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Research Article
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Contributions to the Knowledge on Aquatic/Semi-Aquatic Coleoptera (Insecta) Fauna of Turkey with First Records in Turkish Thrace

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ABSTRACT

In the present study, adult specimens belonging aquatic/semi-aquatic coleopteran collected from 1986 to 2002 in Turkish Thrace were evaluated taxonomically. Altogether, a total of 23 species belonging to the families Dytiscidae, Haliplidae, Noteridae, Gyrinidae, Helophoridae and Hydrophilidae were determined. A total of 12 species *Hydaticus* (*Hydaticus*) *aruspex* Clark, 1864, *Aulonogyrus concinnus* (Klug 1834), *Cercyon* (*Cercyon*) *littoralis* Gyllenhal 1808, *Gyrinus* (*Gyrinus*) *distinctus* Aubé 1836, *G.* (*Gyrinus*) *substriatus* Stephens 1829, *Haliplus* (*Liaphlus*) *flavicollis* Sturm 1834, *Helophorus* (*Helophorus*) *grandis* Illiger 1798, *Hydrochara flavipes* (Steven 1808), *Laccobius* (*Laccobius*) *minutus* (Linnaeus 1758), *Laccophilus hyalinus* (De Geer 1774), *Platambus maculatus* (Linnaeus 1758), *Rhantus* (*Rhantus*) *suturalis* (MacLeay 1825) were determined for the first time from Turkish Thrace. The aquatic habitat distributions of the species were also compared by the statistically using Shannon-Wiener diversity index and Bray-Curtis similarity index.

Key words: Coleoptera, aquatic, fauna, first record, biodiversity, Turkish thrace.

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INTRODUCTION

Coleoptera is the largest order of insects contains terrestrial, semiaquatic and aquatic species which of nearly 5,000 adapt to an aquatic habitat all over the world (Franciscolo, 1979; Ribera, 2002; Audisio & Vigna, 2010). Although the majority of members are terrestrial, a great number of coleopteran beetles adapted to aquatic environments. A lot of them can be also found in nearly aquatic habitat because of life cycles. Some coleopterans are aquatic as both larval and adult stages, while the others are semi-aquatic because of they can enter to aquatic environments for feeding, spawning, etc. All aquatic suborders as Myxophaga, Adephaga, and Polyphaga present in Turkey (Löbl, 1994; Lupi, Jucker, & Rocco, 2014; Ertorun, 2018).

Although, there are a lot of faunistic studies performed on the aquatic beetles including Turkish Thrace Region (Guéorguiev, 1981; Hansen, 1987, 2004; Holmen, 1987; Angus, 1988; Schödl, 1991; Angus, 1992; Jäch, 1998; Boukal, 2007; Aydın & Çamur-Elipek, 2019), none of them are focused on aquatic/semi-aquatic coleopteran fauna of Turkish Thrace region only. With this study, it was aimed to contribute the distribution knowledge of Coleopteran fauna in Turkey.

MATERIALS AND METHODS

In this study, the collected material from aquatic habitats including lakes, ponds, streams, dam lakes, coastal lagoons in Turkish Thrace were evaluated. The collected material sampled by using a hand mud ladle and a plankton mesh net with a diameter of 1-2 mm pore were fixed and preserved in 70% ethanol. The adult aquatic/semi-aquatic coleopteran specimens were found at a total of 35 localities (Fig. 1 and Table 1). The sampling localities were numbered and shown in Figure 1. The obtained material was deposited in 25 cc glass bottles containing 70% ethanol until to their identification in the laboratory. The morphological characters and aedeagophores of the specimens were examined to identification of the species. The aedeagophores were dissected out under a stereomicroscope and they kept waiting in 10% KOH solution for 1-2 hours (Mart, İncekara, & Karaca, 2010). The adult specimens were identified to species level utilizing the literaures Smetana (1980), Holmen (1987), Friday (1988), van Vondel (1991, 1992), Angus (1992), Schödl (1993), Komarek (2003), Nilsson (2003), Foster (2009), İncekara et al, (2011), Yılmaz, Aslan, & Ayvaz (2014). Also, the sampling localities were grouped as their habitat types as stagnant water, running water, and coastal lagoon (Table 2). The results were evaluated by statistically using Shannon-Wiener diversity index and the Bray-Curtis similarity index (Krebs, 1999). All species were confirmed using Fauna Europaea database, for European Turkey (Turkish Thrace Region) (de Jong et al, 2014) and the related literatures. The materials were stored and have been converted into museum material at the Biology Department of Trakya University, Hydrobiology Laboratory, Edirne, Turkey.

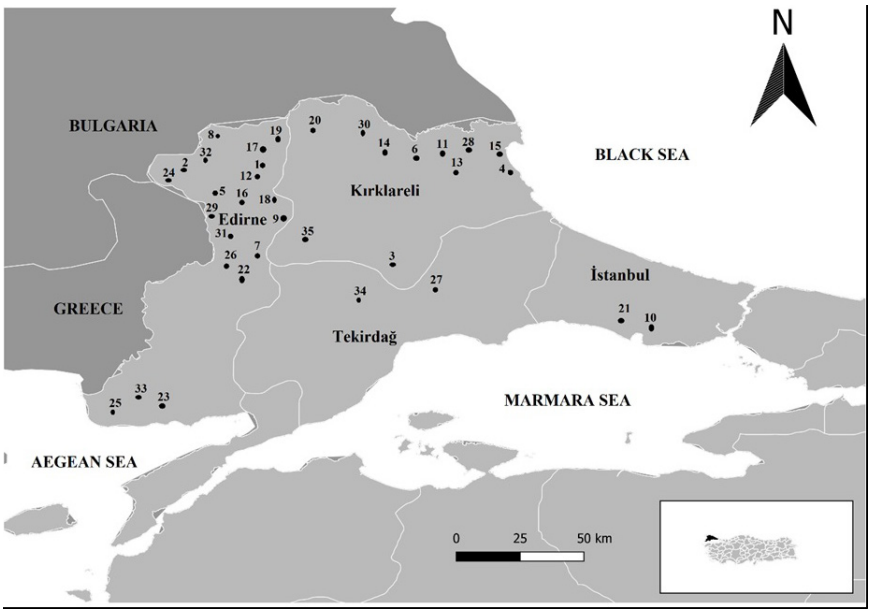

Fig. 1. The sampling localities in Turkish Thrace (the numbers show the locality numbers in Table1).

Table 1. Locality names and sampling dates.

NO	Locality	Sampling Dates
1	Süloğlu Stream-Edirne	21.09.1986-25.05.1987
2	Tunca River-Edirne	02.05.1991
3	Lahana Village-Kırklareli	24.09.1986
4	Hamam Lake-Kırklareli	15.03.1999
5	Güllapoğlu Stream-Edirne	15.05.1996-12.05.1999
6	Çağlayan-Kırklareli	10.09.1987
7	Uzunköprü Dereköy Stream-Edirne	13.08.1991
8	Ahi Village Pond-Edirne	09.03.1991
9	Değirmenci Stream-Edirne	18.09.1986
10	Küçükçekmece Lake-İstanbul	27.09.1997
11	Armutveren Village-Kırklareli	18.10.1996
12	Süloğlu Dam Lake-Edirne	24.05.2002
13	Yenice Village-Kırklareli	16.06.1987
14	Bizim Pond-Kırklareli	18.10.1996
15	Erikli Lake-Kırklareli	15.03.1999
16	Kemalettin Dam Lake-Edirne	14.11.1987
17	Süloğlu-Edirne	25.05.1987
18	Söğütlüdere-Edirne	29.06.1996

No	Locality	Sampling Dates
19	Vaysal Stream-Edirne	01.06.1991
20	Kofçaz-Kırklareli	10.06.1987
21	Büyükçekmece Lake-İstanbul	27.09.1997
22	Uzunköprü-Edirne	13.08.1991-23.12.1995
23	Çandırdağı-Edirne	01.09.1996
24	Kemalköy Pond-Edirne	09.03.1991
25	Sultaniçe Village-Edirne	31.08.1996
26	Oğulpaşa Stream-Edirne	01.06.1989
27	Arzulu Stream-Tekirdağ	21.09.1996
28	Dupnisa Cave-Kırklareli	17.06.2002
29	Musabeyli Pond-Edirne	13.05.1996-24.05.2002
30	Dereköy Pond-Kırklareli	25.04.1986
31	Gölbaba Pond-Edirne	30.08.1991
32	Kalkansöğüt Pond-Edirne	01.04.1991
33	Gala Lake-Edirne	01.06.1991
34	Çene Village-Tekirdağ	21.09.1996
35	Babaeski-Kırklareli	24.09.1986

Table 2. The groups for the habitat types with the locality numbers

Locality Type	Locality Number
Stagnant water	3,6,8,10,11,12,13,14,16,17,18,20,21,22,23,24,25,29,30,31,32,33,34,35
Running water	1,2,5,7,9,19,26,27,28
Coastal lagoon	4,15

RESULTS

A total of 113 individuals belonging 23 species were determined in this study (Table 3). The genus *Laccophilus* was found to have the most abundant species comprising about 33% of the all determined species. Except the species *Agabus* sp., *Agabus* (*Gaurodytes*) *bipustulatus* (Linnaeus 1767), *Agabus* (*Gaurodytes*) *nebulosus* Forster, 1771, *Hydroglyphus geminus* (Fabricius 1792), *Laccophilus minutus* (Linnaeus, 1758), *Hydroporus pubescens* (Gyllenhal 1808), *Peltodytes caesus* (Duftschmid 1805), *Noterus clavicornis* (De Geer 1774) *Helophorus* (*Rhopalohelophorus*) *brevipalpis* Bedel 1881, *Helophorus* (*Helophorus*) *aquaticus* (Linnaeus 1758) and *Berosus* (*Berosus*) *affinis* Brullé 1835, the others were determined as the first records for Turkish Thrace. The uncertain distribution area in Turkey of two species (*A. nebulosus* and *L. minutus*) was presented in the study.

Table 3. The Coleoptera species identified from Turkish Thrace with their sampled locality numbers (●First record for Turkish Thrace).

Taxa	Locality Number	Taxa	Locality Number
Dytiscidae		**Noteridae**	
Agabus (Gaurodytes) bipustulatus (Linnaeus, 1767)	5,7,11,14	*Noterus clavicornis* (De Geer, 1774)	1, 4, 15, 17, 23, 25, 27, 30
Agabus sp.	5	**Gyrinidae**	
Agabus (Gaurodytes) nebulosus Forster, 1771	12	*Gyrinus (Gyrinus) substriatus* Stephens, 1829 ●	29
Hydaticus (Hydaticus) aruspex Clark, 1864 ●	4, 10	*Gyrinus (Gyrinus) distinctus* Aubé, 1836 ●	28
Hydroglyphus geminus (Fabricius, 1792)	9, 12, 32	*Aulonogyrus concinnus* (Klug, 1834) ●	9
Laccophilus hyalinus (De Geer, 1774) ●	1, 3, 9, 12, 19, 20, 29,30,35	**Helophoridae**	
Laccophilus minutus (Linnaeus, 1758)	1, 9, 12, 18, 21, 22, 29	*Helophorus (Helophorus) grandis* Illiger, 1798 ●	1, 12, 13, 24, 26
Hydroporus pubescens (Gyllenhal, 1808)	8	*Helophorus brevipalpis brevipalpis* Bedel, 1881	29
Platambus maculatus (Linnaeus, 1758) ●	6	*Helophorus (Helophorus) aquaticus* (L., 1758)	5
Rhantus (Rhantus) suturalis (MacLeay, 1825) ●	1	**Hydrophilidae**	
Haliplidae		*Berosus (Berosus) affinis* Brullé, 1835	16,31
Haliplus (Liaphlus) flavicollis Sturm, 1834 ●	35	*Cercyon (Cercyon) littoralis* Gyllenhal, 1808 ●	33
Peltodytes caesus (*Duftschmid, 1805)*	34	*Laccobius (Laccobius) minutus* (Linnaeus, 1758) ●	9
		Hydrochara flavipes (Steven, 1808) ●	2

The determined species and their sampling localities were presented below (ex: example):

Family Dytiscidae

Agabus (Gaurodytes) bipustulatus (Linnaeus, 1767)

Material examined: Güllapoğlu Stream-Edirne (loc. 5), 15.05.1996, 1 ex., 12.05.1999, 2 ex.; Uzunköprü Dereköy Stream-Edirne (loc. 7), 13.08.1991, 1 ex.; Armutveren Village-Kırklareli (loc. 11), 18.10.1996, 1 ex.; Bizim Pond-Kırklareli (loc. 14), 18.10.1996, 1 ex.

Distribution in Turkey: Antalya, Isparta, Muğla (Kıyak, Darılmaz, Salur, & Canbulat, 2007), Artvin,Rize (Erman & Erman, 2008), Ankara (Hızarcıoğlu, Kıyak, & Darılmaz, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum, Yozgat (Darılmaz, Salur, & Mesci, 2010), Kayseri (İncekara, Polat, Darılmaz, Mart, & Taşar, 2010), Balıkesir, Çanakkale (Topkara & Ustaoğlu, 2014), Erzincan (Darılmaz, Jäch, & Skale, 2012), Sivas (Darılmaz et al, 2014), Denizli (Topkara & Ustaoğlu, 2015), Gaziantep, Hatay, Kahramanmaraş, Kilis, Osmaniye (Darılmaz, Polat, & İncekara, 2018).

Agabus (Gaurodytes) nebulosus Forster, 1771

Material examined: Süloğlu Dam Lake-Edirne (loc. 12), 24.05.2002, 1 ex.

Distribution in Turkey: Adana, Bursa, Isparta, İstanbul Sinop, Trabzon (Guéorguiev, 1981), Afyon, Antalya, Aydın, Burdur, Denizli, Muğla (Kıyak et al, 2007), Samsun (İncekara, Darılmaz, Mart, Polat, & Karaca, 2009a), Ankara (Hızarcıoğlu et al, 2010), Çorum (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), İzmir (Topkara, Ustaoğlu, & Balık, 2011), Erzincan (Darılmaz et al, 2012), Tokat (Darılmaz, Polat, İncekara, & Mart, 2015), Sivas (Darılmaz et al, 2014), Adana, Hatay, Osmaniye, Kahramanmaraş, Gaziantep (Darılmaz et al, 2018). Although this species has been reported by Guéorguiev (1981) from İstanbul, certain sampling locality (European Part or Asian Part) has not been detailed.

Agabus sp.

Material examined: Güllapoğlu Stream-Edirne (loc. 5), 15.05.1996, 1 ex.

Hydaticus (Hydaticus) aruspex Clark, 1864

Material examined: Küçükçekmece Lake-İstanbul (loc. 10), 27.09.1997, 2 ex.; Hamam Lake-Kırklareli (loc. 4), 15.03.1999, 1 ex.

Distribution in Turkey: It was not found any distribution knowledge in Turkey on this species. The distribution area of this species is reported from Nearctic to Paleartic in the world is as follows; America, Canada, Belarus, Czechia, Sweden, Denmark, England, Finland, France, Germany, Hungary, Lithuania, Netherlands, Kazakhstan, Mongolia, Poland, Russia, Sluvenia, Ukraine, China, Japan (Zaitsev, 1972; Nilsson & Holmen, 1995; Bameul, 1997; Alarie, 2016; Temreshev, 2018; Prokin et al, 2020).

Hydroglyphus geminus (Fabricius, 1792)

Material examined: Değirmenci Stream-Edirne (loc. 9), 18.09.1986, 5 ex.; Süloğlu Dam Lake-Edirne (loc. 12), 24.05.2002, 2 ex.; Kalkansöğüt Pond-Edirne (loc. 32), 01.04.1991, 3 ex.

Distribution in Turkey: Edirne (Guéorguiev, 1981; Aydın & Çamur-Elipek, 2019), Aksaray (Darılmaz & Kıyak, 2006), Muğla (Kıyak et al, 2007), Artvin, Rize (Erman & Erman, 2008), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum,Yozgat (Darılmaz et al., 2010), Kayseri (İncekara et al., 2010), Erzincan (Darılmaz et al, 2012), Balıkesir,Çanakkale (Topkara & Ustaoğlu, 2014), Sivas (Darılmaz et al, 2014), Denizli (Topkara & Ustaoğlu, 2015), Gaziantep, Hatay, Kahramanmaraş, Osmaniye (Darılmaz et al, 2018).

Laccophilus hyalinus (De Geer, 1774)

Material examined: Süloğlu Stream-Edirne (loc. 1), 21.09.1986, 2 ex.; Lahana Village-Kırklareli (loc. 3), 24.09.1986, 2 ex.; Değirmenci Stream-Edirne, (loc. 9), 1 ex.; Süloğlu Dam Lake-Edirne (loc. 12), 24.05.2002, 3 ex.; Vaysal Stream-Edirne (loc. 19), 01.06.1991, 2 ex.; Musabeyli Pond-Edirne, (loc. 29), 24.05.2002, 5 ex.; Dereköy Pond-Kırklareli (loc. 30), 25.04.1986, 1 ex.; Babaeski-Kırklareli (loc. 35), 24.09.1986, 2 ex.

Distribution in Turkey: Kırşehir (Darılmaz & Kıyak, 2006), Antalya, Isparta, Burdur, Konya (Kıyak et al, 2007), Artvin (Erman & Erman, 2008), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Balıkesir, Çanakkale (Topkara & Ustaoğlu, 2014), Sivas (Darılmaz et al, 2014), Adana, Hatay, Osmaniye, Kahramanmaraş, Gaziantep (Darılmaz et al, 2018).

Laccophilus minutus (Linnaeus, 1758)

Material examined: Süloğlu Stream-Edirne (loc. 1), 21.09.1986, 9 ex.; Değirmenci Stream-Edirne (loc. 9), 18.09.1986, 1 ex.; Süloğlu Dam Lake-Edirne (loc. 12), 24.05.2002, 1 ex.; Söğütlüdere-Edirne (loc. 18), 29.06.1996, 1 ex.; Büyükçekçemece Lake-İstanbul (loc. 21), 27.09.1997, 2 ex.; Uzunköprü-Edirne (loc. 22), 23.12.1995, 1 ex.; Musabeyli Pond-Edirne (loc. 29), 13.05.1996, 4 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Antalya, Isparta, Burdur, Aydın (Kıyak et al, 2007), Artvin, Rize (Erman & Erman, 2008), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum, Yozgat (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Balıkesir, Çanakkale (Topkara & Ustaoğlu, 2014), Sivas (Darılmaz et al, 2014), Hatay, Kahramanmaraş, Adana, Kilis, Osmaniye, Gaziantep (Darılmaz et al, 2018). Although this species has been reported by Guéorguiev (1981) from İsaklı (undetailed locality), Erman & Erman (2008) has been reported this species as uncertain sampling locality (Afyon, Denizli or Tekirdağ).

Hydroporus pubescens (Gyllenhal, 1808)

Material examined: Ahi Village Pond-Edirne (loc. 8), 09.03.1991, 1 ex.

Distribution in Turkey: Adana, Aksaray, Antalya, Bilecik, Bursa, Erzincan, Gümüşhane, Manisa, Niğde, Ordu, Sakarya, Trabzon (Guéorguiev, 1981; Darılmaz & Kıyak, 2006), Antalya, Aydın, Afyon, Burdur, Denizli, Isparta, Muğla (Kıyak et al, 2007), Bayburt, Giresun, Tokat (Darılmaz et al, 2015), Balıkesir (Topkara & Ustaoğlu, 2014), Kayseri (İncekara et al, 2010), İzmir (Topkara et al, 2011), Denizli (Topkara & Ustaoğlu, 2015), Hatay, Kahramanmaraş, Adana, Gaziantep (Darılmaz et al, 2018).

***Platambus maculatus* (Linnaeus, 1758)**

Material examined: Çağlayan-Kırklareli (loc. 6), 10.09.1987, 5 ex.

Distribution in Turkey: Burdur, Muğla (Kıyak et al, 2007), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum (Darılmaz et al, 2010),

***Rhantus (Rhantus) suturalis* (MacLeay, 1825)**

Material examined: Süloğlu Stream-Edirne (loc. 1), 21.09.1986-25.05.1987, 2 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Rize (Erman & Erman, 2008), Ankara (Hızarcıoğlu et al, 2010), Çorum (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Balıkesir, Çanakkale (Topkara & Ustaoğlu, 2014), Sivas (Darılmaz et al, 2014), Kahramanmaraş (Darılmaz et al, 2018).

Family Haliplidae

***Haliplus (Liaphlus) flavicollis* Sturm, 1834**

Material examined: Babaeski-Kırklareli (loc. 35), 24.09.1986, 3 ex.

Distribution in Turkey: Bolu, Kastamonu (Topkara & Balık, 2010).

***Peltodytes caesus* (Duftschmid, 1805)**

Material examined: Çene Village-Tekirdağ (loc. 34), 21.09.1996, 2 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Ankara (Hızarcıoğlu et al, 2010), Çorum, Yozgat (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Sivas (Darılmaz et al, 2014), Kahramanmaraş (Darılmaz et al, 2018), Edirne (Aydın & Çamur-Elipek, 2019).

Family Noteridae

***Noterus clavicornis* (De Geer, 1774)**

Material examined: Süloğlu Stream-Edirne (loc. 1), 25.05.1987, 1 ex.; Hamam Lake-Kırklareli (loc. 4), 15.03.1999, 1 ex.; Erikli Lake-Kırklareli (loc. 15), 15.03.1999, 2 ex.; Süloğlu-Edirne (loc. 17), 25.05.1987, 1 ex.; Çandırdağı-Edirne (loc. 23) 01.09.1996, 1 ex.; Sultaniçe Village-Edirne (loc. 25), 31.08.1996, 3 ex.; Arzulu Stream-Tekirdağ (loc. 27), 21.09.1996, 2 ex.; Dereköy Pond-Kırklareli (loc. 30), 25.04.1986, 1 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Antalya, Aydın (Kıyak et al, 2007), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Balıkesir, Çanakkale (Topkara & Ustaoğlu, 2014), Sivas (Darılmaz et al, 2014), Adana, Gaziantep, Kahramanmaraş (Darılmaz et al, 2018), Edirne (Aydın & Çamur-Elipek, 2019).

Family Gyrinidae

***Gyrinus (Gyrinus) substriatus* Stephens, 1829**

Material examined: Musabeyli Pond-Edirne (loc. 29), 13.05.1996, 24.05.2002, 3 ex.

Distribution in Turkey: Çankırı, Düzce (Topkara & Balık, 2010), Çorum, Yozgat (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Balıkesir (Topkara & Ustaoğlu, 2014), Kahramanmaraş (Darılmaz et al, 2018).

***Gyrinus (Gyrinus) distinctus* Aubé, 1836**

Material examined: Dupnisa Cave-Kırklareli (loc. 28), 17.06.2002, 2 ex.

Distribution in Turkey: Aksaray, Konya (Darılmaz & Kıyak, 2006), Isparta, Antalya, Denizli (Kıyak, Salur, Canbulat, & Darılmaz, 2006b), İzmir (Topkara & Balık, 2008), Düzce, Zonguldak, Kastamonu, Sinop (Topkara & Balık, 2010), Erzincan (Darılmaz et al, 2012), Balıkesir (Topkara & Ustaoğlu, 2014), Diyarbakır (Taşar, 2018).

***Aulonogyrus concinnus* (Klug, 1834)**

Material examined: Değirmenci Stream-Edirne (loc. 9),18.09.1986, 1 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Aydın, Denizli (Kıyak et al, 2006b), Ankara (Hızarcıoğlu et al, 2010), Çorum (Darılmaz et al, 2010).

Family Helophoridae

***Helophorus (Helophorus) grandis* Illiger, 1798**

Material examined: Süloğlu Stream-Edirne (loc. 1), 25.05.1987, 1 ex.; Süloğlu Dam Lake-Edirne (loc. 12), 24.05.2002, 1 ex.; Yenice Village-Kırklareli (loc. 13), 16.06.1987, 1 ex., Kemalköy Pond-Edirne (loc. 24), 09.03.1991, 2 ex.; Oğulpaşa Stream-Edirne (loc. 26), 01.06.1989, 1 ex.

Distribution in Turkey: Antalya (Kıyak, Canbulat, Salur, & Darılmaz, 2006a), Tokat (Polat, İncekara, & Mart, 2010), Elazığ (Mart, Tolan, Caf, & Koyun, 2014b), Burdur (Aslan, Yılmaz, Bayram, & Aslan, 2015), Denizli (Topkara & Ustaoğlu, 2015), İzmir, Manisa, Aydın (Akünal & Aslan, 2017a, 2017b), Kahramanmaraş (Erdihan, Polat, & İncekara, 2017), Diyarbakır, Mardin, Batman (Taşar, 2018).

***Helophorus (Rhopalohelophorus) brevipalpis* subsp. *brevipalpis* Bedel, 1881**

Material examined: Güllapoğlu Stream-Edirne (loc. 5), 12.05.1999, 1 ex.; Musabeyli Pond-Edirne (loc. 29), 13.05.1996, 2 ex.

Distribution in Turkey: Kırklareli (Angus, 1988), Aksaray (Darılmaz & Kıyak, 2006), Bayburt, Giresun, Gümüşhane, Ordu, Trabzon (Mart et al, 2010), Ankara (Hızarcıoğlu et al, 2010), Black Sea Region (Topkara & Balık, 2010), Çorum (Darılmaz et al, 2010), Kayseri (İncekara et al, 2010), Kastamonu, Sakarya, Zonguldak (Topkara & Balık, 2010), Tokat, Samsun (Polat et al, 2010), Burdur (Aslan et al, 2015), İzmir, Manisa, Aydın (Akünal & Aslan, 2017a; 2017b), Kahramanmaraş (Erdihan et al, 2017), Afyon,

Denizli, Kütahya, Uşak (Darılmaz & Kıyak, 2018), Diyarbakır, Batman (Taşar, 2018), Erzurum (Yıldız, Özcan, Polat, & İncekara, 2020).

***Helophorus (Helophorus) aquaticus* (Linnaeus, 1758)**

Material examined: Güllapoğlu Stream-Edirne (loc. 5), 15.05.1996 1 ex., 12.05.1999 1 ex.

Distribution in Turkey: Kırklareli (Angus, 1988), Aksaray (Darılmaz & Kıyak, 2006), Kızılırmak (İncekara et al, 2009a), Tokat (Polat et al, 2010), Kastamonu (Topkara & Balık, 2010), Çorum (Darılmaz et al, 2010), Bayburt, Giresun, Gümüşhane, Ordu, Trabzon (Mart et al, 2010), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Isparta (Yılmaz, Aslan, & Ayvaz, 2014), Elazığ (Mart et al, 2014b), Burdur (Aslan et al, 2015), Hakkari (Mart 2016), Kahramanmaraş (Erdihan et al, 2017), Aydın (Akünal & Aslan, 2017a, 2017b), Afyon, Denizli, Kütahya, Uşak (Darılmaz & Kıyak, 2018), Diyarbakır, Batman (Taşar, 2018), Erzurum (Yıldız et al, 2020).

Family Hydrophilidae

***Berosus (Berosus) affinis* Brullé, 1835**

Material examined: Kemalettin Dam Lake-Edirne (loc. 16), 14.11.1987, 1 ex., 3 ex, Gölbaba Pond-Edirne (loc. 31), 30.08.1991, 1 ex.

Distribution in Turkey: Kırklareli (Schödl, 1991), Kayseri (İncekara et al, 2010), Adana, Antalya, Burdur, Bursa, Çanakkale, Antakya (Hatay), Içel, İstanbul, İzmir, Kayseri, Kırklareli, Kocaeli, Kastamonu, Konya, Manisa, Muğla, Ordu (Ünye), Samsun, Sakarya (İncekara et al, 2011).

***Cercyon (Cercyon) littoralis* Gyllenhal, 1808**

Material examined: Gala Lake-Edirne (loc. 33), 01.06.1991, 2 ex.

Distribution in Turkey: Black Sea Region (İncekara, Mart, & Erman, 2004), Bursa (Ertorun & Tanatmış, 2009).

***Laccobius (Laccobius) minutus* (Linnaeus, 1758)**

Material examined: Değirmenci Stream-Edirne (loc. 9), 18.09.1986, 3 ex.

Distribution in Turkey: Bayburt (İncekara et al, 2009a), Kayseri (İncekara et al, 2010), Erzincan (Darılmaz et al, 2012), Manisa (Akünal & Aslan, 2017a; 2017b).

***Hydrochara flavipes* (Steven, 1808)**

Material examined: Tunca River-Edirne (loc. 2), 02.05.1991, 3 ex.

Distribution in Turkey: Aksaray (Darılmaz & Kıyak, 2006), Samsun (İncekara, Mart, Polat, & Karaca, 2009b), Kayseri (İncekara et al, 2010), Aydın (Akünal & Aslan, 2017a, 2017b), Kütahya, Uşak, Denizli, Afyon (Darılmaz & Kıyak, 2018), Diyarbakır (Taşar, 2018).

CONCLUSIONS AND DISCUSSION

In the present study, a total of 14 species from 5 families of Coleoptera, (Dytiscidae: 6, Haliplidae: 1, Gyrinidae. 3, Helophoridae: 1 and Hydrophylidae:3), were recorded for the first time from Turkish Thrace.

In this study, *H. aruspex*, *L. hyalinus*, *P. maculatus*, *R. suturalis* belong to family Dytiscidae; *H. flavicollis* belong to family Haliplidae; *G. substriatus*, *G. distinctus*, *A. concinnus* belong to family Gyrinidae; *H. grandis* belong to family Helophoridae; *C. littoralis*, *L. minutus*, *H. flavipes* belong to family Hydrophilidae were the first records for Turkish Thrace. Family Dytiscidae of Coleoptera including about 4,000 species in the World is known as the largest family into the suborder Adephaga (Balke, Ribera, & Vogler, 2004; Jäch & Balke, 2008; Darılmaz & Kıyak, 2009). The family Dytiscidae includes aquatic forms and a total of 137 species and 9 subspecies are reported from Turkey (Darılmaz et al, 2015). In the previous studies performed in Turkish Thrace, 4 species (*H. geminus*, *A. nebulosus*, *A. bipustulatus* and *Hydroporus planus* (Fabricius, 1782)) from this family were reported (Guéorguiev, 1981; Fery, 1999). In this study, a total of 10 species belonging family Dytiscidae were found (*H. geminus*, *A. nebulosus*, *A. bipustulatus Agabus* sp., *H. aruspex, L. hyalinus, L. minutus, H. pubescens, P. maculatus, R. suturalis*).

The family Haliplidae has 220 species in the World and a total of 16 species are reported from Turkey (Nardi, 2001; Darılmaz & Kıyak, 2009; Darılmaz et al, 2014). In this study, a total of three species into two genera (*Haliplus* and *Peltodytes*) were found in the area. Although these species have been reported from Anatolia, *H. flavicollis* is the first record for Turkish Thrace region. The family Noteridae has 250 species in the World and a total of 3 species have been reported from Turkey (Darılmaz & Kıyak, 2009).

N. clavicornis was recorded by Aydın & Çamur-Elipek, (2019) from rice fields located in Edirne, Kırklareli and Tekirdağ provinces at Turkish Thrace.

The family Gyrinidae has aquatic/semi-aquatic species which are living on the surface of the water and has 900 species in the world. A total of 13 gyrinid species are reported from Turkey (Kıyak et al, 2006b). A total of three species were recorded in the present study area and all of them (*G. substriatus, G. distinctus A. concinnus*) are the first records for Turkish Thrace region. *Helophorus* is known as the single genus of small hydrophiloid family Helophoridae with about 200 species in all over the world (Anton & Beutel, 2004). Except only one subgenus (*Empleurus*), all adult helophorids are known from aquatic or semi-aquatic ecosystems and they exist very wide distribution range of aquatic habitats (Anton & Beutel, 2004). A total of 48 species and 2 subspecies belonging to 7 subgenera are reported for Helophoridae fauna of Turkey (Yılmaz et al, 2014; Akünal & Aslan, 2017a, 2017b). A total of 7 species has been reported in previous studies performed in Turkish Thrace. In the present study was recorded 3 species belonging genus *Helophorus*. Although the records of two of them (*H. brevipalpis* and *H. aquaticus*) are known from Turkish Thrace, species *Helophorus grandis* is new records for the study area.

The family Hydrophilidae is one of the most important groups of Hydrophiloidea, the other is the family Helophoridae. Although the family Hydrophilidae has terrestrial forms, it has also 2716 known aquatic species in the world. Up to now, a total of 95 species and 4 subspecies belong to Hydrophilidae were reported from Turkey (Yılmaz, 2011; Mart, Aydoğan, & Fırat, 2014a). In the previous studies in Turkish Thrace, 12 species belonging three genera were recorded. *B. affinis* of them has been already reported from Turkish Thrace, the others are the first records for the study area. Thus the species number of Hydrophilidae in Turkish Thrace were updated to 15 species.

When considering species numbers Dytiscidae was found as the richest family with 10 species in the area (Fig. 2). It was followed by Hydrophilidae family with 4 species. While the Dytiscidae was found to have to be the most individual numbers (58% of all specimens with a total of 66 individuals), it was followed by the family Hydrophilidae (12% with 13 individuals). The family Haliplidae was to have the lowest individual numbers (4% with 5 individuals) (Fig. 2).

The sampling localities were grouped as stagnant waters, running waters and coastal lagoons to determine the aquatic habitat distributions of the species (Table 2). According to the Shannon-Wiener diversity index results, the stagnant water resources were found to have the most species richness with H'= 1.25 (Fig. 3). It was followed by running water resources by the H'=1.14 richness. The similarities of the habitats for including the species of beetles were determined by the Bray-Curtis index (Fig. 4). The highest similarity was observed between the stagnant and running water resources (50% similarity). While this relatively low similarity ratio signed that it can be the habitat preference among the species. The similarities were observed at very low rations between the stagnant water resources and coastal lagoons (19% similarity), and running water resources and coastal lagoons (23% similarity). It is suggested that the more taxonomical studies should be made to update the geographical distributions of the species.

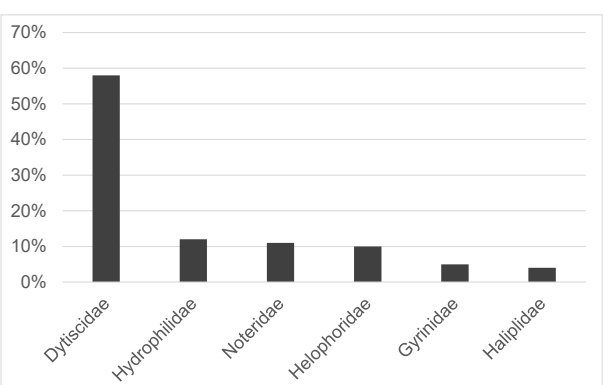

Fig. 2. The percentage of families by number of individuals.

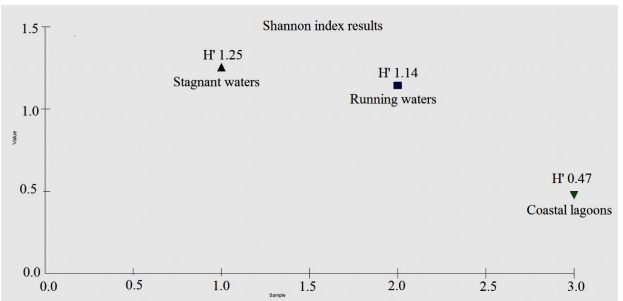

Fig. 3. Shannon-Wiener diversity index results for the species according to the habitat types.

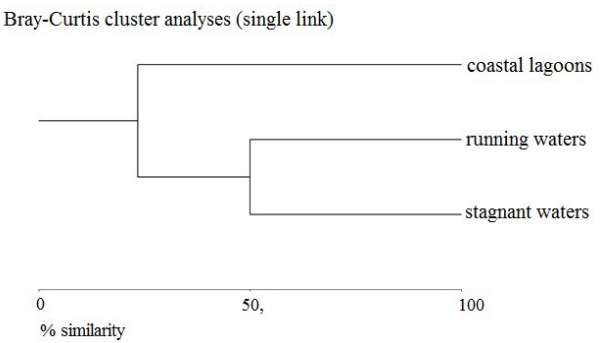

Fig. 4. Bray-Curtis similarity index results for the species according to the habitat types.

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