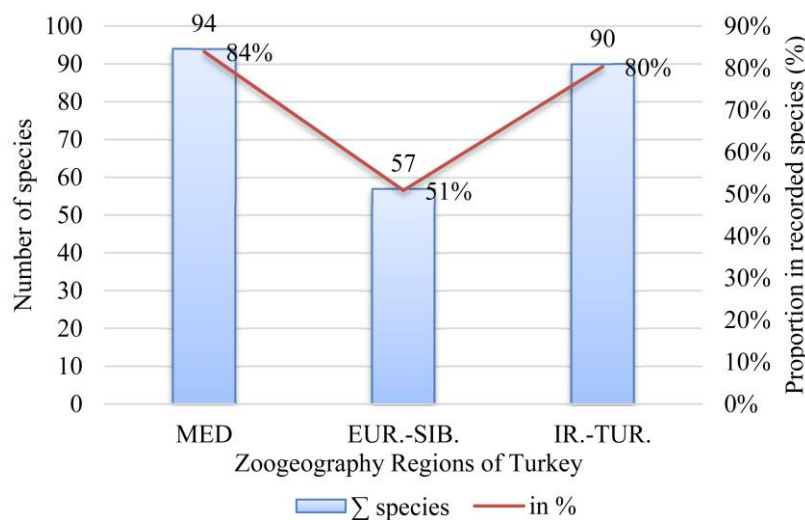
### Material and methods

The study material were constituted from specimens collected between 2009 and 2018 by the authors and the specimens deposited in the Nazife Tuatay Plant Protection Museum (Ankara) were also included in. In this article, the previous publications on the aquatic and semi-aquatic Heteroptera of Turkey are reviewed and the distribution and zoogeography of the Turkish fauna are examined. In the article, the species whose type localities are in Turkey are pick up with an asterisk (\*), and the endemic species are given in this way. Faunal similarities between zoogeographical regions of Turkey were assessed, without regard to differences in region area by using Jaccard coefficient of similarity (see Legendre & Legendre, 1998). The similarity matrix resulting from pair-wise calculations was then subjected to unweighted arithmetic average clustering (Biodiv Pro2. program).

## Results

One species of Enicocephalidae, one species of Dipsocoromorpha, two species in one genera of Mesoveliidae, four species in one genus of Hebridae, two species in one genus of Hydrometridae, 13 species in three genera of Veliidae, 14 species in three genera of Gerridae, 16 species in four genera of Saldidae, four species in three genera of Leptopodidae, two species in two genera of Nepidae, one species of Belostomatidae, one species of Ochteridae, 35 species in nine genera of Corixidae, two species in two genera of Naucoridae, two species in one genus of Aphelocheiidae, 10 species in two genera of Notonectidae and two species in one genus of Pleidae were reviewed. In total, 112 species of 37 genera belonging to 17 families of aquatic and semi-aquatic Heteroptera are recorded from Turkey (Table 1). Among them, ten species (8%) of aquatic and semi-aquatic Heteroptera are endemic (Table 1). Furthermore, the type localities of seven species (*Micronecta wui alkani* Hoberlandt, *Sigara kervillei* (Poisson), *Sigara samani samani* Hoberlandt, *Notonecta glauca kervillei* Poisson, *Notonecta glauca poissoni* Hungerford, *Microvelia hozari* Hoberlandt, *Velia mariae* Tamanini) are situated in Turkey.

It was determined that there are big differences in terms of species composition and richness between the zoogeographical regions in Turkey (Table 1, Fig. 2). It was determined that 94 (84%) species are distributed from Mediterranean, 57 (51%) species from Europe-Siberian, and 90 (80%) species from Irano-Turanian. While 48 species distribute in all regions, only 31 species distribute in one region. The genera and species diversity is highest in the Mediterranean followed by Irano-Turanian regions. The cluster analysis of faunal similarities on Aquatic and Semi-Aquatic Heteroptera among three zoogeographical regions of Turkey produce two major clusters (Fig. 3): Mediterranean and Irano-Turanian (bootstrap probability 83.81%) which form united cluster (bootstrap 68.45%). This coupled largest cluster belongs to Eastern Mediterranean in the Palaearctic. Second cluster (EUR.-SIB.) show minimum similarity (68%) with other Turkish fauna. Euro-Siberian indicate least similarity (68%) with other Turkish fauna and belongs to Siberian region in the Palaearctic. Mediterranean and Irano-Turanian fauna have highest similarity (84%) and contains most of the Aquatic and Semi-Aquatic Heteroptera species in Turkey. The ordination of the three zoogeographical regions of Turkey in the diminished field of the first two principal coordinates for 113 species of Aquatic and Semi-Aquatic Heteroptera see Fig. 4.



**Figure 2.** Number of species of aquatic and semi-aquatic Heteroptera in the zoogeographical regions of Turkey. **MED:** Mediterranean, **EUR.-SIB.:** Euro-Siberian, **IR.-TUR.:** Irano-Turanian.



**Table 1.** The species number, endemic species and restricted distribution of Aquatic and Semi-Aquatic Heteroptera in zoogeographic regions of Turkey.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
ENICOCEPHALOMORPHA					
<b>Enicocephalidae</b>	<i>Henschiella pellucida</i> Horváth, 1888*			+	Adana (Hoberlandt, 1956; Önder et al., 2006)
DIPSOCOROMORPHA					
<b>Dipsocoridae</b>	<i>Alpagut castaneovitreus</i> (Linnavuori, 1951)*		+	+	Adana, Ankara, İzmir (Hoberlandt, 1956; Önder et al., 2006)
GERROMORPHA					
<b>Mesoveliidae</b>	<i>Mesovelia furcata</i> Mulsant and Rey, 1852		+	+	Amasya, Edirne, Kayseri, Sivas (Kment & Jindra 2005; Önder et al., 2006; Banbal & Fent, 2016; Berchi et al., 2016; Dursun, 2017)
	<i>M. vittigera</i> Horváth, 1895		+	+	Antalya, Denizli, Edirne, Mersin (Hoberlandt, 1948; Önder et al., 2006; Kıyak et al., 2008; Banbal & Fent, 2016)
<b>Hebridae</b>	<i>Hebrus montanus</i> Kolenati, 1857	+	+	+	Adana, Ankara, Antalya, Bingöl, Bursa, Çanakkale, Gaziantep, Karabük, Kilis, Konya, Mersin, Osmaniye (Hoberlandt, 1952; Kment & Jindra, 2005; Önder et al., 2006; Kment & Kanyukova, 2010; Fent et al., 2011; Dursun, 2012)
	<i>H. pilipes</i> Kanyukova, 1997	+	+	+	Amasya, Antalya, Konya, Mersin, Sivas, Tunceli (Hoberlandt, 1952; Kment & Jindra, 2005; Önder et al., 2006; Kment & Kanyukova, 2010; Fent et al., 2011; Dursun, 2017)
	<i>H. pusillus</i> (Fallen, 1807)		+	+	Adana, Aydın, Bursa, Gaziantep, Mersin, Osmaniye (Hoberlandt, 1948; Kment & Jindra, 2005; Kıyak et al., 2008)
	<i>H. ruficeps</i> Thomson, 1871		+	+	Konya (Fent et al., 2011)
<b>Hydrometridae</b>	<i>Hydrometra stagnorum</i> (Linnaeus, 1758)	+	+	+	Adana, Afyon, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydın, Bartın, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Edirne, Erzincan, Gümüşhane, Hatay, Iğdır, Isparta, İzmir, Kahramanmaraş, Kırklareli, Kırşehir, Konya, Mersin, Muğla, Samsun, Sivas, Şanlıurfa, Tokat, Tunceli (Lindberg, 1922; Hoberlandt, 1948, 1956; Kıyak et al., 2004b, 2008; Önder et al., 2006; Salur & Mesci, 2009; Fent et al., 2011; Dursun, 2012)

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
<b>Hydrometridae</b>	<i>H. gracilentata</i> Horváth, 1899			+	Edirne (Banbal & Fent, 2016)
<b>Veliidae</b>	<i>Microvelia reticulata</i> (Burmeister, 1835)		+	+	Edirne, Konya, Sivas (Kment & Jindra, 2005; Önder et al., 2006; Banbal & Fent, 2016)
	<i>M. hozari</i> Hoberlandt, 1952*		+	+	Adana, Kilis, Mersin (Kment & Jindra, 2005; Önder et al., 2006; Dursun, 2012; Kment & Kolinova, 2013)
	<i>M. pygmaea</i> (Dufour, 1833)	+	+	+	Bursa, Çanakkale, Edirne, Kırşehir, Konya, Sakarya, Sivas (Önder et al., 1981, 1984, 2006; Fent et al., 2011)
	<i>Rhagovelia nigricans nigricans</i> (Burmeister, 1835)			+	Hatay (Dursun, 2012)
	<i>Velia affinis affinis</i> Kolenati, 1857	+	+	+	Adana, Amasya, Ankara, Antalya, Artvin, Bursa, Isparta, Giresun, Hatay, Mersin, Niğde, Konya (Önder et al., 2006; Fent et al., 2011; Dursun, 2012)
	<i>V. affinis filippii</i> Tamanini, 1947	+	+	+	Adana, Antalya, Aydın, Burdur, Denizli, Isparta, Kırklareli, Muğla (Hoberlandt, 1948, 1956; Önder et al., 2006; Kıyak et al., 2008; Fent et al., 2011; Berchi & Kment, 2015)
	<i>V. caprai</i> Tamanini, 1947		+	+	Antalya, Aydın, Burdur, Çorum, Isparta, Kırşehir, Muğla (Fent et al., 2011; Berchi & Kment, 2015; Kıyak et al., 2008; Salur & Mesci, 2009)
	<i>V. filippii anatolica</i> Tamanini, 1951		+	+	Adana, Afyon (Kment & Kolinova, 2013)
	<i>V. kiritshenkoi</i> Tamanini, 1958	+	+		Giresun, Kahramanmaraş, Sinop, Van (Fent et al., 2011; Dursun, 2012)
	<i>V. mancinii</i> Tamanini, 1947		+		Denizli (Fent et al., 2011)
	<i>V. mariae</i> Tamanini, 1971*		+	+	Balıkesir, Denizli (Fent et al., 2011; Zoltán et al., 2017)
	<i>V. rhadamantha rhadamantha</i> Hoberlandt, 1941			+	Kırklareli (Fent et al., 2011)
	<i>V. saulii</i> Tamanini, 1947	+			Kastamonu (Küçükbasımacı & Kıyak, 2015)
<b>Gerridae</b>	<i>Aquarius najas</i> (De Geer, 1773)	+	+	+	Antalya, Aydın, Burdur, Denizli, Isparta, Kastamonu, Muğla (Kıyak et al. 2007, 2008; Küçükbasımacı & Kıyak, 2015); and Ankara (this paper)



Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution		
Gerridae	<i>A. paludum paludum</i> (Fabricius, 1794)	+	+	+	Adana, Afyon, Amasya, Antalya, Aydın, Bartın, Burdur, Çorum, Denizli, Edirne, Hatay, Iğdır, Isparta, İzmir, Kahramanmaraş, Konya, Mersin, Muğla, Niğde, Osmaniye, Samsun, Sinop (Hoberlandt, 1948; Kıyak et al. 2004b, 2008; Önder et al., 2006; Fent et al., 2011; Salur & Mesci, 2009; Topkara et al., 2011; Dursun, 2012; Yıldırım et al., 2013); and Ankara (this paper)		
	<i>A. ventralis</i> (Fieber, 1860)	+	+	+	Adana, Amasya, Antalya, Bolu, Elazığ, Erzurum, Hatay, Kırklareli, Mersin, Osmaniye, Rize, Samsun, Sinop, Trabzon (Lindberg, 1922; Önder et al., 2006; Fent et al., 2011; Dursun, 2012, 2017; Yıldırım et al., 2013)		
	<i>Gerris argentatus</i> Schummel, 1832	+	+	+	Adana, Antalya, Aydın, Burdur, Çorum, Denizli, Erzurum, Isparta, Kahramanmaraş, Kayseri, Kütahya, Mersin, Muğla, Niğde, Sinop, Tekirdağ (Hoberlandt, 1948; Önder et al., 2006; Kıyak et al., 2008; Salur & Mesci, 2009; Fent et al., 2011; Dursun, 2012; Yıldırım et al., 2013)		
	<i>G. asper</i> (Fieber, 1860)			+	+	Adana, Ağrı, Amasya, Çorum (Önder et al., 2006; Salur & Mesci, 2009; Dursun, 2012, 2017)	
	<i>G. caucasicus</i> Kanyukova, 1982**				+	Amasya, Çorum, Sivas, Tokat, Van (Fent et al., 2011; Dursun, 2012, 2017)	
	<i>G. costae fieberi</i> Stichel, 1938	+	+	+		Afyon, Aksaray, Amasya, Ankara, Antalya, Ardahan, Artvin, Aydın, Burdur, Bursa, Çankırı, Çorum, Denizli, Erzincan, Giresun, İstanbul İzmir, Isparta, Kastamonu, Kırklareli, Kırşehir, Kocaeli, Mersin, Muğla, Niğde, Sivas, Tekirdağ, Tunceli, Van (Hoberlandt, 1948; Kıyak et al., 2004b, 2008; Önder et al., 2006; Salur & Mesci, 2009; Fent et al., 2011; Dursun, 2012, 2017)	
	<i>G. gibbifer</i> (Schummel, 1832)				+	+	Ankara, Antalya, Aydın, Burdur, Çorum, Denizli, Edirne, Isparta, İzmir, Kahramanmaraş, Muğla (Önder et al., 2006; Kıyak et al., 2007, 2008; Salur & Mesci, 2009; Berchi et al., 2018) and Kayseri (this paper)

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
<b>Gerridae</b>	<i>G. kabaishanus</i> Linnavuori, 1998*			+	Kilis (Fent et al., 2011)
	<i>G. lacustris</i> (Linnaeus, 1758)	+	+	+	Afyon, Ağrı, Amasya, Antalya, Ardahan, Aydın, Bolu, Burdur, Çanakkale, Çorum, Denizli, Edirne, Erzincan, Gaziantep, Giresun, Hatay, Iğdır, Isparta, İstanbul, Karabük, Muğla, Rize, Sakarya, Samsun, Sinop, Sivas, Tekirdağ, Tokat, Trabzon, Van (Hoberlandt, 1948; Kıyak et al., 2004b, 2008; Önder et al., 2006; Salur & Mesci, 2009; Dursun, 2012, 2017; Topkara & Ustaoglu, 2015); and Antalya (this paper)
	<i>G. maculatus</i> Tamanini, 1946	+	+	+	Adana, Ağrı, Amasya, Antalya, Ardahan, Edirne, Erzincan, Hatay, Kayseri, Sinop, Sivas, Tunceli, Van (Seidenstücker, 1957; Önder et al., 2006; Fent et al., 2011; Dursun, 2012, 2017; Berchi et al., 2018). Tekirdağ (this paper)
	<i>G. thoracicus</i> Schummel, 1832	+	+	+	Adana, Afyon, Ağrı, Amasya, Ankara, Antalya, Ardahan, Artvin, Aydın, Balıkesir, Bartın, Bursa, Burdur, Çankırı, Çorum, Denizli, Edirne, Erzincan, Giresun, Gümüşhane, Hatay, Iğdır, Isparta, İzmir, Karabük, Kayseri, Konya, Samsun, Mersin, Muğla, Niğde, Sinop, Sivas, Tekirdağ, Tokat, Trabzon, Van (Hoberlandt, 1948; Kıyak et al., 2004b, 2008; Lindberg, 1922; Önder et al., 2006; Salur & Mesci, 2009; Fent et al., 2011; Dursun, 2012; Topkara & Ustaoglu, 2014); and Gaziantep, Tekirdağ (this paper)
	<i>G. lateralis</i> Schummel 1832	+	+	+	Adana, Çankırı, Denizli, Erzurum, Gümüşhane, Kastamonu, Konya, Kütahya, Osmaniye (Yıldırım et al., 2013; Küçükbasmacı & Kıyak, 2015)
	<i>Limnoporos rufoscutellatus</i> (Latreille, 1807)			+	Edirne (Banbal & Fent, 2016)
<b>Saldidae</b>	<i>Chartoscirta cincta cincta</i> (Herrich-Schaeffer, 1841)	+		+	Artvin, Edirne, Kocaeli (Önder et al., 2006; Fent et al., 2011)
	<i>C. cocksii</i> (Curtis, 1835)		+	+	Adana, Ankara, Erzincan, Konya (Önder et al., 2006; Fent et al., 2011)



Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
<b>Saldidae</b>	<i>Macrosaldula scotica</i> (Curtis, 1835)	+			Zonguldak (Cobben, 1985)
	<i>M. variabilis</i> (Herrich-Schaeffer, 1835)	+	+	+	Adana, Antalya, Aksaray, Ankara, Bolu, Edirne, İzmir (Önder et al., 2006; Fent et al., 2011)
	<i>Saldula amplicollis</i> (Reuter, 1891)		+	+	Adana, Ankara, Antalya, Ardahan, Bitlis, Erzurum, Hatay, İzmir (Lindberg, 1922; Hoberlandt, 1952; Önder et al., 2006; Fent et al., 2011; Yıldırım et al., 2013) and Erzincan (this paper)
	<i>S. arenicola arenicola</i> (Scholtz, 1847)	+	+	+	Adana, Adapazarı, Amasya, Ankara, Antalya, Burdur, Bursa, Edirne, Erzincan, İzmir, Konya, Sakarya, Tunceli (Lindberg, 1922; Hoberlandt, 1952; Önder et al., 1981, 2006; Fent et al., 2011; Yıldırım et al., 2013; Dursun, 2017) and Erzurum (this paper)
	<i>S. fucicola</i> (J. Sahlberg, 1870)		+	+	Antalya, Aydın, Denizli, Isparta, Muğla (Kıyak et al. 2007, 2008)
	<i>S. lindbergi</i> Lindskog, 1975**			+	Antalya (Hoberlandt, 1952; Fent et al., 2011)
	<i>S. melanoscela</i> (Fieber, 1859)			+	Adana, Antalya, İzmir (Önder et al., 2006; Fent et al., 2011)
	<i>S. opacula</i> (Zetterstedt, 1838)	+	+	+	Bursa, Mersin, Sivas (Önder et al., 1981, 2006; Fent et al., 2011)
	<i>S. pallipes</i> (Fabricius, 1794)			+	Antalya (Kıyak et al., 2007, 2008)
	<i>S. palustris</i> (Douglas, 1874)	+	+	+	Ankara, Antalya, Erzincan, Erzurum, Eskişehir, Isparta, İzmir, Kayseri, Konya, Mersin, Muğla, Tunceli (Lindberg, 1922; Hoberlandt, 1948; Önder et al., 2006; Kıyak et al., 2008; Fent et al., 2011; Yıldırım et al., 2013)
	<i>S. pilosella pilosella</i> (Thomson, 1871)	+	+		Afyon, Ankara, Eskişehir, Mersin (Fent et al., 2011)
	<i>S. saltatoria</i> (Linnaeus, 1758)	+	+	+	Amasya, Edirne (Fent et al., 2011; Dursun, 2017)
	<i>Salda littoralis</i> (Linnaeus, 1758)			+	Adana, Amasya, Burdur, Bursa, Çankırı, Konya, (Hoberlandt, 1948; Önder et al., 2006; Kıyak et al., 2008; Dursun, 2017) and Ankara, Erzurum, Van (this paper)
<i>S. morio</i> Zetterstedt, 1838				+	Antalya (Fent et al., 2011).
LEPTOPODOMORPHA					
<b>Leptopodidae</b>	<i>Erianotus lanosus</i> (Dufour, 1834)	+			Karabük (Fent et al., 2011)

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
<b>Leptopodidae</b>	<i>Leptopus hispanus</i> Rambur, 1840			+	Adana, Hatay (Önder et al., 2006; Fent et al., 2011)
	<i>L. marmoratus</i> (Goeze, 1778)	+	+	+	Aksaray, Bursa, Isparta (Önder et al., 2006; Kıyak et al., 2008; Fent et al., 2011)
	<i>Patapius spinosus</i> (Rossi, 1790)	+	+	+	Adana, Bursa, Diyarbakır, İzmir (Önder & Adıgüzel, 1979; Önder et al., 2006; Fent et al., 2011)
NEPOMORPHA					
<b>Nepidae</b>	<i>Nepa cinerea</i> Linnaeus, 1758	+	+	+	Adıyaman, Afyon, Ağrı, Amasya, Aydın, Bolu, Burdur, Edirne, Isparta, Kahramanmaraş, Kayseri, Kırklareli, Kırşehir, Nevşehir, Sakarya, Sivas, Van (Kıyak et al., 2004a, 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Yıldırım et al., 2013; Dursun & Fent, 2018)
	<i>Ranatra linearis</i> (Linnaeus, 1758)	+	+	+	Afyon, Amasya, Burdur, Denizli, Edirne, Isparta, İstanbul, İzmir, Kayseri, Kırklareli, Konya, Muğla, Samsun (Lindberg, 1922; Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Dursun & Fent, 2018)
<b>Belostomatidae</b>	<i>Lethocerus patruelis</i> (Stål, 1854)	+	+	+	Adana, Amasya, Balıkesir, Bursa, Çanakkale, Edirne, Hatay, Kırklareli, Mersin, Tekirdağ (Önder et al., 2006; Fent et al., 2011; Yıldırım et al., 2013; Dursun, 2017; Dursun & Fent, 2018) and Adana (this paper)
<b>Ochteridae</b>	<i>Ochterus marginatus marginatus</i> (Latreille, 1804)		+	+	Antalya, Amasya, Denizli (Lindberg, 1922; Kıyak et al., 2007; Fent et al., 2011; Dursun, 2017; Dursun & Fent, 2018).
<b>Corixidae</b>	<i>Micronecta pusilla</i> (Horváth, 1895)		+	+	Adana, Amasya, Konya, Sivas (Fent et al., 2011; Dursun, 2017; Dursun & Fent, 2018)
	<i>M. griseola</i> Horváth, 1899		+	+	Amasya, Antalya, Burdur, Denizli, Edirne, Isparta, Muğla, Sivas (Kıyak et al., 2007; Fent et al., 2011; Dursun, 2017; Dursun & Fent, 2018)
	<i>M. scholtzi</i> (Fieber, 1860)	+	+	+	Amasya, Balıkesir, Bolu, Denizli, Edirne, İzmir, Sakarya (Hoberlandt, 1948; Fent et al., 2011; Topkara et al., 2011; Topkara, 2013; Topkara & Ustaoglu, 2014; Dursun, 2017; Dursun & Fent, 2018)

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
Corixidae	<i>M. anatolica anatolica</i> Lindberg, 1922	+	+	+	Adana, Antalya, Balıkesir, Burdur, Denizli, Isparta, İzmir, Kahramanmaraş, Kastamonu, Muğla, Van (Hoberlandt, 1948; Önder et al., 2006; Kıyak et al., 2007; Dursun, 2011; Kment & Kolinova, 2013; Topkara, 2013; Topkara & Ustaoglu, 2014, 2015)
	<i>M. vitticeps</i> (Horvath, 1895)	+		+	Edirne, Sakarya (Önder et al., 1981, 2006)
	<i>M. wui alkani</i> Hoberlandt, 1952*	+	+	+	Adana, Bursa, Erzincan, Gaziantep, Kilis, Sivas (Fent et al., 2011; Kment & Kolinova, 2013)
	<i>Cymatia rogenhoferi</i> (Fieber, 1864)			+	Ankara, Konya, Van (Hoberlandt, 1948; Önder et al., 2006; Topkara, 2013)
	<i>Monticorixa armeniaca</i> (Štys, 1975)**			+	Ardahan, Mersin (Önder et al., 2006; Fent et al., 2011)
	<i>Callicorixa raddei</i> (Kiritshenko and Jaczewski, 1960)**			+	Ağrı, Ardahan, Erzurum, Kars, Van (Önder et al., 2006; Dursun, 2011; Fent et al., 2011)
	<i>C. concinna</i> (Fieber, 1848)				Afyon, Ankara, Edirne (Önder et al., 1984, 2006).
	<i>Corixa affinis</i> Leach, 1817	+	+	+	Adana, Afyon, Ağrı, Amasya, Ankara, Antalya, Aydın, Burdur, Çanakkale, Çorum, Denizli, Diyarbakır, Edirne, Erzincan, Eskişehir, Hatay, Isparta, İzmir, Karaman, Kırklareli, Kocaeli, Konya, Manisa, Mersin, Muğla, Osmaniye, Samsun, Sivas, Zonguldak (Hoberlandt, 1948; Önder & Adıgüzel, 1979; Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara et al., 2011; Topkara, 2013; Yıldırım et al., 2013; Topkara & Ustaoglu, 2015; Dursun & Fent, 2018)
	<i>C. dentipes</i> Thomson, 1869				Kars, Konya, Van (Önder et al., 2006; Dursun, 2011)
	<i>C. jakowleffi</i> Horváth, 1880				Adana, Kayseri, Konya (Önder et al., 2006; Fent et al., 2011)
<i>C. panzeri</i> Fieber, 1848	+	+	+	Amasya, Ankara, Burdur, Edirne, Erzurum, Isparta, Konya, Kütahya, Samsun (Jansson, 1986; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara, 2013; Yıldırım et al., 2013; Dursun & Fent, 2018)	

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution		
Corixidae	<i>C. punctata</i> (Illiger, 1807)	+	+	+	Adana, Afyon, Ağrı, Amasya, Ankara, Antalya, Ardahan, Aydın, Burdur, Çankırı, Denizli, Edirne, Isparta, İstanbul, İzmir, Kastamonu, Kayseri, Kırklareli, Kocaeli, Konya, Samsun (Hoberlandt, 1948; Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara, 2013; Yıldırım et al., 2013; Dursun & Fent, 2018) and Kastamonu (this paper)		
	<i>Heliocorisa vermiculata</i> (Puton 1874)	+			Bursa, Kocaeli (Önder et al., 1981, 2006)		
	<i>Hesperocorixa linnaei</i> (Fieber, 1848)	+	+	+	Adana, Adapazarı, Ağrı, Ankara, Antalya, Aydın, Bolu, Burdur, Bursa, Denizli, Düzce, Edirne, Isparta, Kayseri, Sakarya, Sivas (Hoberlandt, 1948; Önder et al., 1981, 2006; Kıyak et al., 2007; Topkara, 2013; Banbal & Fent, 2016)		
	<i>H. parallela</i> (Fieber, 1860)	+	+	+	Adana, Adapazarı, Ağrı, Antalya, Aydın, Burdur, Çorum, Isparta, Konya, Niğde, Sakarya (Önder et al., 1981, 2006; Kıyak et al., 2007)		
	<i>H. sahlbergi</i> (Fieber, 1848)	+			Bolu (Fent et al., 2011)		
	<i>Paracorixa concinna concinna</i> (Fieber, 1848)			+	+	Ağrı, Amasya, Ankara, Antalya, Bitlis, Burdur, Edirne, Erzurum, İzmir, Kars, Konya, Van (Önder et al., 2006; Durun, 2011, 2017; Dursun & Fent, 2018)	
	<i>Sigara mayri</i> (Fieber, 1860)	+	+	+	+	Adana, Afyon, Aydın, Edirne, İzmir, Kırklareli Mersin (Önder et al., 2006; Fent et al., 2011; Banbal & Fent, 2016)	
	<i>S. iranica</i> Lindberg, 1964**				+	Ardahan, Van (Fent et al., 2011)	
	<i>S. kervillei</i> (Poisson, 1927)*				+	+	Adana, Afyon, Ankara, Antalya, Konya, Kütahya (Hoberlandt, 1948; Jansson, 1986; Önder et al., 2006; Kıyak et al., 2007; Fent et al., 2011; Topkara, 2013)
	<i>S. limitata limitata</i> (Fieber, 1848)	+	+	+	+	Ağrı, Ardahan, Balıkesir, Edirne, Erzurum, Kastamonu (Önder et al., 2006; Fent et al., 2011; Topkara & Ustaoglu, 2014)	
<i>S. albiventris</i> (Horváth, 1911)				+	+	Adana, Afyon, Hatay, Kahramanmaraş, Kayseri (Önder et al., 2006)	

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
Corixidae	<i>S. nigrolineata nigrolineata</i> (Fieber, 1848)	+	+	+	Adana, Adapazarı, Ağrı, Afyon, Ağrı, Amasya, Ankara, Antalya, Ardahan, Artvin, Aydın, Balıkesir, Bolu, Burdur, Bursa, Çanakkale, Çorum, Denizli, Diyarbakır, Düzce, Edirne, Erzincan, Erzurum, Eskişehir, Gaziantep, Hatay, Iğdır, Isparta, İstanbul İzmir, Kars, Kastamonu, Kocaeli Konya, Mersin, Muğla, Rize, Samsun, Sakarya, Şanlıurfa, Sivas, Tokat, Trabzon, Tunceli, Van (Hoberlandt, 1948; Jansson, 1986; Önder et al., 1981, 2006; Kıyak et al., 2004b; 2007; Dursun, 2011, 2017; Fent et al., 2011; Topkara et al., 2011; Topkara, 2013; Yıldırım et al., 2013; Topkara & Ustaoglu, 2014; Dursun & Fent, 2018) and Kahramanmaraş, Kastamonu, Nevşehir (this paper)
	<i>S. assimilis</i> (Fieber, 1848)		+	+	Bitlis, Burdur, İzmir, Konya, Van (Önder et al., 2006; Topkara, 2013)
	<i>S. striata</i> (Linnaeus, 1758)	+	+	+	Afyon, Ağrı, Amasya, Ankara, Antalya, Ardahan, Aydın, Balıkesir, Bolu, Burdur, Çanakkale, Çankırı, Denizli, Edirne, Erzurum, Isparta, İzmir, Kayseri, Konya, Manisa, Mersin, Muğla, Sakarya, Samsun, Van (Kıyak et al. 2004b, 2007; Önder et al., 2006; Dursun 2011, 2017; Fent et al., 2011; Topkara, 2013; Topkara & Ustaoglu, 2014; Dursun & Fent, 2018)
	<i>S. lateralis</i> (Leach, 1817)	+	+	+	Adana, Afyon, Ağrı, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bitlis, Bolu, Burdur, Bursa, Çanakkale, Denizli, Diyarbakır, Edirne, Erzurum, Eskişehir, Gaziantep, Iğdır, Isparta, İstanbul, İzmir, Karabük, Kars, Kastamonu, Kayseri, Kırklareli, Kocaeli, Konya, Mersin, Muğla, Niğde, Osmaniye, Rize, Samsun, Sinop, Tekirdağ, Tunceli, Van, Zonguldak (Hoberlandt, 1948; Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara, 2013; Yıldırım et al., 2013; Topkara & Ustaoglu, 2014; Dursun & Fent, 2018) and Edirne, Konya, Nevşehir, Niğde, Tekirdağ (this paper)
	<i>S. daghestanica</i> Jansson, 1983**			+	Konya (Önder et al., 2006)
	<i>S. scripta</i> (Rambur, 1840)			+	Edirne, Sivas (Önder et al., 2006; Fent et al., 2011)

Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.- Sib.	Ir.- Tur.	Med	Distribution
<b>Corixidae</b>	<i>S. iactans</i> Jansson, 1983	+	+	+	Bolu, Çankırı, Edirne, Kırklareli, Sakarya (Önder et al., 2006; Fent et al., 2011; Topkara, 2013)
	<i>S. samani samani</i> Hoberlandt, 1952*			+	Adana, Mersin (Seidenstücker, 1959; Önder et al., 2006; Fent et al., 2011; Kment & Kolinova, 2013)
	<i>S. samani tigranes</i> Jansson, 1986*		+		Diyarbakır, Mardin (Önder et al., 2006)
	<i>S. stagnalis stagnalis</i> (Leach, 1817)			+	İzmir (Topkara et al., 2010)
<b>Naucoridae</b>	<i>Ilyocoris cimicoides cimicoides</i> (Linnaeus, 1758)	+	+	+	Adana, Afyon, Amasya, Ankara, Ardahan, Aydın, Burdur, Denizli, Isparta, Kars, Kayseri, Kırklareli, Konya, Muğla, Niğde, Samsun, Sivas (Önder et al., 2006; Kıyak et al., 2004b, 2007; Fent et al., 2011; Dursun, 2011, 2017; Dursun & Fent, 2018)
	<i>Naucoris maculatus maculatus</i> Fabricius, 1798			+	Mersin (Önder et al., 2006)
<b>Aphelocheiridae</b>	<i>Aphelocheirus (A.) aestivalis</i> (Fabricius, 1794)		+	+	Van (Önder et al., 2006)
	<i>A. kolenatii</i> Kiritshenko, 1925		+		Çorum (Kanyukova, 1995)
<b>Notonectidae</b>	<i>Anisops debilis</i> Gerstaecker, 1873			+	Hatay (Dursun, 2011)
	<i>A. sardeus sardeus</i> Herrich-Schaeffer, 1849		+	+	Adana, Amasya, Antalya, Aydın, Denizli, Edirne, Gaziantep, Mersin, Muğla, Osmaniye (Önder et al., 2006; Kıyak et al., 2007; Fent et al., 2011; Banbal & Fent, 2016; Dursun, 2017; Dursun & Fent, 2018)
	<i>Notonecta glauca glauca</i> Linnaeus, 1758	+	+	+	Afyon, Amasya, Ankara, Antalya, Bolu, Bursa, Çankırı, Denizli, Erzincan, Kırklareli, Konya, İzmir, Kastamonu, Samsun, Sivas, Şanlıurfa (Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara et al., 2011; Berchi, 2013; Yıldırım et al., 2013; Topkara & Ustaoglu, 2015; Dursun & Fent, 2018)
	<i>N. glauca poissoni</i> Hungerford, 1934*	+	+	+	Ağrı, Erzurum, Kars, Kırşehir, Osmaniye, Trabzon, Sivas, Van (Önder et al., 2006; Dursun, 2011; Fent et al., 2011)



Table 1. Continued.

Infraorders and Families	Names of taxa	Eur.-Sib.	Ir.-Tur.	Med	Distribution
<b>Notonectidae</b>	<i>N. maculata</i> Fabricius, 1794	+	+	+	Adana, Amasya, Antalya, Aydın, Balıkesir, Burdur, Denizli, Hatay, Isparta, İstanbul, Kırklareli, Mersin, Muğla, Osmaniye, Samsun, Sinop, Şanlıurfa, Tekirdağ (Önder et al., 2006; Kıyak et al., 2007; Dursun, 2011, 2017; Fent et al., 2011; Berchi, 2013; Yıldırım et al., 2013; Topkara & Ustaoglu, 2014; Dursun & Fent, 2018)
	<i>N. marmorea</i> Fabricius, 1803	+	+	+	Çankırı, Kastamonu (Küçükbasmacı & Kıyak, 2015) and Edirne (this paper)
	<i>N. meridionalis</i> Poisson, 1926	+	+	+	Adana, Amasya, Ankara, Bursa, Erzurum, Hatay, Kırklareli, Kırşehir, Kocaeli, Konya, Samsun, Tunceli (Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Berchi, 2013; Yıldırım et al., 2013; Dursun & Fent, 2018)
	<i>N. obliqua</i> Thunberg, 1787	+	+	+	Adana, Amasya, Antalya, Burdur, Denizli, Isparta, İstanbul, Kahramanmaraş, Kars, Kırklareli, Kırşehir, Kocaeli, Muğla, Samsun, Van (Önder et al., 2006; Kıyak et al., 2007; Dursun, 2011, 2017; Fent et al., 2011; Dursun & Fent, 2018).
	<i>N. reuteri reuteri</i> Hungerford, 1928			+	Ardahan (Dursun, 2011; Fent et al., 2011)
	<i>N. viridis</i> Delcourt, 1909	+	+	+	Adana, Afyon, Amasya, Ankara, Antalya, Aydın, Balıkesir, Burdur, Denizli, Edirne, Erzincan, Hatay, Isparta, İzmir, Kırşehir, Muğla, Osmaniye, Samsun, Sivas, Tokat, Van (Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Berchi, 2013; Topkara & Ustaoglu, 2014, 2015; Dursun & Fent, 2018)
<b>Pleidae</b>	<i>Plea leachi</i> MG., 1899		+		Afyon, Ankara (Önder et al., 2006; Kıyak et al., 2004a)
	<i>P. minutissima minutissima</i> Leach, 1817	+	+	+	Adana, Afyon, Amasya, Ankara, Antalya, Burdur, Denizli, Edirne, Isparta, İzmir, Kayseri, Konya, Muğla, Nevşehir, Samsun, Sivas (Kıyak et al., 2004b, 2007; Önder et al., 2006; Dursun, 2011, 2017; Fent et al., 2011; Topkara et al., 2011; Dursun & Fent, 2018)
<b>17 Family</b>	<b>37 Genus and 112 Species</b>	<b>57</b>	<b>90</b>	<b>94</b>	

MED: Mediterranean, EUR.-SIB.: Euro-Siberian, IR.-TUR.: Irano-Turanian, \*:endemic, \*\*:restricted distribution.

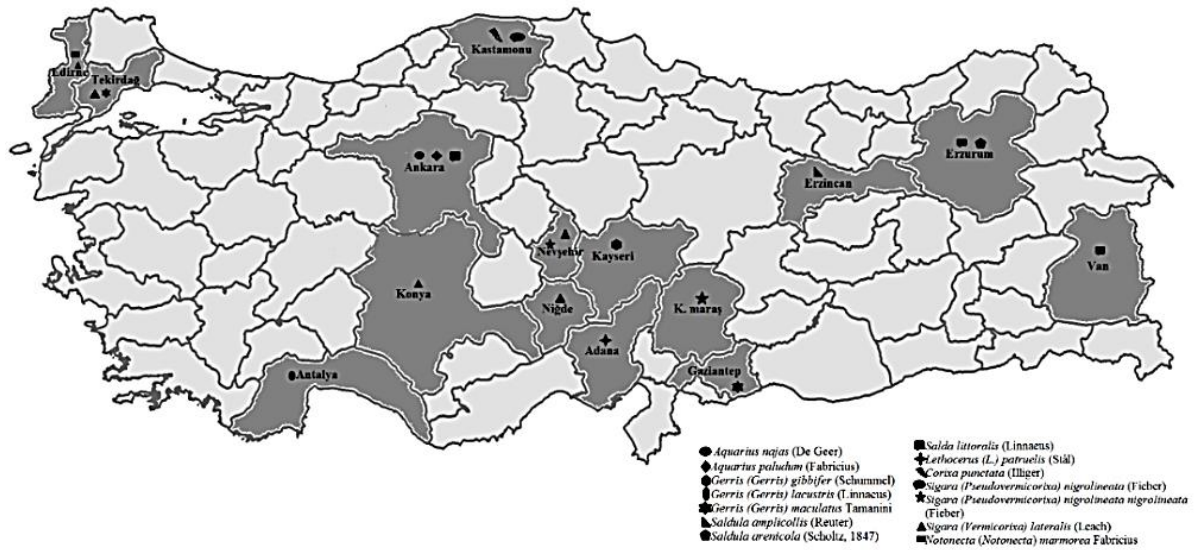
## Discussion

In this study, 112 species of 37 genera belonging to 17 families (Enicocephalidae, Dipsocoridae, Mesoveliidae, Hebridae, Hydrometridae, Veliidae, Gerridae, Saldidae, Leptopodidae, Nepidae, Belostomatidae, Ochteridae, Corixidae, Naucoridae, Aphelocheiridae, Notonectidae, Pleidae) of aquatic and semi-aquatic Heteroptera were recorded from Turkey. Among them, ten species (8%) are endemic. Additionally, the most widespread species in all zoogeographic regions are (Table 1): *Aquarius paludum paludum* (Fabricius), *Hydrometra stagnorum* (Linnaeus), *Gerris argentatus* Schummel, *G. lacustris* (Linnaeus), *G. maculatus* Tamanini, *G. thoracicus* Schummel, *Saldula arenicola arenicola* (Scholtz), *Notonecta meridionalis* Poisson, *N. viridis* Delcourt, *Corixa affinis* Leach, *C. panzeri* Fieber, *C. punctata* (Illiger), *Hesperocorixa linnaei* (Fieber), *Paracorixa concinna concinna* (Fieber), *Sigara nigrolineata nigrolineata* (Fieber), *S. lateralis* (Leach), *S. striata* (Linnaeus).

In addition, new locality records are given for *Aquarius najas* (De Geer), *A. paludum paludum* (Fabricius), *Gerris gibbifer* (Schummel), *G. lacustris* (Linnaeus), *G. maculatus* Tamanini, *Saldula amplicollis* (Reuter), *S. arenicola arenicola* (Scholtz), *Salda littoralis* (Linnaeus), *Lethocerus patruelis* (Stål), *Corixa punctata* (Illiger), *S. nigrolineata nigrolineata* (Fieber), *S. lateralis* (Leach), *Notonecta marmorea* Fabricius, 1803 that have been collected and diagnosed. New locality records are shown on (Fig. 5). Two species *Saldula arenicola arenicola* (Scholtz) and *Salda littoralis* (Linnaeus) are given as the new distributional record for Irano-Turanian region.

There are big differences in terms of endemic species composition abundance among the zoogeographic regions of Turkey. Accordingly, five species were determined from Irano-Turanian, eight species from Mediterranean and one species from Euro-Siberian. As a result, the zoogeographic region with the highest endemism is Mediterranean (Table 1). While Gerridae species are distributed in almost every region, *Gerris caucasicus* is only distributed in Irano-Turanian region. *G. caucasicus* Kanyukova which is determined from Iran-Turan region, is recorded from Amasya, Çorum, Sivas, Tokat and Van (Aukema & Rieger, 1995; Önder et al., 2006; Fent et al., 2011; Dursun, 2012, 2017). Also it is distributed in Russia, Azerbaijan, Armenia, Georgia and Iran in the Palaearctic region (Aukema & Rieger, 1995). Linnavuori (1994) recorded *Gerris kiristhenkoi* Kanyukova from Iraq. However, it is quite clear that is a misidentification, most likely of *G. caucasicus* Kanyukova (Aukema & Rieger, 1995). When the distribution area of the species is examined, it is determined that Turkey is the most western border. *Gerris kabaishanus* Linnavuori was reported from Kilis by Fent et al. (2011) who noted that this species was recorded as *G. lacustris* P. Kment from Kilis by Hoberlant (1952). Also in the same literature, it is given as *G. lacustris* from northern Iraq by Jaczewski (1964). Thus it could not change from Mediterranean (from the Toros mountains) to other regions and the species belonging to Mesopotamia and has endemic status.

*Saldula lindbergi* Lindskog was recorded from Antalya (part of the Toros mountains of the Mediterranean region) by Hoberlant (1952) and Fent et al. (2011). This species is distributed in Asian part of the Turkey and Cyprus (Aukema & Rieger, 1995). Therefore, the northern boundary within the distribution area constitutes Turkey. It may be the species has restricted distribution in eastern Mediterranean. Also *Saldula saltatoria* (Linnaeus) has been reported for the first time from the study area (it collected from Ankara, Erzurum and Van province of the Irano-Turanian) in Turkey.



**Figure 5.** New locality records for species of aquatic and semi-aquatic Heteroptera

*Monticorixa armeniaca* (Štys) was reported from Mersin (part of the Toros mountains of the Mediterranean region) by Önder et al. (2006). Also it distributes in Armenia and Georgia (Aukema & Rieger, 1995). Aukema & Rieger (1995) reported that it was given as *Arctocorixa armeniaca* by Jansson (1986). Besides this species it was reported distribution from Ardahan (part of the part of the Eastern Anatolia of the Irano-Turanian) by Fent et al. (2011). Hence, this species may be Siberian species. *Callicorixa raddei* (Kiritshenko & Jaczewski) was reported from Ağrı, Ardahan, Erzurum, Kars, Van (part of the Eastern Anatolia of the Irano-Turanian) by Önder et al. (2006), Dursun (2011) and Fent et al. (2011). Aukema & Rieger (1995) gave distribution from Armenian and Georgia. So this species is Siberian species and the western border of the distribution area is Turkey. *Notonecta marmorea* Fabricius has been reported for the first time from the study area (it collected from Edirne province of the Mediterranean region) in Turkey.

*Sigara iranica* Lindberg was reported from Ardahan and Van (part of the Eastern Anatolia of the Irano-Turanian) by Fent et al. (2011). General distribution is in Iran (Aukema & Rieger, 1995; Fent et al., 2011). It may not have passed to the west of the Anatolian cross. Endemism or restricted distribution may be occurred. Therefore, it needs to be investigated in more detail. *Sigara daghestanica* Jansson was reported from Konya (part of the Central Anatolia of the Irano-Turanian) by Önder et al. (2006). This species is distributed in Armenia, Azerbaijan, Iran, Russia (Aukema & Rieger, 1995; Fent et al., 2011). The western border of the distribution area is Turkey. It can be said that the species has a restricted distribution. *Sigara samani samani* Hoberlandt was reported from Adana, Mersin (part of the Toros of the Mediterranean) by Seidenstücker (1959), Önder et al. (2006) and Fent et al. (2011). This species has been reported from Syria, Lebanon and Israel (Aukema & Rieger, 1995; Fent et al., 2011; Önder et al., 2006). The northern border of the distribution area is Turkey and it is an endemic species. *Sigara samani tigranes* Jansson was given from Diyarbakır and Mardin by Fent et al. (2011) and Önder et al. (2006). The species was reported from Syria, Iran, Iraq (Aukema & Rieger, 1995). Therefore, it can be evaluated that it is a Mesopotamian endemic species. *Sigara stagnalis stagnalis* (Leach) was reported from İzmir as new record for the Turkey fauna by Topkara et al. (2010). Also species is widely

distributed in Algeria, Belgium, Cyprus, Denmark, France, Great Britain, Germany, Ireland, Italy, Morocco, the Netherlands, Poland, Spain and Sweden (Aukema & Rieger, 1995). When the distribution area of the species is examined, it is determined that Turkey is the most eastern border. Concerning the distribution it seems to be a Mediterranean species.

Aquatic and semi-aquatic Heteroptera fauna in Turkey can be considered as very species rich group. Turkey is a country locating as a bridge between Europe and Asia. It has different climatic conditions. Both geographic position and climatic differentiations have some effects on flora and fauna. Because of this, Turkey has been focused by Turkish and foreign scientists for a long period. The highest number of species are known from the zoogeographical regions of Turkey. Turkish aquatic and semi-aquatic Heteroptera fauna is very rich. The great richness and diversity of aquatic and semi-aquatic Heteroptera fauna in Turkey is one result of the variety topographic and climatic structure of the country.

### Acknowledgments

I am grateful to Dr. Yasemin Güler (Turkey) and Didem Coral Şahin (Turkey) for providing English language control.

### Conflict of Interests

The author declares that there is no conflict of interest regarding the publication of this paper.

### References

- Aukema, B. & Rieger, C. (1995) *Catalogue of the Heteroptera of the Palaearctic Region, Vol. 1*. The Netherlands Entomological Society c/o Plantage Middenlaan 64, NL-1018 DH, Amsterdam, The Netherlands. 222 pp.
- Banbal, T. & Fent, M. (2016) New Records of Gerromorpha and Nepomorpha (Hemiptera) Fauna of Turkey. *Journal of the Entomological Research Society*, 18, 121–128.
- Berchi, G.M. (2013) Checklist and distribution of the family Notonectidae in Romania, with the first record of *Notonecta maculata* Fabricius, 1794 (Hemiptera: Heteroptera: Nepomorpha). *Zootaxa*, 3682 (1), 121–132. <https://doi.org/10.11646/zootaxa.3682.1.5>
- Berchi, G.M. & Kment, P. (2015) Review of the family Veliidae in Romania (Hemiptera: Heteroptera: Gerromorpha). *Zootaxa*, 3963 (1), 074–088. <https://doi.org/10.11646/zootaxa.3963.1.5>
- Berchi, G.M., Kment, P., Copilaş-Ciocianu, D., Rákósy, L. & Damgaard, J. (2016) Water treaders of Romania and adjacent countries and their phylogenetic relationships (Hemiptera: Heteroptera: Mesoveliidae). *Annales Zoologici*, 66 (2), 193–212. <https://doi.org/10.3161/00034541ANZ2016.66.2.004>
- Berchi, G.M., Cianferoni, F., Csabai, Z., Damgaard, J., Olosutean, H., Ilie, D.M., Boda, P. & Kment, P. (2018) Water striders (Heteroptera: Gerromorpha: Gerridae) of Romania with an update on the distribution of *Gerris gibbifer* and *G. maculatus* in southeastern Europe. *Zootaxa*, 4433 (3), 479–491. <https://doi.org/10.11646/zootaxa.4433.3.6>
- Cobben, R. (1985) Additions to the Eurasian saldid fauna, with a description of fourteen new species (Heteroptera, Saldidae). *Tijdschrift voor Entomologie*, 128, 215–270.
- Çokçalışkan, B.A. (2014) Ekoloji, ekosistemler ile Türkiye'deki bitki örtüsü bölgeleri (fitocoğrafik bölgeler). Available from: <https://www.kirsalcevre.org.tr> [Accessed 28th February 2019].
- Dursun, A. (2011) A study on the Nepomorpha (Hemiptera) species of some provinces of Anatolia, Turkey, with new records of *Anisops debilis perplexus* Poisson, 1929 and *Notonecta reuteri* Hungerford, 1928. *Turkish Journal of Entomology*, 35, 461–474.



- Dursun, A. (2012) Additional records of Gerromorpha (Hemiptera) and redescription of *Rhagovelia nigricans nigricans* (Burmeister, 1835) from Anatolia (Turkey). *Turkish Journal of Zoology*, 36, 652–661. <https://doi.org/10.3906/zoo-1107-12>
- Dursun, A. (2017) *The Distributions of Aquatic and Semiaquatic Species of Heteroptera (Hemiptera) in Amasya's Wetlands*. XIII. Congress of Ecology and Environment with International Participation, 15-12 September, Edirne, 165 pp.
- Dursun, A. & Fent, M. (2018) Contributions to Nepomorpha (Hemiptera: Heteroptera) fauna in wetland areas of Amasya, Turkey. *Acta Biologica Turcica*, 31, 193–202.
- Fent, M., Kment, P., Çamur-Elipek, B. & Kırgız, T. (2011) Annotated catalogue of Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha, and Leptopodomorpha (Hemiptera) of Turkey, with new records. *Zootaxa*, 2856, 1–84. <https://doi.org/10.11646/zootaxa.2856.1.1>
- Hoberlandt, L. (1948) Results of the Zoological Scientific Expedition of the National Museum in Praha to Turkey. Hemiptera-Heteroptera I. The Aquatic and Semiaquatic Heteroptera of Turkey. *Acta Entomologica Musei Nationalis Pragae*, 26, 1–71.
- Hoberlandt, L. (1952) Results of the zoological scientific expedition of the National Museum in Praha to Turkey. 2. Hemiptera-Heteroptera I. The aquatic and semiaquatic Heteroptera of Turkey. *Acta Entomologica Musei Nationalis Pragae*, 26, 1–74.
- Hoberlandt, L. (1956) Results of the zoological scientific expedition of the National Museum in Praha to Turkey. 18. Hemiptera IV. Terrestrial Hemiptera-Heteroptera of Turkey. *Acta Entomologica Musei Nationalis Pragae, Supplementum*, 3, 1–264.
- Gür, H. (2016) The Anatolian diagonal revisited: Testing the ecological basis of a biogeographic boundary. *Zoology in the Middle East*, 62 (3), 189–199. <https://doi.org/10.1080/09397140.2016.1226544>
- Jaczewski, T. (1964) Notes on some aquatic and semi-aquatic Heteroptera from Iraq. *Bulletin de l'Académie Polonaise des Sciences*, 12, 263–268.
- Jansson, A. (1986) The Corixidae (Heteroptera) of Europa and some adjacent region. *Acta Entomologica Fennica*, 52, 1–93.
- Kanyukova, E.V. (1995) Family Aphelocheiridae. In: Aukema, B. & Rieger, Ch. (eds.), *Catalogue of the Heteroptera of the Palaearctic Region*. I. The Netherlands Entomological Society, Amsterdam, pp. 60–63.
- Kıyak, S., Öz Saraç, Ö. & Salur, A. (2004a) Additional Notes on the Heteroptera fauna of Nevşehir province (Turkey). *G.U. Journal of Science*, 17, 21–29.
- Kıyak, S., Salur, A., Canbulat, S. & Öz Saraç, Ö. (2004b) Contributions of the aquatic and semiaquatic Heteroptera fauna of the Afyon province. *G.U. Journal of Science*, 17, 31–34.
- Kıyak, S., Canbulat, S. & Salur, A. (2007) Four New Records for the Turkish fauna (Heteroptera: Gerromorpha: Leptopodomorpha). *Munis Entomology Zoology*, 2, 461–468.
- Kıyak, S., Salur, A. & Canbulat, S. (2008) Gerromorpha and Leptopodomorpha (Heteroptera) fauna of southwest Anatolia. *Turkish Journal of Zoology*, 32, 309–326.
- Kment, P. & Jindra, Z. (2005) New and interesting records of true bugs (Heteroptera) from Turkey, southeastern Europe, Near and Middle East. *Acta Entomologica Musei Nationalis Pragae*, 45, 3–16.
- Kment, P. & Kanyukova, E.V. (2010) New faunistic records of Hebridae (Hemiptera) from the Mediterranean and the Near and Middle East. *Acta Musei Moraviae, Scientiae biologicae (Brno)*, 95, 11–18. <https://doi.org/10.11646/zootaxa.4457.3.9>
- Kment, P. & Kolinova, Z. (2013) Catalogue of type specimens of true bugs (Hemiptera) deposited in the National Museum, Prague, Czech Republic, Catalogue of types in NMPC, part VIII: Heteroptera I. *Acta Entomologica Musei Nationalis Pragae*, 53, 821–890.

- Küçükbasımcı, İ. & Kıyak, S. (2015) A study on the fauna of Heteroptera of Ilgaz mountains (Kastamonu, Çankırı) with a new record for Turkey. *Neosehir Science and Technology Review*, 4, 1–33. <https://doi.org/10.17100/nevbiltek.210937>
- Legendre, P. & Legendre, L. (1998) *Numerical ecology. 2nd English Edition*. Elsevier, Amsterdam. 852 pp.
- Lindberg, H. (1922) Verzeichnis der von John Sahlberg und unio saales in den Mittelmeergebieten gesammelten semiaquatischen und aquatischen Heteropteren. *Notulae Entomologicae*, 2, 15–19.
- Linnavuori, R.E. (1994) Hemiptera of Iraq. IV. Heteroptera, the aquatic and subaquatic families, Saldidae and Leptopodidae. *Entomologica Fennica*, 5, 87–95. <https://doi.org/10.33338/ef.83798>
- Önder, F. & Adıgüzel, N. (1979) Some Heteroptera collected by light trap in Diyarbakır. *Turkish Journal of Plant Protection*, 3, 25–34.
- Önder, F., Ünal, A. & Ünal, E. (1981) Heteroptera fauna collected by traps in some districts of northwestern part of Anatolia. *Turkish Journal of Plant Protection*, 5, 151–169.
- Önder, F., Ünal, E. & Ünal, A. (1984) Heteropterous insects collected by light traps in Edirne (Turkey). *Turkish Journal of Plant Protection*, 8, 215–224.
- Önder, F., Karsavuran, Y., Tezcan, S. & Fent, M. (2006) *Heteroptera Catalogue of Turkey*. Meta Basım Matbaacılık Hizmetleri, İzmir. 164 pp.
- Salur, A. & Mesci, S. (2009) Gerromorphan fauna of Çorum province in Turkey (Heteroptera). *Munis Entomology Zoology*, 4, 340–345.
- Seidenstücker, G. (1957) Anadoludan Heteropterler I. Heteroptera aus Anatolien I. *Revue de la Faculté des Sciences Naturelles de l'Université d'Istanbul, Série B, Sciences Naturelles*, 22, 179–189.
- Seidenstücker, G. (1959) *Sigara emesa* n. sp. und einige Corixiden aus der Türkei und Syrien. *Revue de la Faculté des Sciences Naturelles de l'Université d'Istanbul, Série B, Sciences Naturelles*, 24, 33–38.
- Topkara, E.T., Balık, S. & Ustaoglu, M.R. (2010) *Sigara (Halicorixa) stagnalis stagnalis* (Leach, 1817), A New Record for the Corixidae (Insecta, Hemiptera) Fauna of Turkey. *Journal of the Entomological Research Society*, 12, 49–52.
- Topkara, E.T., Ustaoglu, M.R. & Balık, S. (2011) An overview of the aquatic Coleoptera and aquatic and Semiaquatic Heteroptera fauna in Tahtalı Dam lake basin (Menderes-Izmir). *KSU Journal of Natural Sciences*, 14, 10–21. <https://doi.org/10.18016/ksujns.13496>
- Topkara, E.T. (2013) Contribution to the knowledge on distribution of water boatmen (Heteroptera: Corixidae) in Turkey. *Ege Journal of Fish Aqua Sciences*, 30, 15–19. <https://doi.org/10.12714/egejfas.2013.30.1.03>
- Topkara, E.T. & Ustaoglu, M.R. (2014) A study on the fauna of aquatic Coleoptera and aquatic-semiaquatic Heteroptera living in Gönen stream (Balıkesir, Çanakkale-Turkey). *Ege Journal of Fish Aqua Sciences*, 31, 19–26. <https://doi.org/10.12714/egejfas.2014.31.01.04>
- Topkara, E.T. & Ustaoglu, R.M. (2015) A study on the aquatic Coleoptera and aquatic-semiaquatic Heteroptera fauna of Lake Kartal (Denizli) and ecological notes. *Ege Journal of Fish Aqua Science*, 32, 45–50. <https://doi.org/10.12714/egejfas.2015.32.1.07>
- Wagner, E. (1966) Eine Heteropterenausbeute aus der Türkei (Hemiptera). *Bulletin des Recherches Agronomiques de Gembloux*, 1, 646–654.
- Wagner, E. (1976) Neue Heteropteren aus der Türkei und dem Libanon (Hemiptera). *Reichenbachia*, 16, 135–141.
- Yıldırım, E., Yazıcı, G. & Moulet, P. (2013) Contribution to the knowledge of the Gerridae, Coreoidea, Piesmatidae, Saldidae, Corixoidea, Nepoidea and Notonectidae (Hemiptera) fauna of Turkey. *Linzer Biologische Beiträge*, 45, 995–1010.
- Zoltán, C.Z., Soós, N., Berchi, G.M., Cianferoni, F., Boda, P. & Móra, A. (2017) Aquatic and semiaquatic Heteroptera (Nepomorpha and Gerromorpha) fauna of Greek holiday islands (Rhodes, Crete and Corfu) with first records of three species from Europe and Greece. *Zootaxa*, 4231, 051–069. <https://doi.org/10.11646/zootaxa.4231.1.3>



## بررسی اجمالی توزیع جغرافیای جانوری ناجوربالان آبزی و نیمه آبزی (Hemiptera) در ترکیه

گولتن یازیکی\*

مدیریت مؤسسه مرکزی تحقیقات گیاهپزشکی، ینی محله ۰۶۱۷۲، آنکارا، ترکیه  
 \* پست الکترونیکی نویسنده مسئول مکاتبه: [gultenkulekci@hotmail.com](mailto:gultenkulekci@hotmail.com)  
 تاریخ دریافت: ۵ آذر ۱۳۹۸، تاریخ پذیرش: ۱۵ اسفند ۱۳۹۸، تاریخ انتشار: ۲۴ اسفند ۱۳۹۸

**چکیده:** هدف از این تحقیق، مرور مطالعات فونستیک و سیستماتیک ناجوربالان آبزی و نیمه آبزی ترکیه و تحلیل پراکنش و جغرافیای جانوری فون ترکیه در این گروه است. در این مطالعه یک گونه از *Enicocephalomorpha*، یک گونه از *Dipsocoromorpha*، ۵۱ گونه متعلق به ۱۳ جنس از *Gerromorpha*، چهار گونه متعلق به سه جنس از *Leptopodomorpha* و ۵۵ گونه متعلق به ۱۹ جنس از *Nepomorpha* و در مجموع، ۱۱۲ گونه متعلق به ۳۷ جنس از ۵ مادون راسته از ترکیه بررسی شد. تمام نمونه‌های جمع‌آوری شده توسط نویسنده از سال ۲۰۰۹ تا ۲۰۱۸ و نمونه‌های ذخیره شده در موزه گیاهپزشکی *Nazife Tuatay* (آنکارا) نیز بررسی شدند. بر اساس تحلیل صورت گرفته، مشخص شد ۹۴ گونه در منطقه مدیترانه‌ای، ۵۷ گونه از بخش اروپا-سیبری و ۹۰ گونه از منطقه ایرانی - تورانی پراکنش دارند. در این بین، ۹ گونه و زیرگونه شامل ۸ درصد سن‌های آبزی و نیمه آبزی بومی ترکیه هستند. همچنین، گزارش‌هایی محلی جدید برای گونه‌های جمع‌آوری شده ثبت شد. بر اساس نتایج بدست آمده، ترکیب و تنوع گونه‌ای، و نسبت گونه‌های بومی در بین مناطق مختلف جغرافیای جانوری ترکیه بسیار متفاوت است.

**واژگان کلیدی:** ناجوربالان، جغرافیای جانوری، منطقه پالئارکتیک، تنوع گونه‌ای