

Updated checklist of Odonata fauna in the Turkish Thrace Region, with additional records of new, rare, and threatened taxa

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Received: 26.01.2016 • Accepted/Published Online: 14.06.2016 • Final Version: 25.01.2017

Abstract: A new record for the Odonata from Turkish Thrace, *Lindenia tetraphylla* (Vander Linden, 1825), and its heterofamilial heterosexual tandem with a female of *Orthetrum albistylum* (Selys, 1848) are reported. This finding increases the species number in the region to 56. The current species list of the region based on unpublished records and available literature is presented. Five species are listed at subspecies levels in the region and the controversial subspecies status of some species is summarized. Additional records of rare species based on specimens collected in the region between 2001 and 2015 are provided and their distributions and threat statuses in the European regional assessment are considered. *Somatochlora flavomaculata* (Vander Linden, 1825) is considered as a species whose presence in the region needs to be confirmed. The presence of *Gomphus schneiderii* Selys, 1850 is unclear in the region.

Key words: List, *Lindenia tetraphylla*, Gomphidae, new record, heterofamilial tandem, rare and threatened species, Turkish Thrace

1. Introduction

A checklist of the Odonata fauna of Turkey was first published by Kalkman et al. (2003) after the review study of Dumont (1977) on Odonates of Turkey including the Mediterranean islands and the book of Demirsoy (1982) on Odonates of Turkey. In this checklist, a total of 96 spp. (108 spp./sspp. together with subspecies) was listed considering the available literature on Turkey fauna. The last list of Odonates of Turkey was given by Boudot et al. (2009), in which the authors listed 101 spp. (103 spp./sspp.), 2 of which were reported as extinct in the list. Since the publication of this last list, data obtained from regional faunistic studies have continued to contribute to the Odonata fauna of Turkey (e.g., Miroğlu et al., 2011; Salur et al. 2012a, 2012b, 2014) and recently 2 new species were added to the last list of the Odonata fauna of Turkey by Miroğlu (2011) and Kalkman et al. (2012).

The first and the only list of Odonates of Turkish Thrace was reported by Kalkman et al. (2003), in which 48 spp. (49 spp./sspp.) from the region were listed. When species numbers given for Turkish Thrace in this list and the numbers given for Turkey fauna as a whole by Kalkman et al. (2003) are compared, it appears that the number of the species in Turkish Thrace represents half of the number of total species in Turkey. Kalkman et al. (2003) reported that a few species and subspecies might be expected to be present in the region. While some of these

species were recorded subsequently, the subspecies status of some species was clarified during continuing studies in Turkish Thrace (Boudot et al., 2004; Hacet and Aktaç, 2004, 2008; Olias et al., 2007). The misidentification of some species from the region in previous studies was also indicated (Hacet and Aktaç, 2004). Additional records of rare species collected in the region in addition to a new record for the region are also reported in the present study. Consequently, it appears that the current list and distributional knowledge of Odonata species in Turkish Thrace are different from the latest data published.

The threatened species and their threat factors were recently reported in the Red Data list prepared on the Odonates of Europe (Kalkman et al., 2010). Six of 21 species in the threatened categories in this list are present in the Turkish Thrace, of which 4 species are at NT status. This rate for the region is significantly high. Records of these species in the region are rarely known. The density of species found in an area may change within a short or long period (Dijkstra and Lewington, 2006). Therefore, actual information about the species in the area (e.g., their ecology, distribution, and current taxonomy) is needed to comment on the status of the species there. This paper presents an updated checklist of Odonata species in the Turkish Thrace region and also aims to document the presence of *Lindenia tetraphylla* in Turkish Thrace and to report new records for some species that are rare for the

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region or threatened according to the Red List assessment data on odonatans of Europe.

2. Materials and methods

The material belonging to the rare and the new species evaluated in this study was collected during field studies performed especially in Edirne and Kırklareli provinces of the Turkish Thrace region between 2001 and 2015. A female sample (with its first three abdominal segments missing) of *Lestes dryas* Kirby, 1890 kept in the Odonata collection of Trakya University since 1993 was also added to the records of the present study.

The Turkish Thrace region is situated in the southeastern part of Europe. The Red Data list of odonatans of Europe was taken into account for the evaluation of the threatened species in the region.

The information belonging to sampling localities and recording dates for the new and additional records were listed and the localities were shown on a map of the study region (Figure 1).

The current Odonata list of the region was based on the available literature, given in the Table, and records given

in this study. Available records reported from the region so far were classified according to the provinces of the study region and published records for each species from the region were listed (Table). Numbers near the species names indicate the row of comments in the records section for some species in the Table. The names of genera and species in the records section and in the Table are given in alphabetical order.

2.1. List of localities of recorded new and rare species from Turkish Thrace

Edirne Province:

Locality-1. Uzgaç village: (41°48'N, 26°24'E), 146 m, 04.07.2013, 08.07.2013, 10.07.2014, barrage lake.

Locality-2. Balkan Campus of Trakya University: (41°38'N, 26°37'E), 58 m, 15.05.2002, 20.05.2002, 28.05.2002, 5.06.2002, 31.05.2006, 01.06.2006, 16.05.2007, 23.05.2007, 21.05.2008, brook and a manmade pond.

Locality-3. Sarayıçi: (41°41'N, 26°33'E), 41 m, 21.05.2002, Tavuk woodland.

Kırklareli Province:

Locality-4. Tatarköy village: (41°29'N, 27°22'E), 107 m, 08.06.2014, 12.07.2014, 13.07.2014, barrage lake.

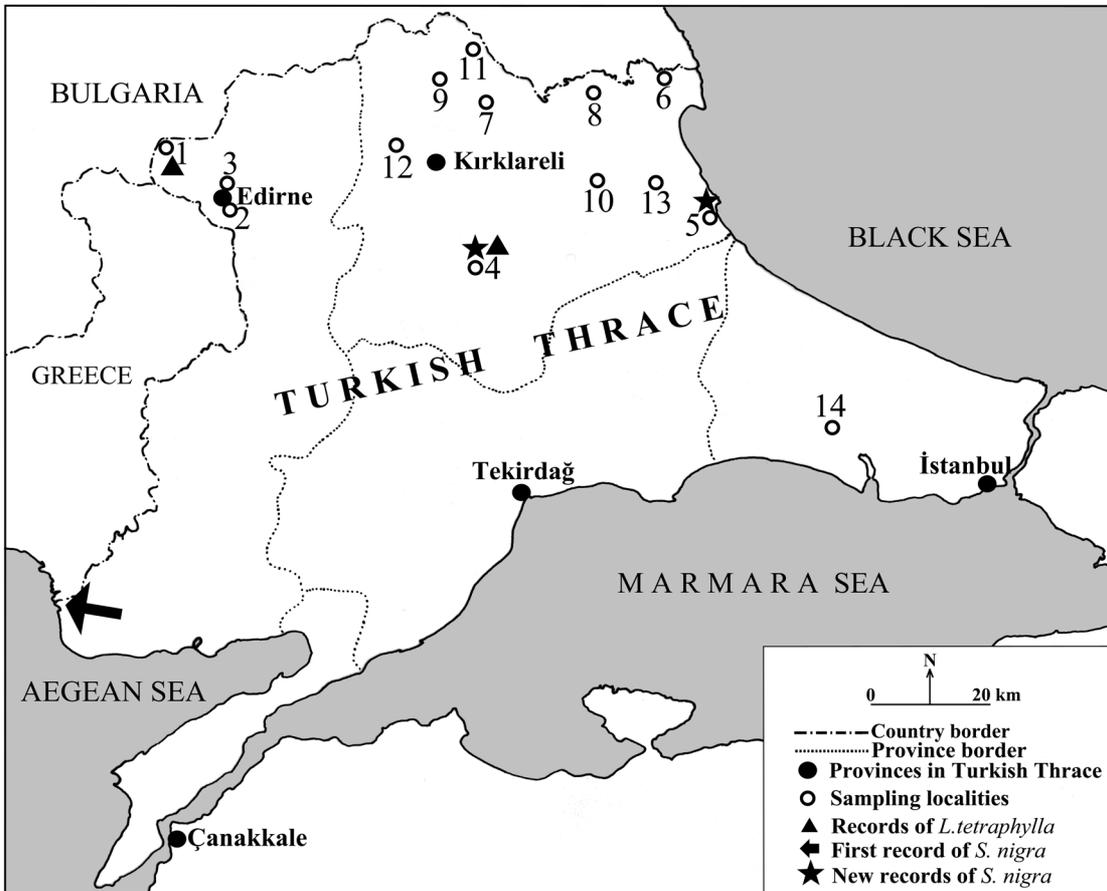


Figure 1. Localities of the species given from Turkish Thrace in the study.

Table. Updated Odonata list of Turkish Thrace Region (the records of species are given for the each provinces of the region). [Abbreviations- Provinces- ÇA: Çanakkale; ED: Edirne; İS: İstanbul; KI: Kırklareli; TE: Tekirdağ. Red List categories of IUCN- EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; NA: not applicable. R.L.S of IUCN-E.O.: Red List status of IUCN for European Odonata (Kalkman et al., 2010). *: New record for the region (present paper); +: additional records (present paper); x: records based on literature. Bolded numbers near species names refer to comments in Section 3.]

R.L.S of IUCN-E.O.	Current Odonata species in Turkish Thrace	Provinces in the Turkish Thrace Region					Literature giving the records of each species from Turkish Thrace
		ÇA	ED	İS	KI	TE	
	Suborder: ZYGOPTERA						
	Family: Calopterygidae						
LC	<i>Calopteryx splendens</i> (Harris, 1782)	x	x	x	x	x	3; 9; 10; 13; 14; 24
LC	<i>Calopteryx virgo festiva</i> (Brullé, 1832)		x	x	x	x	3; 9; 10; 12; 14; 19; 20
	Family: Euphaeidae						
NT	<i>Epallage fatime</i> (Charpentier, 1840) 1			x	x,+		3; 9; 10; present paper
	Family: Lestidae						
LC	<i>Chalcolestes parvidens</i> (Artobolevsky, 1929)	x	x	x	x	x	9; 10; 12; 14; 15; 17; 25
LC	<i>Chalcolestes viridis</i> (Vander Linden, 1825)					x	21
LC	<i>Lestes barbarus</i> (Fabricius, 1798)		x	x	x	x	9; 10; 12; 20; 24; 25
LC	<i>Lestes dryas</i> Kirby, 1890 2			x,+		x	19; 25; present paper
VU	<i>Lestes macrostigma</i> (Eversmann, 1836)		x				10
LC	<i>Lestes virens</i> (Charpentier, 1825)			x		x	10; 25
LC	<i>Sympecma fusca</i> (Vander Linden, 1820)		x	x	x		9; 10; 24
	Family: Coenagrionidae						
NT	<i>Coenagrion ornatum</i> (Selys, 1850) 3		x,+		x		8; 10; present paper
LC	<i>Coenagrion puella</i> (Linnaeus, 1758)		x	x	x	x	6; 9; 10; 12; 19; 25
LC	<i>Coenagrion pulchellum</i> (Vander Linden, 1825) 4		+	x	x		8; 12; present paper
LC	<i>Coenagrion scitulum</i> (Rambur, 1842)		x	x	x	x	6; 9; 10; 16; 19; 25
LC	<i>Enallagma cyathigerum</i> (Charpentier, 1840) 5		+		x,+		10; present paper
LC	<i>Erythromma lindenii lindenii</i> (Selys, 1840)		x	x	x	x	3; 9; 10; 12; 20
LC	<i>Erythromma viridulum</i> (Charpentier, 1840)	x	x	x			9; 10; 12; 13; 14; 24
LC	<i>Ischnura elegans</i> (Vander Linden, 1820)	x	x	x	x	x	3; 5; 9; 10; 12; 13; 14; 22; 23; 25
LC	<i>Ischnura pumilio</i> (Charpentier, 1825)	x	x	x	x	x	3; 9; 10; 13; 17; 20; 24
LC	<i>Pyrrhosoma nymphula nymphula</i> (Sulzer, 1776) 6		+		x	x	4; 9; present paper
	Family: Platycnemididae						
LC	<i>Platycnemis pennipes pennipes</i> (Pallas, 1771)	x	x	x	x	x	2; 3; 5; 9; 10; 12; 13; 14; 15; 17; 20; 22; 24; 25
	Suborder: ANISOPTERA						
	Family: Aeshnidae						
LC	<i>Aeshna affinis</i> Vander Linden, 1820	x	x		x	x	7; 8; 10
LC	<i>Aeshna cyanea</i> (Müller, 1764)				x		7; 9
LC	<i>Aeshna isoceles</i> (Müller, 1767)		x		x		5; 9; 10; 13
LC	<i>Aeshna mixta</i> Latreille, 1805		x	x	x	x	2; 6; 10; 20; 24; 25
LC	<i>Anax ephippiger</i> (Burmeister, 1839)		x	x	x		6; 10; 15
LC	<i>Anax imperator</i> Leach, 1815		x	x	x	x	9; 10; 12; 13; 14
LC	<i>Anax parthenope</i> (Selys, 1839)		x	x	x		9; 10; 13; 14; 19; 24

Table. (Continued).

LC	<i>Brachytron pratense</i> (Müller, 1764)			x	x	x	9; 12; 19
NT	<i>Caliaeschna microstigma</i> (Schneider, 1845) 7		x	x	x	x	3; 9; 12; 18
	Family: Gomphidae						
LC	<i>Gomphus flavipes</i> (Charpentier, 1825)		x			x	6; 11; 12; 13; 25
NT	<i>Gomphus schneiderii</i> Selys, 1850					x	25
LC	<i>Gomphus vulgatissimus</i> (Linnaeus, 1758)		x	x	x		5; 6; 10; 12; 14
VU	<i>Lindenia tetraphylla</i> (Vander Linden, 1825) * 8		*		*		Present paper
LC	<i>Onychogomphus forcipatus forcipatus</i> (Linnaeus, 1758)		x	x	x	x	3; 5; 9; 10; 12; 13; 20; 25
LC	<i>Ophiogomphus cecilia</i> (Fourcroy, 1785)		x				11; 13
	Family: Cordulegastridae						
EN	<i>Cordulegaster insignis insignis</i> Schneider, 1845 9		x,+		x		10; 12; 14; present paper
VU	<i>Cordulegaster picta</i> Selys, 1854 10		x	x	x,+		3; 9; 10; 12; 19; present paper
	Family: Corduliidae						
VU	<i>Somatochlora borisi</i> Marinov, 2001			x	x		1; 5
LC	<i>Somatochlora flavomaculata</i> (Vander Linden, 1825)					x	25
LC	<i>Somatochlora meridionalis</i> Nielsen, 1935		x		x	x	6; 9; 10; 12; 19; 20; 25
	Family: Libellulidae						
LC	<i>Crocothemis erythraea</i> (Brullé, 1832)	x	x	x	x	x	3; 9; 10; 13; 14; 19; 24
LC	<i>Libellula depressa</i> Linnaeus, 1758		x	x	x	x	5; 9; 10; 12; 17; 25
LC	<i>Libellula fulva</i> Müller, 1764		x	x	x	x	5; 8; 10; 12; 13
LC	<i>Orthetrum albistylum</i> (Selys, 1848)	x	x	x	x	x	6; 9; 10; 12; 13; 14; 22; 24
LC	<i>Orthetrum brunneum</i> (Fonscolombe, 1837)	x	x	x	x	x	5; 9; 10; 12; 13; 17; 24
LC	<i>Orthetrum cancellatum</i> (Linnaeus, 1758)		x	x	x	x	9; 10; 12; 13; 17; 20; 22; 24
LC	<i>Orthetrum coerulescens</i> (Fabricius, 1798)		x	x	x	x	3; 9; 10; 12; 13; 20; 24; 25
NA	<i>Pantala flavescens</i> (Fabricius, 1798)	x	x				10
LC	<i>Selysiothemis nigra</i> (Vander Linden, 1825) 11		x		+		15; present paper
VU	<i>Sympetrum depressiusculum</i> (Selys, 1841)		x		x		8; 10
LC	<i>Sympetrum fonscolombii</i> (Selys, 1840)	x	x	x	x	x	3; 10; 12; 13; 14; 20; 22; 24; 25
LC	<i>Sympetrum meridionale</i> (Selys, 1841)	x	x	x	x	x	3; 9; 10; 17; 20; 24
LC	<i>Sympetrum pedemontanum</i> (Müller in Allioni, 1766)					x	10
LC	<i>Sympetrum sanguineum</i> (Müller, 1764)		x	x	x	x	3; 5; 9; 10; 17; 24; 25
LC	<i>Sympetrum striolatum</i> (Charpentier, 1840)		x	x	x	x	3; 6; 9; 10; 13; 14; 17; 24; 25
	Total 56 species of 26 Genera in 10 Family	13	44	37	46	35	

Records of the species in Turkish Thrace (also provinces) are based on the literature as follows: 1- Boudot et al., 2004; 2- Demirsoy, 1982; 3- Dumont, 1977; 4- Guan et al., 2013; 5- Hacet, 2009; 6- Hacet, 2010a; 7- Hacet, 2010b; 8- Hacet and Aktaç, 1994; 9- Hacet and Aktaç, 1997; 10- Hacet and Aktaç, 2004; 11- Hacet and Aktaç, 2008; 12- Hacet et al., 2010; 13- Hacet and Çokkuvvetli, 2012; 14- Havza and Aktaç, 1987; 15- Kalkman et al., 2004; 16- Kalkman and Van Pelt, 2006a; 17- Kempny, 1908; 18- Kovács and Murányi, 2013; 19- Morton, 1915; 20- Morton, 1922; 21- Olias et al., 2007; 22- Pisica and Popescu-Mirceni, 2008; 23- Schmidt, 1967; 24- Spagnolini, 1877; 25- Yazıcıoğlu, 1982.

Locality-5. Kıyıköy: (41°39'N, 28°04'E), at about sea level, 20.06.2015, woodland where oak trees are dominant, *S. nigra* (Vander Linden, 1825) (photo: M. SÖZEN).

Locality-6. Sislioba village: (41°58'N, 27°54'E), 35 m, 24.06.2015, brook, *Caliaeschna microstigma* (Schneider, 1845) (collector: A. DURSUN).

Locality-7. Dereköy: (41°55'N, 27°22'E), 435 m, 17.07.2001, 25.07.2008, brook.

Locality-8. Between Demirköy town and Yeşilce village: (41°52'N, 27°42'E), 385 m, 26.06.2008, brook.

Locality-9. Kocayazı: (41°58'N, 27°14'E), 453 m, 25.06.2008, brook.

Locality-10. Sergen: (41°43'N, 27°41'E), 23.06.2008, 290 m, running stream.

Locality-11. Çağlayık village: (42°03'N, 27°31'E), 465 m, 17.07.2001, 26.07.2002, running stream.

Locality-12. Kayalı village: (41°46'N, 27°06'E), 252 m, 19.06.2001, a wetland near the entrance of the village.

Locality-13. Vize-Kızılağaç village: (41°39'N, 27°51'E), 300 m, 18.06.2001, a brook in the entryway of village.

İstanbul Province:

Locality-14. Çatalca-Ovayenice village: (41°06'N, 28°25'E), 30.05.1993, 112 m, *L. dryas* (collector: Z. OKYAR).

3. Results

3.1. Records and comments on the species from the region

Euphaeidae

(1) *Epallage fatime* (Charpentier, 1840)

Material examined: Loc.11: 16.08.2015, 1 ♂.

E. fatime was known from fast-running rivers with rocks in the northern part of the region. Its new record was found in similar habitat in a village near the border of Bulgaria and Turkey.

Lestidae

(2) *Lestes dryas* Kirby, 1890

Material examined: Loc.14: 1 ♀.

The presence of *Lestes dryas* in the region was based on only two records, the first from İstanbul Province by Morton (1915) and the second from Tekirdağ Province by Yazıcıoğlu (1982). A third regional record is that of a female specimen, collected in 1993 from İstanbul Province-Ovayenice, which was kept in the Odonata collection of Trakya University. Although abdominal segments 1–3 of the specimen are lacking, it could be easily identified. The lateral lobes of the prothorax in the female specimen have metallic green areas and the ovipositor reaches beyond the tip of abdominal segment 10, unlike that of *L. sponsa* (Hansemann, 1823).

Coenagrionidae

(3) *Coenagrion ornatum* (Selys, 1850)

Material examined: Loc.2: 15.05.2002, 2 ♂; 20.05.2002, 1 ♂; 28.05.2002, 5 ♂; 05.06.2002, 2 ♂, 3 ♀; 16.05.2007, 2 ♂, 2 ♀; 23.05.2007, 3 ♂; 21.05.2008, 2 ♂, 1 ♀.

C. ornatum, which has a near threatened (NT) status according to the International Union for the Conservation of Nature (IUCN) Red List Category of Europe, is a rarely recorded species from Turkish Thrace (Kalkman et al., 2010). A permanent population of the species occurs along the borders of a brook and an artificial pond situated in Loc.2.

(4) *Coenagrion pulchellum* (Vander Linden, 1825)

Material examined: Loc.2: 20.05.2002, 1 ♂; 31.05.2006, 1 ♂; 01.06.2006, 2 ♂; 23.05.2007, 3 ♂, 1 ♀; 21.05.2008, 2 ♂, 1 ♀. **Loc.3:** 1 ♀.

The species was also recorded in two localities from Edirne Province where no previous record were given. The populations of species in both localities are represented by low numbers.

(5) *Enallagma cyathigerum* (Charpentier, 1840)

Material Examined: Loc.1: 04.07.2013, 1 ♂; 08.07.2013, 4 ♂. **Loc.4:** 12.07.2014, 1 ♀. **Loc.12:** 2 ♀.

In the past, *E. cyathigerum* was only recorded from one locality in the Turkish Thrace region (Hacet and Aktaş, 2004). The species was also found at one locality in both Edirne Province and Kırklareli Province aside from the original locality (Loc.4) in the region; these sites are located in the northern part of the region in areas with standing waters. Population numbers for this species were observed to be rather low in the locations where it was recorded.

(6) *Pyrrhosoma nymphula nymphula* (Sulzer, 1776)

Material examined: Loc.2: 31.05.2006, 1 ♂.

This species was represented by one record from the region for a long time (Hacet and Aktaş, 1997). It was also found in Kırklareli Province (Devletliagaç-Malkoçlar) during fieldwork in 2008 (Guan et al., 2013). A third location for this species in the region is reported from Edirne Province in the present study. In the locations in which *P. n. nymphula* was found in the region, population density levels have been observed to be low so far.

Aeshnidae

(7) *Caliaeschna microstigma* (Schneider, 1845)

Material examined: Loc.6: 2 ♂. **Loc.7:** 25.07.2008, 1 ♂, (Exuvia: 1 ♂, 1 ♀). **Loc.10:** 2 ♂. **Loc.11:** 17.07.2001, 1 ♂; 26.07.2002, 1 ♂.

The IUCN Red List Category (Europe) lists *C. microstigma* at NT (Kalkman et al., 2010). In this study, *C. microstigma* is reported from three different localities in addition to Dereköy (Loc.7), where it was previously recorded. Habitats recorded for *C. microstigma* from the region are areas with running water that are not very large.

Gomphidae

(8) *Lindenia tetraphylla* (Vander Linden, 1825)

Material examined: Loc.1: 04.07.2013, (2 ♂-observation), barrage lake; (a few males- observation), cultivated areas near a barrage lake. 08.07.2013, 1 ♂, barrage lake; 1 ♂, (a few males- observation), cultivated areas near the lake. 10.07.2014, 1 ♂, 1 ♀, (about 10 males and 1 or 2 females- observation), cultivated areas near the lake; (about 10 males and 3 females- observation), barrage lake. **Loc.4:** 12.07.2014, (a heterospecific tandem between a male of this species and a female of *O. albistylum* (Selys)-observation), barrage lake; 13.07.2014, 1 ♂, barrage lake.

L. tetraphylla is a migrant species and its distribution extends from Central Asia throughout the Arabian Peninsula and the Anatolian part of Turkey to the island of Sardinia (Italy) (Boudot et al., 2009). The southern

part of the Anatolian peninsula also has localities where *L. tetrphylla* has been recorded (Kalkman and Van Pelt, 2006b).

3.1.1. Comments and observations on heterofamilial heterosexual tandem between a male *L. tetrphylla* and a female *O. albistylum*

A mixed pairing between a male of *L. tetrphylla* and a female of *O. albistylum* (Selys, 1848) at the barrage lake of Tatarköy village, Kırklareli Province, is reported in the present study. A male of *L. tetrphylla* was observed flying over the lake. After this male specimen was pursued for 10–15 min (it flew over the water and perched along the border of the lake from time to time in this period), eventually it perched on a small dried plant along the border of the lake. In the meantime, a few *S. fonscolombii* (Selys, 1840) and *O. albistylum* were flying nearby along the border of the lake. When a male *L. tetrphylla* began to fly between individuals of *O. albistylum*, surprisingly, it suddenly caught a female *O. albistylum*. The tandem position continued for a short time (probably 3 or 4 s); the female suddenly inverted its abdomen downwards and a wheel position consisting of the two species of the families Gomphidae and Libellulidae appeared. The pair in the wheel position flew away towards the center of the pond; when I attempted to approach them slowly, they suddenly disappeared from sight.

Corbet (1999) indicated that 10% of the heterospecific pairings in the reported records were heterofamilial of the same suborder. A report does exist of a tandem linkage between a male Libellulidae and a female Gomphidae in records of currently known heterofamilial connections (Utzeri and Belfiore, 1990). The present study reports an adversely anomalous pairing between a male Gomphidae and a female Libellulidae. Furthermore, the anomalous connection reported in this communication is probably the first record for *L. tetrphylla*.

3.1.2. On the possibility of occurrence of *L. tetrphylla* in the region

Permanent populations of the species are known from lake and river regions with vegetation areas in its range in Europe. Exuviae of the species were reported from barrage lakes without vegetation or with a marshy shore in Gökçeada (Kalkman and Van Pelt, 2006a). Resident populations of *L. tetrphylla* found in Sardinia and Crete recently showed that the species colonize on islands far from the main land, and also these populations were reported from manmade reservoirs (Handersen and Leo, 2011; Boudot, 2014). The new data of the species in Europe in the last years showed that it was probably either overlooked or colonized in its range.

In the present study mating positions or egg laying behaviors of female in the Uzgaç locality were not observed. However, flights of males and females on water were seen

occasionally. On the other hand, a male *L. tetrphylla* observed at the Tatarköy barrage lake attempted to mate with a female of *O. albistylum*. Even if the populations of the species given from both localities in the present report are thought to be individuals of a population migrating through the region, this mating attempt with another species shows that the species will be able to most probably colonize in these water reservoirs.

Cordulegastridae

(9) *Cordulegaster insignis* Schneider, 1845

Material examined: Loc.1: 08.07.2013, 1 ♂; 10.07.2014, 1 ♂, a brook near the barrage lake.

Currently, *C. insignis* is known to occur in Bulgaria, Greece, Romania, and Turkish Thrace in Europe (Kalkman, 2006; Boudot et al., 2009). The IUCN threat status for this species in Europe is endangered (Kalkman et al., 2010). The present study reported this species from a new location near the border of Bulgaria and Turkey. Two male specimens have features of the nominate subspecies with blue eyes, a black band on the frons, and yellow spots on the anterior part of abdominal segment 9, which were also observed on the other male specimens recorded from the region (Hacet and Aktaç, 2004).

(10) *Cordulegaster picta* Selys, 1854

Material examined: Loc.7: 17.07.2001, 4 ♂. Loc.8: 26.06.2008, 1 ♀. Loc.9: 25.06.2008, 2 ♂. Loc.13: 1 ♀.

This species, recorded previously in Loc.7 by Dumont (1977) and in Loc.9 by Hacet and Aktaç (1997), was reported within the present study from the same localities. *C. picta* was also found in two additional new localities, Yeşilce (Loc.8) and Kızılağaç (Loc.13) villages in Kırklareli Province in the northern part of the region. The species prefers small brook habitats in this region. Although the species has a wide distribution in the northwestern and western parts of Anatolia (Asian part of Turkey), the IUCN Red List Category for Europe is vulnerable (Kalkman et al., 2010).

Libellulidae

(11) *Selysiothemis nigra* (Vander Linden, 1825)

Material examined: Loc.4: 13.07.2014, 1 ♀, (1 ♀-observation). Loc.5: 1 ♂ (photo).

Currently, *Selysiothemis nigra* is known only from the southwestern part of Turkish Thrace near the border with Greece (Kalkman et al., 2004). The present study recorded this species together with *L. tetrphylla* in the center of the region in a place rather far from the border. A male specimen was photographed in Kiyıköy located along the shore of the Black Sea in June 2015 (Figure 2). These records probably represent individuals of a population migrating to the region, most probably from Greece, similar to migrating populations of *L. tetrphylla*.

A specimen being inconspicuous with typical dark blue eyes, sand-colored body, and small white pterostigma



Figure 2. Male of *Selysiothemis nigra* from Kıyıköy.

on the wings was observed perched on a plant between short plants near the border of a barrage. Although this specimen was caught, another female observed at the same location suddenly disappeared from sight. No other individual of the species could be found in the local environment on the same or the next day. When a female specimen was placed in an envelope for examination, a green egg mass was observed sticking to the tip of its abdomen. As Gashtarov and Beshkov (2010) interpreted a similar observation of *L. tetraphylla*, if the female specimen of *S. nigra* in Tatarköy had not been caught, it is most likely that she could have laid her eggs in the local reservoir or in ephemeral reservoirs in the local environment.

Studies in the last few years showed both the presence of *S. nigra* and *L. tetraphylla* from new localities and also expansion of their distributions towards the north in Europe (Gashtarov and Beshkov, 2010; Kulijer et al., 2012; De Knijf et al., 2013; Boudot, 2014; Stille et al., 2014; Uboni et al., 2015). New data related to these species found in Europe in the last few years exhibit a positive correlation with increasing number of studies and artificial reservoirs (Uboni et al., 2015). Findings of *L. tetraphylla* and *S. nigra* given in the present paper are also from barrage lakes. Records of these species can be thought to be individuals of a migrating population. When taking into account that a mating attempt was observed with an interspecific species by *L. tetraphylla* and an egg mass was observed in the abdomen of *S. nigra* in the study region, it is most likely that these species will be permanently indigenous in artificial ponds and reservoirs in this region in the future. The increasing number of studies conducted in the region will be able to provide clear answers to the present questions related to the distribution and ecology of this species in the future.

4. Discussion

A total of 56 species, 5 of which were given at subspecies level, were listed for Turkish Thrace Region. *L. tetraphylla* was reported for the first time. New locations were

presented for the rarely reported species *E. fatime*, *L. dryas*, *C. ornatum*, *C. pulchellum*, *E. cyathigerum*, *P. n. nymphula*, *C. microstigma*, *C. insignis*, *C. picta*, and *S. nigra* in this study.

The subspecies status of *Calopteryx splendens* (Harris, 1782), *Lestes virens* (Charpentier, 1825), and *Ischnura elegans* (Vander Linden, 1820) is still not clear or is controversial in the Turkish Thrace region. In the region, the size and shape of the wing spots, which are the main features considered in subspecies separation, in male specimens of *C. splendens* show variations (Hacet and Aktaç, 2004). Similarly, the taxonomic status of the subspecies level of *L. virens* still remains unresolved for the area from the eastern Balkans to Turkey (Dijkstra and Lewington, 2006). Also, when specimens of *Ischnura elegans* in the region were evaluated by taking into consideration the position of superior appendages in males and the shape of the distal parts of the prothorax in both sexes, all specimens of this species in the region were identifiable as subspecies *pontica*. However, the typical position of the superior appendages that can be considered to separate the two subspecies, *I. e. ebneri* Schmidt, 1938 and *I. e. pontica* Schmidt, 1938, may not always be stable (Kalkman, 2006). Consequently, clarification of the taxonomic status of these species in the Balkan Peninsula including Turkish Thrace requires comparative and more comprehensive studies supported by molecular analyses.

The presence of both *Gomphus schneiderii* Selys, 1850 and *Somatochlora flavomaculata* (Vander Linden, 1825) in Turkish Thrace was based on only one locality (Yazıcıoğlu, 1982). Since the latter species could not be recorded from the region for a long time, its presence in the region needs to be confirmed. The distribution of *S. flavomaculata* is rare in the southeast of Europe (Boudot et al., 2009). It was recorded often from densely vegetated ponds (Askew, 2004). Such habitats are known especially from the north of Turkish Thrace. A new record of the species is expected in the region. Distribution of *G. schneiderii* in Europe is known mainly from Greece but also Albania, Macedonia, Montenegro, and Turkish Thrace (Boudot et al., 2009). This species is evaluated as closely related to *G. vulgatissimus* (Linnaeus, 1758) (Boudot et al., 2009), and differences between imaginal diagnostic characters of the two taxa are variable (De Knijf et al., 2013). In the mainland of Greece, the distributional area of *G. schneiderii* overlaps with that of *G. vulgatissimus* (Boudot et al., 2009), and De Knijf et al. (2013) reported intermediate forms from Montenegro. Consequently, the distribution of *G. schneiderii* in the area is unclear. In Turkish Thrace, Yazıcıoğlu (1982) gave this species as a subspecies of *G. vulgatissimus*. After this study, records of the genus coming from the region were given belonging to *Gomphus flavipes* (Charpentier, 1825) and *G. vulgatissimus* (Hacet and Aktaç, 2004,

2008). The shape of vulvar scale of one female specimen, which is an unpublished record from Edirne-Uzunköprü (Çöpköy) near the southern part of the region, seems to fit the description and figure given by Askew (2004) for *G. vulgatissimus*. Also, larval specimens from two stations near the known locality of *G. schneiderii* in Turkish Thrace have lateral spines in the 6th abdominal segment, and this feature is similar to the one reported by Suhling and Müller (1996) for *G. vulgatissimus*. *G. schneiderii* could not be recorded for a long time from the region and it is seen that all available records belong to *G. vulgatissimus*. These findings show that the status of *G. schneiderii* remains unclear in Turkish Thrace. In this case, it is possible that either this taxon was misidentified or its specimens recorded from the region belong to intermediate forms.

There is no endemic Odonata species reported so far for only Turkish Thrace. *Somatochlora borisi* Marinov, 2001, which is endemic for the Balkans, is known from the provinces of Kırklareli and İstanbul (Boudot et al., 2004; Hacet, 2009). This species inhabits humid forest areas in the northern parts of the Istranca Mountains.

When published and unpublished data on Turkish Thrace Odonata fauna is evaluated, it is seen that there are 56 spp./sspp. of 26 genera belonging to 10 families. This represents approximately 41% of the species of European odonatan. About 62% of the species are dragonflies (Anisoptera). The three dominant families are Libellulidae (about 27%), Coenagrionidae (18%), and Aeshnidae (16%). The Turkish Thrace region consists of five provinces (Figure 1). It can be seen that most species were recorded from the provinces of Kırklareli and Edirne (Table). The number of species in the other two provinces, İstanbul and Tekirdağ, in the region is expected to increase with future studies, given the fact that suitable habitats for odonatan also exist here. Çanakkale is represented in Turkish Thrace with a smaller area compared to the other provinces and this small area is mainly covered with maquis and pseudomaquis, and the number of suitable water sources is not high. Therefore, it is expected that odonatan are represented by a low number in this small and relatively poor area in terms of suitable habitats for the species to visit.

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Fifty species (if *G. schneiderii* is included, 51 species) listed from Turkey are known both in Turkish Thrace and the Anatolian part of Turkey. At present, the species number of Odonata in the region represents approximately 55% of the species number of Odonata of Turkey. Five Odonata species listed for Turkey, *Lestes viridis* (Vander Linden, 1825), *G. flavipes*, *G. vulgatissimus*, *Ophiogomphus cecilia* (Geoffroy in Fourcroy, 1785), and *S. borisi*, are known only from Turkish Thrace.

When the results of analysis of the IUCN Red List assessment of European odonatan are taken into account, it appears that the Turkish Thrace region includes 6 species in the threatened categories and 4 species in the near threatened category of the Red List (Table). Two of these can be excepted for the moment: the presence of *G. schneiderii* is unclear and it is not yet known whether *L. tetraphylla*, a migrant species, is a resident species or not in the region. *S. borisi*, which may be the most important species to be considered for conservation, is an endemic species for the Balkan Peninsula according to its known distribution. *C. insignis*, *C. picta*, and *C. microstigma* are listed as threatened species and they were reported in the present study from small running waters or brooks lined with trees within this region. Some of the present records for these species, like that of *S. borisi*, come from the northern parts of Turkish Thrace where the Istranca Mountains are located. This area of the region is rich in biological diversity. Environmental awareness of effects of human actions in the region is increasing. However, while Odonata species may use water sources near residential areas, they are prone to be affected by irrigation, pesticide application, and urban pollution.

Acknowledgments

Many thanks to Prof Dr M Sözen (Bülent Ecevit University, Turkey) for permission to use the photo of *S. nigra* from Kıyıköy and Doç Dr Ahmet Dursun (Amasya University, Turkey) for the specimens of *C. microstigma* from Sislioba.

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