

Brachytron



Nederlandse Vereniging
voor Libellenstudie

Libellenvereniging
Vlaanderen



Odonata fauna of Kırklareli province, with updated species list of Longoz Forest in Thrace Region (Türkiye)

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Samenvatting

Karagöz, H. & N. Hacet, 2024. Libellenfauna van de provincie Kırklareli, met bijgewerkte soortenlijst van het Longoz-Forest in de regio Thracië (Türkiye). *Brachytron* 25(2): 1-13.

Deze studie werd uitgevoerd om de libellenfauna van de provincie Kırklareli in de regio Thrace in kaart te brengen. Het onderzoek werd uitgevoerd op 58 verschillende locaties in diverse wetlands in de provincie Kırklareli in 2022 en 2023. Er werden drie nieuwe soorten voor de provincie Kırklareli gevonden: Tangpantserjuffer (*Lestes dryas*), Kleine roodoogjuffer (*Erythromma viridulum*), Smaragdlibel (*Cordulia aenea*) en Viervlek (*Libellula quadrimaculata*). Voor Smaragdlibel is het tevens de eerste waarneming voor de regio Thrace. Drie soorten die we vonden, werden beoordeeld als "Bedreigd" op de Europese Rode Lijst voor libellen, namelijk Blauwoogbronlibel (*Cordulegaster insignis*), Turkse bronlibel (*Cordulegaster picta*) en de Bulgaarse glanslibel (*Somatochlora borisi*). Van deze drie soorten, waarvan de Bulgaarse glanslibel endemisch is voor de Balkan, werden nieuwe locaties gevonden. In de Longoz Forest, waar verschillende bijzondere biotopen voorkomen, werden in totaal tien nieuwe libellensoorten gevonden. Dat brengt het totaal aantal waargenomen soorten voor dit bosgebied op 29.

Summary

This study was conducted to investigate the Odonata fauna of Kırklareli province in the Thrace Region. It was carried out at 58 different localities in various wetlands in the Kırklareli province in 2022 and 2023. *Lestes dryas*, *Erythromma viridulum*, *Cordulia aenea* and *Libellula quadrimaculata* were recorded for the first time in this province. Of these species, *C. aenea* is also a new record for the Turkish Thrace Region. Three species recorded during this study are listed as Threatened in the Red List of European Odonates: *Cordulegaster insignis*, *Cordulegaster picta* and *Somatochlora borisi*; the latter species is endemic to the Balkans. For these species, a new location was found. In the Longoz Forests, which have a special habitat, ten new species have been added to the list, which brings the total number of species to 29.

Keywords: Dragonfly, damselfly, Longoz Forests, new records, Türkiye

Introduction

Türkiye is geographically located on both the Asian and European continents. The country's Asian part, called the Anatolian peninsula, has a surface area of 790.200 km² and its European part, called the Thrace region, is located in the southeast of the European continent and has a surface area of 24.378 km² (Avcı 2014). Thrace is located in the northwest of Türkiye and separated from the Anatolian Peninsula by the İstanbul Strait, Marmara Sea and Çanakkale Strait (Figure 1) and has been well studied. So far, 57 Odonata species have been recorded in the region (Hacet 2017, Kısa Mencütekin & Hacet 2018). Of these species, 46 have been found within the borders of Kırklareli province in the north of Thrace (Hacet 2017). Over the years, studies carried out by Hacet & Aktaş (1994, 1997, 2004), Hacet (2010a, 2010b, 2017) and Hacet et al. (2010) have contributed to the knowledge of the Kırklareli province, although they were carried out in a larger area. However, until today, there has been no special study carried out on the Odonata fauna of Kırklareli province. Here we present an overview of the Odonata fauna of the Kırklareli province, which has important wetlands including the Longoz Forests, a very rare ecosystem located on the Black Sea coast. The study was carried out in order to find i)

species that have not been recorded so far from Thrace and ii) new locations for rare species in the research area, including *Somatochlora borisi* that is endemic to the Balkans. The data from the study will provide the opportunity to better evaluate the research area in terms of the protection of Odonates.

Materials and Methods

Samples were collected from 58 localities in Kırklareli province between May and August in 2022-2023 (Table 1). Sampling localities include lakes, ponds, brooks and springs. In addition, material collected by the second author from the study area on 09/08/2009 and 08/08/2018 was incorporated in this study. Sampling localities are shown in Figure 2. In the field study, adult specimens were collected by the first author using a net. The specimens were killed in the field using ethyl acetate and brought to the laboratory in temporary envelopes, and dried at room temperature. Although the identification of some species was made by the first author during the field work, all samples were identified to the species/subspecies level using Askew (2004) and Kalkman (2006). The specimens were prepared as museum material by transferring them to storage envelopes with their species labels and placed in collection cabinets.



Figure 1. Map showing Türkiye's geographical location.
Figuur 1. Kaart met de geografische ligging van Türkiye.

Table 1. Investigated localities in Kırklareli province, coordinates, altitudes and dates. For each locality, district, village or town and habitat are given.

Tabel 1. Onderzochte locaties in de provincie Kırklareli (Thracië, Turkije), coördinaten, hoogte in meter a.s.l. en onderzoeksdagen.

Locality	Coordinate	Altitude	Dates
1. İğneada, Longoz Forests, Mert lake	41°51'42.7"N 27°58'10.1"E	Sea Level	08/08/2018; 14/07/2022; 23/07/2022 13/08/2022; 07/07/2023; 02/09/2023
2. İğneada, Longoz Forests, Hamam lake	41°49'21.7"N 27°57'54.5"E	13 m	08/08/2018; 14/07/2022; 13/08/2022 02/09/2023
3. Lüleburgaz, Hamzabey, pond	41°32'09.0"N 27°24'55.8"E	120 m	08/05/2022; 14/05/2022; 07/08/2022 11/06/2023
4. Lüleburgaz, Evrensekiz, pond	41°23'04.0"N 27°28'24.6"E	65 m	21/05/2022; 22/05/2022
5. Lüleburgaz, Umurca, pond	41°26'06.7"N 27°26'13.3"E	97 m	21/05/2022; 22/05/2022; 30/05/2022 01/06/2022; 05/06/2022; 26/06/2022 29/06/2022; 24/07/2022; 26/07/2022 06/08/2022; 11/06/2023; 18/06/2023 25/06/2023
6. Lüleburgaz, between Sakızköy – Evrensekiz, spring	41°25'02.6"N 27°28'52.7"E	108 m	22/05/2022
7. Pınarhisar, Sülüce, pond	41°30'41.3"N 27°36'27.7"E	175 m	28/05/2022
8. Pınarhisar, Tozaklı, Maden pond	41°35'23.0"N 27°34'34.8"E	232 m	28/05/2022
9. Pınarhisar, Tozaklı, pond	41°34'41.9"N 27°34'32.8"E	234 m	28/05/2022
10. Lüleburgaz, between Karaağaç – Ceylanköy, pond	41°31'56.1"N 27°27'49.4"E	152 m	28/05/2022
11. Pınarhisar, Cevizköy, spring	41°32'16.6"N 27°35'04.9"E	183 m	28/05/2022
12. Pınarhisar, Evciler, pond	41°44'44.6"N 27°36'04.7"E	413 m	29/05/2022
13. Pınarhisar, between Evciler – Akören, spring	41°42'35.6"N 27°34'14.6"E	369 m	29/05/2022
14. Pınarhisar, Çayyrdere, brook	41°42'08.0"N 27°30'40.4"E	230 m	29/05/2022
15. Lüleburgaz, Ayvalı, pond	41°26'40.1"N 27°18'45.1"E	97 m	04/06/2022; 05/06/2022; 02/07/2022 18/06/2023; 25/06/2023
16. Babaeski, Karamesutlu, brook	41°29'12.3"N 27°07'04.5"E	61 m	4/06/2022
17. Babaeski, Karacaoğlan, pond	41°32'16.1"N 27°05'31.2"E	103 m	4/06/2022
18. Babaeski, Kumrular, brook	41°30'29.8"N 27°13'10.1"E	97 m	4/06/2022
19. Babaeski, Çavuşköy, pond	41°31'29.6"N 27°11'36.2"E	110 m	4/06/2022
20. Pehlivan köy, Kumköy, brook	41°24'21.0"N 26°55'41.6"E	31 m	5/06/2022
21. Pınarhisar, Osmancık, brook	41°34'11.6"N 27°22'52.4"E	127 m	18/06/2022
22. Center, Değirmencik, brook	41°36'32.5"N 27°12'21.3"E	103 m	18/06/2022
23. Center, Asilbeyli, brook	41°40'03.3"N 27°14'35.7"E	124 m	18/06/2022
24. Center, Bayramdere, brook	41°38'20.2"N 27°20'30.9"E	170 m	18/06/2022
25. Lüleburgaz, Celaliye, pond	41°33'36.0"N 27°20'47.5"E	141 m	18/06/2022
26. Lüleburgaz, Celaliye, brook	41°32'00.7"N 27°22'05.8"E	110 m	18/06/2022
27. Center, Dokuzhöyük, brook	41°38'15.3"N 27°03'20.6"E	83 m	19/06/2022
28. Lüleburgaz, Ceylanköy, pond	41°32'50.4"N 27°26'58.8"E	147 m	19/06/2022
29. Center, İnce town, brook	41°40'28.1"N 27°04'22.0"E	92 m	19/06/2022
30. Center, between Kavaklı – İnce towns, pond	41°40'23.7"N 27°07'45.9"E	161 m	19/06/2022
31. Vize, Evrencik, brook	41°39'01.6"N 27°42'57.4"E	364 m	25/06/2022
32. Vize, Develi, brook	41°34'11.3"N 27°43'58.8"E	167 m	25/06/2022
33. Vize, Sergen, Çifte Kaynaklar, brook	41°43'30.4"N 27°47'01.8"E	338 m	25/06/2022; 24/06/2023
34. Vize, Küçükyayla, brook	41°38'01.3"N 27°49'41.8"E	258 m	26/06/2022
35. Vize, Balkaya, Saklı waterfall	41°37'08.1"N 27°58'58.1"E	72 m	03/07/2022; 31/07/2022
36. Center, Kırıköy town, Kazan brook	41°37'31.4"N 28°05'54.0"E	6 m	03/07/2022; 31/07/2022
37. Center, Kırıköy town, Pabuç brook	41°38'12.0"N 28°04'08.6"E	8 m	03/07/2022; 31/07/2022
38. Vize, Hamidiye, brook	41°39'49.4"N 27°58'37.4"E	36 m	3/07/2022
39. Center, Dolhan, brook	41°45'02.1"N 27°01'04.6"E	195 m	10/07/2022

40. Kofçaz, Aşağıkanara, brook	42°00'47.1"N 27°02'32.0"E	315 m	11/07/2022
41. Kofçaz, between Kofçaz – center (Erikler), brook	41°55'24.0"N 27°08'17.2"E	356 m	11/07/2022
42. Center, Armağan, Büyükdere brook	41°52'31.1"N 27°26'57.8"E	379 m	12/07/2022
43. Center, between Dereköy – Karadere, brook	41°55'06.8"N 27°25'16.9"E	484 m	12/07/2022
44. Center, Dereköy, brook	41°56'01.2"N 27°21'39.2"E	454 m	12/07/2022; 07/08/2022
45. İğneada, entrance of Longoz Forests, brook	41°52'11.1"N 27°56'05.0"E	15 m	14/07/2022
46. İğneada, Longoz Forests, Saka lake	41°47'51.4"N 27°59'34.4"E	7 m	15/07/2022; 13/08/2022
47. Demirköy, Sivrilir, Güneşli lakes	41°47'40.6"N 27°47'42.3"E	249 m	15/07/2022
48. Demirköy, entrance of Sivrilir, brook	41°46'13.7"N 27°51'35.5"E	342 m	15/07/2022
49. Demirköy, Sivrilir, pond	41°46'05.5"N 27°50'20.1"E	407 m	15/07/2022
50. Demirköy, entrance of Gökyaka, brook	41°52'12.8"N 27°37'13.4"E	346 m	23/07/2022
51. Demirköy, Sislioba, brook	41°58'08.5"N 27°55'08.6"E	34 m	23/07/2022
52. Vize, Kızılağaç, Cehennem waterfalls	41°42'52.0"N 27°49'31.0"E	261 m	31/07/2022; 02/07/2023
53. Lüleburgaz, Büyükkarıştıran town, brook	41°17'35.8"N 27°32'38.6"E	67 m	7/08/2022
54. Center, Üsküp town, brook	41°44'33.3"N 27°24'33.1"E	289 m	07/08/2022; 10/09/2022
55. Demirköy, Armutveren, brook	41°53'54.8"N 27°33'26.1"E	287 m	7/08/2022
56. İğneada, Longoz Forests, Pedina lake	41°49'37.9"N 27°56'06.2"E	23 m	09/08/2009; 13/08/2022
57. İğneada, Longoz Forests, Erikli lake	41°53'41.2"N 28°00'04.4"E	6 m	13/08/2022; 02/09/2023
58. Vize, Kömürköy, brook	41°37'52.1"N 27°53'06.1"E	164 m	30/08/2022

Study area: Kırklareli province

Kırklareli province is geographically located in the north of Thrace, northwestern Türkiye. It is bordered by Bulgaria in the north along a border length of 159 km, the Black Sea in the east with a coastline of 58 km, Edirne province in the west

and Tekirdağ province in the south (Webref 1; Figure 2).

The Istranca Mountains (Strandja in Bulgaria) extend from Bulgaria in the west to İstanbul province in Thrace in the east, and the mountains extend parallel to the Black Sea

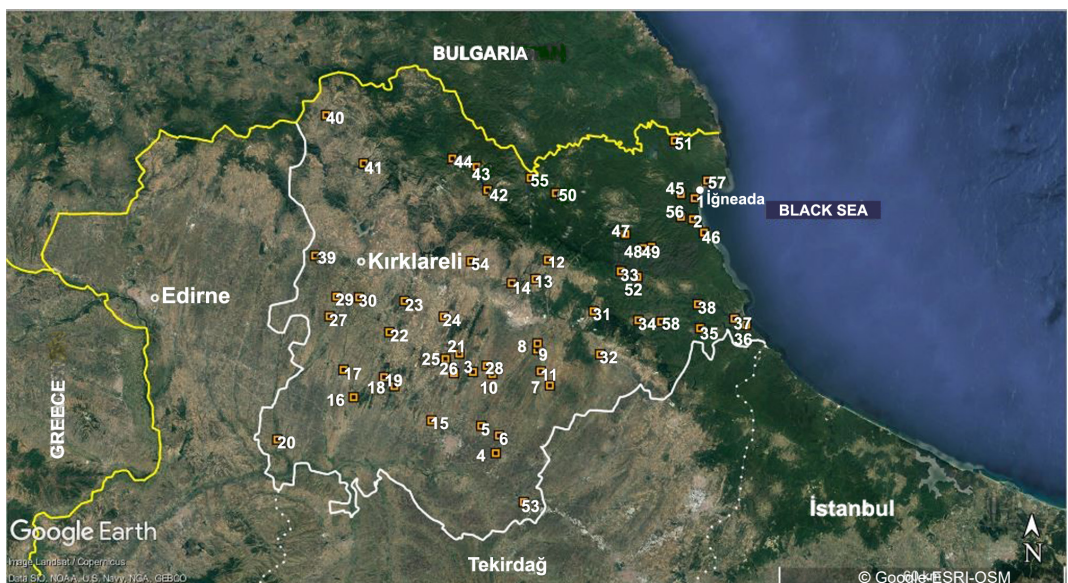


Figure 2. Sampled localities in Kırklareli province.

Figuur 2. Geïnventariseerde locaties in de provincie Kırklareli.

coast in Bulgaria (Webref 2). Consequently most of these mountains in Türkiye are located within the borders of the Kırklareli province, where they extend in a northwest to southeast direction. The northern slopes are covered with humid deciduous forests while the southern sides are covered with dry forests. In the coastal region from İstanbul to İğneada, pseudomaquis (scrub communities similar to maquis formed as a result of forest degradation on the Black Sea coast) replaces maquis. To the south of the Istranca Mountains lies the Ergene Basin, which consists of low-altitude plains exhibiting anthropogenic steppe characteristics (Dönmez 1990). The mountains, which are part of the southeastern Balkans, served during the Pleistocene glacial period as a refuge for several northern species and at the same time as a corridor for migration to Anatolia (Demirsoy 1996). This is one of the main reasons for the high biodiversity of the region. Kırklareli province contains important water resources within its borders, including streams, lakes and swamp areas. Of special interest are the Longoz Forests with the Erikli, Mert, Hamam, Pedina and Saka Lakes (Webref 3; Figure 3, 4).

Longoz Forests National Park is located on the Black Sea coast at İğneada town in the Demirköy district of Kırklareli province. These Forests were formed as a result of the accumulation of alluvium carried by streams flowing from the Istranca Mountains to the Black Sea coast. The Longoz Forests contain a floodplain type forest area, which is a rare ecosystem where coastal sand-dunes, wetlands (lakes and swamp areas), floodplains and deciduous forests co-occur (Webref 3; Figure 3). In the Istranca part of Türkiye, the İğneada Floodplain Forests National Park was established in 2007 (Webref 4).

Results

Altogether 43 species of Odonata were recorded in the Kırklareli province. An overview of the species per locality is given below, with an indication of the number of collected males and/or females.

Family: Calopterygidae

Calopteryx splendens (Harris, 1782)

Loc. 14: 6♂♂, 7♀♀; loc. 16: 1♂, 2♀♀; loc. 18: 2♂♂; loc. 23: 3♂♂, 2♀♀; loc. 32: 2♂♂, 4♀♀; loc.



Figure 3. Flooded forests (green), wetlands (blue) and costal dune ecosystems (red) in Longoz Forests (Webref 5).
 Figuur 3. Vloedbossen (groen), wetlands (blauw) en het kustduin ecosystem (rood) in Longoz Forests



Figure 4. Hamam (a) and Saka (b) Lakes in Longoz Forests. Photo: Haşim Karagöz

Figuur 4. Hamam (a) en Saka (b) meren in de Longozbossen. Foto: Haşim Karagöz

38: 2♂♂; loc. 41: 3♂♂, 1♀; loc. 44: 12.07.2022, 1♂; loc. 45: 1♂; loc. 51: 2♂♂; loc. 54: 07.08.2022, 2♂♂, 1♀, 10.09.2022, 1♂; loc. 58: 2♂♂

***Calopteryx virgo* (Linnaeus, 1758)**

Loc. 32: 1♂, 2♀♀; loc. 33: 25.06.2022, 1♂, 24.06.2023, 1♂, 1♀; loc. 34: 3♂♂, 3♀♀; loc. 35: 03.07.2022, 3♂♂, 4♀♀, 31.07.2022, 3♂♂, 2♀♀; loc. 42: 2♂♂, 2♀♀; loc. 44: 12.07.2022, 1♂, 1♀, 07.08.2022, 2♂♂, 1♀; loc. 45: 13.08.2022, 1♂; loc. 47: 4♂♂, 2♀♀; loc. 48: 3♂♂, 2♀♀; loc. 50: 2♂♂, 2♀♀; loc. 51: 2♂♂, 2♀♀; loc. 52: 31.07.2022, 2♂♂, 2♀♀, 02.07.2023, 2♂♂, 1♀; loc. 54: 10.09.2022, 1♂; loc. 55: 2♂♂

Family: Euphaeidae

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

Loc. 33: 25.06.2022, 1♂, 2♀♀, 24.06.2023, 1♂, 1♀; loc. 34: 2♂♂, 2♀♀; loc. 35: 03.07.2022, 1♀; loc. 42: 2♀♀; loc. 43: 1♀; loc. 52: 02.07.2023, 1♂, 2♀♀

Family: Lestidae

***Chalcolestes parvidens* (Artobolevsky, 1929)**

Loc. 1: 02.09.2023, 2♂♂; loc. 2: 08.08.2018, 1♂; loc. 3: 14.05.2022, 1♀; loc. 25: 1♀; loc. 54: 10.09.2022, 3♂♂; loc. 56: 09.08.2009, 8♂♂, 5♀♀

***Lestes barbarus* (Fabricius, 1798)**

Loc. 3: 14.05.2022, 2♀♀, 11.06.2023, 3♂♂, 1♀; loc. 13: 2♂♂, 1♀

***Lestes dryas* Kirby, 1890**

Loc. 13: 1♂, 2♀♀

***Sympecma fusca* (Vander Linden, 1820)**

Loc. 3: 14.05.2022, 1♂; loc. 5: 11.06.2023, 1♂

Family: Coenagrionidae

***Coenagrion puella* (Linnaeus, 1758)**

Loc. 1: 07.07.2023, 1♂; loc. 3: 08.05.2022, 9♂♂, 11♀♀, 11.06.2023, 2♂♂; loc. 4: 21.05.2022, 4♂♂, 2♀♀; loc. 6: 4♂♂, 10♀♀; loc. 7: 2♂♂, 1♀; loc. 11: 1♂, 1♀; loc. 29: 1♂, 1♀; loc. 36: 03.07.2022, 1♂; loc. 45: 1♂

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

Loc. 1: 07.07.2023, 2♂♂; loc. 5: 11.06.2023, 3♀♀

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

Loc. 5: 01.06.2022, 1♂; loc. 12: 1♀

***Erythromma lindenii* (Selys, 1840)**

Loc. 1: 14.07.2022, 1♀; loc. 5: 21.05.2022, 1♀, 24.07.2022, 2♂♂, 11.06.2023, 3♂♂, 1♀; loc. 15: 02.07.2022, 1♂; loc. 21: 1♂; loc. 23: 2♂♂, 1♀; loc. 25: 1♂; loc. 26: 2♂♂

***Erythromma viridulum* (Charpentier, 1840)**

Loc. 1: 23.07.2022, 2♂♂, 13.08.2022, 2♂♂, 07.07.2023, 2♂♂; loc. 2: 14.07.2022, 2♂♂, 13.08.2022, 2♂♂; loc. 5: 26.06.2022, 2♂♂, 2♀♀

06.08.2022, 1♀, 11.06.2023, 1♂, 25.06.2023, 1♂; loc. 22: 1♂, 1♀; loc. 36: 03.07.2022, 1♂; loc. 46: 13.08.2022, 1♂

Ischnura elegans (Vander Linden, 1820)

Loc. 1: 14.07.2022, 2♂♂, 1♀, 13.08.2022, 3♂♂, 02.09.2023, 1♂; loc. 3: 08.05.2022, 1♂, 1♀, 14.05.2022, 1♂, 11.06.2023, 1♂; loc. 4: 21.05.2022, 2♀♀; loc. 5: 21.05.2022, 1♂, 3♀♀, 22.05.2022, 3♂♂, 2♀♀, 01.06.2022, 1♀, 26.06.2022, 1♂, 11.06.2023, 1♂, 1♀; loc. 7: 2♂♂, 2♀♀; loc. 8: 1♂; loc. 9: 1♀; loc. 10: 1♂; loc. 12: 1♂, 1♀; loc. 15: 04.06.2022, 1♂; loc. 17: 1♂, 1♀; loc. 18: 1♂; loc. 19: 1♂, 1♀; loc. 25: 1♂; loc. 27: 1♂; loc. 36: 03.07.2022, 3♂♂, 2♀♀, 31.07.2022, 1♂, 1♀; loc. 37: 31.07.2022, 1♀; loc. 41: 1♂; loc. 46: 13.08.2022, 2♂♂, 2♀♀

Ischnura pumilio (Charpentier, 1825)

Loc. 3: 08.05.2022, 3♂♂, 2♀♀, 11.06.2023, 1♂; loc. 39: 4♂♂, 1♀

Pyrrhosoma nymphula (Sulzer, 1776)

Loc. 3: 08.05.2022, 3♂♂, 2♀♀, 11.06.2023, 2♂♂, 1♀; loc. 33: 25.06.2022, 3♂♂, 24.06.2023, 1♂

Family: Platycnemididae

Platycnemis pennipes (Pallas, 1771)

Loc. 1: 08.08.2018, 1♂, 14.07.2022, 4♂♂, 4♀♀, 02.09.2023, 1♂; loc. 3: 11.06.2023, 3♂♂, 1♀; loc. 5: 25.06.2023, 1♂; loc. 8: 2♀♀; loc. 9: 1♀; loc. 14: 3♂♂, 3♀♀; loc. 16: 2♂♂, 1♀; loc. 18: 1♂, 3♀♀; loc. 20: 1♂, 1♀; loc. 21: 2♂♂, 2♀♀; loc. 22: 1♀; loc. 23: 1♂, 1♀; loc. 25: 1♀; loc. 26: 2♂♂, 2♀♀; loc. 27: 1♂; loc. 29: 1♀, loc. 32: 4♂♂, 4♀♀; loc. 33: 25.06.2022, 2♂♂, 1♀; loc. 34: 2♂♂, 2♀♀; loc. 35: 03.07.2022, 1♂, 31.07.2022, 1♂; loc. 36: 03.07.2022, 1♂; loc. 37: 31.07.2022, 1♂; loc. 39: 3♂♂, 1♀; loc. 40: 2♂♂, 2♀♀; loc. 41: 1♂, 1♀; loc. 44: 12.07.2022, 1♂, 2♀♀; loc. 45: 1♂, 2♀♀; loc. 49: 2♂♂; loc. 52: 31.07.2022, 1♀, 02.07.2023, 3♀♀; loc. 54: 07.08.2022, 3♂♂, 3♀♀; loc. 55: 2♂♂, 1♀; loc. 58: 1♂

Family: Aeshnidae

Aeshna affinis Vander Linden, 1820

Loc. 43: 2♂♂; loc. 46: 15.07.2022, 2♂♂, 13.08.2022, 2♂♂; loc. 56: 09.08.2009, 1♂

Aeshna cyanea (Müller, 1764)

Loc. 1: 23.07.2022, 1♂, 1♀; loc. 46: 13.08.2022, 1♀

Aeshna isocetes (Müller, 1767)

Loc. 1: 23.07.2022, 1♂, 07.07.2023, 2♂♂

Aeshna mixta Latreille, 1805

Loc. 1: 02.09.2023, 1♂

Anax imperator Leach, 1815

Loc. 11: 1♂; loc. 15: 02.07.2022, 1♂

Anax parthenope (Selys, 1839)

Loc. 3: 07.08.2022, 1♀; loc. 5: 21.05.2022, 1♂, 05.06.2022, 1♀, 18.06.2023, 2♂♂; loc. 15: 04.06.2022, 2♂♂, 05.06.2022, 1♂; loc. 36: 03.07.2022, 1♂

Caliaeschna microstigma (Schneider, 1845)

Loc. 31: 1♂; loc. 33: 25.06.2022, 2♂♂, 24.06.2023, 2♂♂; loc. 34: 1♂; loc. 43: 1♂; loc. 47: 1♂; loc. 52: 31.07.2022, 1♂, 02.07.2023, 2♂♂

Family: Gomphidae

Lindenia tetraphylla (Vander Linden, 1825)

Loc. 5: 26.06.2022, 2♂♂, 29.06.2022, 1♂, 24.07.2022, 1♂; loc. 15: 25.06.2023, 2♂♂

Onychogomphus forcipatus forcipatus

(Linnaeus, 1758)

Loc. 5: 29.06.2022, 1♂; loc. 16: 1♂; loc. 21: 1♂; loc. 23: 1♂; loc. 24: 2♀♀; loc. 27: 1♀; loc. 28: 1♂; loc. 29: 1♂, 1♀; loc. 32: 2♂♂; loc. 34: 1♂; loc. 35: 31.07.2022, 3♂♂; loc. 39: 1♂; loc. 41: 1♂; loc. 42: 1♂; loc. 44: 12.07.2022, 1♂, 1♀; loc. 47: 1♂; loc. 48: 1♂; loc. 50: 3♂♂; loc. 52: 31.07.2022, 1♂; loc. 55: 3♂♂

Family: Cordulegastridae

Cordulegaster insignis Schneider, 1845

Loc. 5: 30.05.2022, 1♀

Cordulegaster picta Selys, 1854

Loc. 31: 1♂; loc. 43: 1♀; loc. 52: 02.07.2023, 2♂♂; loc. 55: 1♀

Family: Corduliidae

Cordulia aenea (Linnaeus, 1758)

Loc. 5: 21.05.2022, 1♂, 2♀♀, 25.06.2023, 1♂

Somatochlora borisi Marinov, 2001

Loc. 52: 31.07.2022, 2♂♂, 02.07.2023, 1♂

Somatochlora meridionalis Nielsen, 1935

Loc. 1: 08.08.2018, 3♂♂; loc. 30: 1♀

Family: Libellulidae

Crocothemis erythraea (Brullé, 1832)

Loc. 1: 23.07.2022, 1♂, 1♀, 13.08.2022, 1♂, 2♀♀, 07.07.2023, 1♂, 02.09.2023, 1♂; loc. 2: 14.07.2022, 1♂; loc. 4: 21.05.2022, 1♂, 22.05.2022, 2♂♂, 1♀; loc. 5: 22.05.2022, 1♂, 26.06.2022, 1♂, 24.07.2022, 1♂, 11.06.2023, 1♂, 18.06.2023, 1♂; loc. 15: 04.06.2022, 3♂♂, 2♀♀, 05.06.2022, 1♂, 1♀, 02.07.2022, 1♂; loc. 17: 1♂; loc. 22: 1♀; loc. 25: 2♂♂; loc. 36: 03.07.2022, 2♀♀, 31.07.2022, 2♂♂; loc. 46: 15.07.2022, 1♂; loc. 54: 07.08.2022, 1♂

Libellula depressa Linnaeus, 1758

Loc. 3: 11.06.2023, 1♂; loc. 5: 18.06.2023, 1♀; loc. 11: 1♂; loc. 12: 1♂; loc. 14: 1♂; loc. 25: 1♀; loc. 27: 1♂; loc. 33: 24.06.2023, 1♀; loc. 35: 31.07.2022, 1♀; loc. 45: 1♂, 1♀

Libellula fulva Müller, 1764

Loc. 5: 01.06.2022, 3♀♀, 05.06.2022, 1♀, 11.06.2023, 1♂; loc. 15: 04.06.2022, 2♂♂, 1♀; loc. 19: 1♀; loc. 23: 1♂; loc. 29: 1♂; loc. 32: 1♂, 1♀; loc. 36: 03.07.2022, 1♂

Libellula quadrimaculata Linnaeus, 1758

Loc. 4: 22.05.2022, 1♂, 1♀; loc. 5: 25.06.2023, 1♀

Orthetrum albistylum (Selys, 1848)

Loc. 2: 14.07.2022, 2♂♂; loc. 4: 22.05.2022, 1♀; loc. 5: 21.05.2022, 1♂, 1♀, 05.06.2022, 1♂; loc. 15: 05.06.2022, 1♂, 25.06.2023, 1♀; loc. 20: 2♀♀

Orthetrum brunneum (Fonscolombe, 1837)

Loc. 1: 14.07.2022, 1♂; loc. 5: 21.05.2022, 1♂, 26.06.2022, 1♂; loc. 16: 3♂♂; loc. 19: 2♂♂;

loc. 21: 2♂♂; loc. 22: 1♂; loc. 23: 1♂, 1♀; loc. 24: 1♂; loc. 26: 4♂♂; loc. 27: 2♂♂; loc. 35: 31.07.2022, 1♂; loc. 39: 4♂♂, 1♀; loc. 41: 1♂; loc. 44: 12.07.2022, 1♂; loc. 53: 2♂♂, 1♀; loc. 54: 07.08.2022, 1♂; loc. 58: 1♂

Orthetrum cancellatum (Linnaeus, 1758)

Loc. 1: 08.08.2018, 1♀, 23.07.2022, 2♀♀, 13.08.2022, 1♂; loc. 5: 22.05.2022, 1♀, 01.06.2022, 1♂, 1♀, 29.06.2022, 1♀, 11.06.2023, 1♂, 1♀; loc. 15: 04.06.2022, 1♂, 02.07.2022, 1♂; loc. 17: 1♂; loc. 36: 31.07.2022, 2♂♂; loc. 37: 31.07.2022, 1♀; loc. 46: 15.07.2022, 1♂, 13.08.2022, 1♀; loc. 56: 09.08.2009, 1♀

Orthetrum coerulescens (Fabricius, 1798)

Loc. 1: 14.07.2022, 1♀; loc. 3: 11.06.2023, 1♂; loc. 5: 01.06.2022, 1♀, 05.06.2022, 1♂, 26.06.2022, 1♀, 29.06.2022, 2♀♀, 24.07.2022, 1♂, 26.07.2022, 1♂, 11.06.2023, 1♂; loc. 28: 1♂; loc. 29: 1♂; loc. 32: 2♂♂, 3♀♀; loc. 36: 31.07.2022, 2♂♂; loc. 56: 09.08.2009, 1♀

Selysiothemis nigra (Vander Linden, 1825)

Loc. 1: 13.08.2022, 1♂; loc. 5: 02.07.2022, 2♂♂, 24.07.2022, 1♂, 2♀♀, 25.06.2023, 1♂, 1♀; loc. 15: 18.06.2023, 1♀, 25.06.2023, 1♀

Sympetrum fonscolombii (Selys, 1840)

Loc. 9: 2♂♂; loc. 10: 2♂♂

Sympetrum meridionale (Selys, 1841)

Loc.3: 11.06.2023, 1♂; loc. 5: 05.06.2022, 1♀, 26.06.2022, 2♂♂, 1♀, 29.06.2022, 1♀; loc. 15: 02.07.2022, 1♀

Sympetrum sanguineum (Müller, 1764)

Loc. 1: 08.08.2018, 1♂, 07.07.2023, 1♂, 02.09.2023, 1♂; loc. 2: 14.07.2022, 5♂♂, 13.08.2022, 2♂♂, 02.09.2023, 1♂, 1♀; loc. 4: 22.05.2022, 1♂; loc. 46: 15.07.2022, 1♀, 13.08.2022, 1♂; loc. 56: 13.08.2022, 5♂♂, 09.08.2009, 2♂♂, 2♀♀; loc. 57: 13.08.2022, 2♂♂; 02.09.2023, 2♂♂, 1♀

Sympetrum striolatum (Charpentier, 1840)

Loc. 1: 14.07.2022, 1♂; loc. 54: 10.09.2022, 1♂

Discussion

Odonata species recorded from the Longoz Forests

The Longoz Forests are a rare ecosystem known as flooded forests located in the north of Kırklareli province. It contains wetlands such as marshes and lakes suitable for odonates. Previous studies reported the findings of 19 species of odonates from the region so far (Table 2). With a more

comprehensive investigation of the different ecosystems within the study area, we could add 10 more species to the regional list. The Longoz Forests harbour several rarely recorded species from Thrace, such as *Aeshna cyanea*, *Brachytron pratense* and *Somatochlora meridionalis*. Wetlands are difficult to access at several places within the Longoz Forests, so we expect that more species will be found here in the future.

Table 2. Odonata species list known from Longoz Forests. Species marked with an * are new for the area.

Tabel 2. Overzicht van de waargenomen libellensoorten uit de Longoz Forests. Soorten gemarkeerd met een * zijn nieuw voor het gebied.

Species	Reference
Calopterygidae	
* <i>Calopteryx splendens</i> (Harris)	present paper
* <i>Calopteryx virgo</i> (Linnaeus)	present paper
Lestidae	
<i>Chalcolestes parvidens</i> (Artobolevsky)	Hacet & Aktaş 1997; present paper
<i>Lestes barbarus</i> (Fabricius)	Hacet & Aktaş 1997
<i>Sympecma fusca</i> (Vander Linden)	Hacet & Aktaş 1997
Coenagrionidae	
<i>Coenagrion puella</i> (Linnaeus)	Hacet & Aktaş 1997; present paper
<i>Coenagrion pulchellum</i> (Vander Linden)	Hacet & Aktaş 1997; Hacet et al. 2010; present paper
<i>Coenagrion scitulum</i> (Rambur)	Hacet & Aktaş 1997
<i>Erythromma lindenii</i> (Selys)	Hacet & Aktaş 1997; present paper
* <i>Erythromma viridulum</i> (Charpentier)	present paper
<i>Ischnura elegans</i> (Vander Linden)	Hacet & Aktaş 1997; Hacet et al. 2010; present paper
Platycnemididae	
<i>Platycnemis pennipes</i> (Pallas)	Hacet & Aktaş 1997; present paper
Aeshnidae	
<i>Aeshna affinis</i> Vander Linden	Hacet 2010b; present paper
<i>Aeshna cyanea</i> (Müller)	Hacet 2010b; present paper
* <i>Aeshna isocles</i> (Müller)	present paper
* <i>Aeshna mixta</i> Latreille	present paper
<i>Anax imperator</i> Leach	Hacet & Aktaş 1997
<i>Brachytron pratense</i> (Müller)	Hacet & Aktaş 1997
Corduliidae	
<i>Somatochlora meridionalis</i> Nielsen	Hacet 2010b; present paper
Libellulidae	
* <i>Crocothemis erythraea</i> (Brullé)	present paper
<i>Libellula depressa</i> Linnaeus	Hacet & Aktaş 1997; present paper
* <i>Orthetrum albistylum</i> (Selys)	present paper
* <i>Orthetrum brunneum</i> (Fonscolombe)	present paper
<i>Orthetrum cancellatum</i> (Linnaeus)	Hacet & Aktaş 1997; Hacet et al. 2010; present paper
* <i>Orthetrum coerulescens</i> (Fabricius)	present paper
* <i>Selysiothemis nigra</i> (Vander Linden)	present paper
<i>Sympetrum meridionale</i> (Selys)	Hacet & Aktaş 1997
<i>Sympetrum sanguineum</i> (Müller)	Hacet & Aktaş 1997; present paper
<i>Sympetrum striolatum</i> (Charpentier)	Hacet & Aktaş 1997; present paper

New species for Thrace

Cordulia aenea was recorded for the first time on 21 May 2022 from Umurca village within Kırklareli province and is also a new species for Thrace. This increased the number of odonate species for the Thrace region from 57 to 58. In Türkiye, *Cordulia aenea* was only known from the north of Anatolia (Kazancı 2008, Miroğlu & Kartal 2008, Hacet 2009a, Olthoff & Ikemeyer 2012, Salur et al. 2014). Although widely distributed in most of Europe, it has a rather fragmented occurrence in the southeast of Europe, including Bulgaria (Boudot et al. 2021). Suitable habitats for the species are present in the area, such as large ponds in woodland, slow-flowing rivers and bogs. Therefore *C. aenea* was expected to occur and was found at a large irrigation pond. This pond has a well-developed riparian vegetation of reeds and bushes, and is surrounded by agricultural fields. The finding of *C. aenea* extends its distribution a little bit further southeast in Europe and connects the European populations with the one in the north of Anatolia.

First records for Kırklareli province

In addition to *Cordulia aenea*, three more species are reported for the Kırklareli province for the first time: *Lestes dryas*, *Erythromma viridulum* and *Libellula quadrimaculata*. These findings increase the number of dragonfly species for Kırklareli province from 46 to 50 (Hacet 2017), and this corresponds to 86% of the species listed for Thrace. *Lestes dryas* is rarely recorded in Thrace (Morton 1915, Yazıcıoğlu 1982, Hacet 2017, Kısa Mencütekin & Hacet 2018). We only found it at one locality in the Pınarhisar district (between Evciler and Akören villages) on 29 May 2022. Specimens were collected from a pool formed by spring water surrounded by reeds, grasses and bushes. Although *Erythromma viridulum* is widespread and not uncommon throughout Türkiye, it has never been observed in Kırklareli province. We found the species at İğneada town-Mert lake, İğneada town-Hamam lake, Umurca village, Değirmencik village, Kırıkköy town and İğneada town-Saka Lake, both in standing waters such as lakes and ponds and in slow-flowing streams. All records date from Mid-June to Mid-August. *Libellula quadrimaculata*

was only known from the Enez district of Edirne province in Thrace (Kısa Mencütekin & Hacet 2018). During this study *Libellula quadrimaculata* was found at irrigation ponds in the villages of Evrensekiz on 22 May 2022 and Umurca on 25 June 2023. Both ponds look very similar and are only at 6 kms distance from each other. In the next years, we want to confirm the presence of *L. quadrimaculata* at these localities and try to determine the autochthony through indications of local reproduction (mating behavior, oviposition), and by searching for nymphs or exuvia.

Rare species in the Thrace Region

The following species are rare throughout Thrace: *Epallage fatime*, *Sympecma fusca*, *Coenagrion pulchellum*, *Enallagma cyathigerum*, *Pyrrhosoma nymphula*, *Aeshna cyanea*, *Lindenia tetraphylla*, *Cordulegaster insignis*, *Cordulegaster picta*, *Somatochlora borisi* and *Selysiothemis nigra*. The occurrence of *Pyrrhosoma nymphula* is more or less limited to the northern part of Türkiye (Boudot et al. 2021). Previously, it was recorded from two localities in the north of Kırklareli and from 2 localities in Edirne province (Hacet & Aktaş 1997, Guan et al. 2013, Hacet 2017). *Pyrrhosoma nymphula* was found at Sergen village-Çifte Kaynaklar (25 June 2022 and 24 June 2023) and at Hamzabey village (08 May 2022 and 11 June 2023) of Kırklareli, extending the distribution further south within Thrace. The species was found in a seepage with reeds, trees and herbaceous vegetation surrounding the pond, especially near the outlet of the pond. The other location (Sergen-Çifte Kaynaklar) where *Pyrrhosoma nymphula* was found, is a seepage in the forest area of the Istranca mountains. *Aeshna cyanea* was only known in Thrace from two localities in Kırklareli province, one of which is in Longoz Forests along the road to Lake Pedina (Hacet & Aktaş 1997, Hacet 2010b). We found populations of *A. cyanea* at Mert lake on 23 July 2022 and at the Saka lake in İğneada on 13 August 2022. *Lindenia tetraphylla* and *Selysiothemis nigra* are widespread species but were rarely observed in Thrace (Hacet 2017). Although *L. tetraphylla* reproduces in Bulgaria (Kolev & Boudot 2018), we only observed males. No reproductive

behaviour (mating or laying eggs) of either species could be observed. Therefore, it remains uncertain if any population occurs in the region or not. More fieldwork is needed to clarify this. *Somatochlora borisi* is an endemic species of the southeastern Balkans, where Bulgaria, Greece and Türkiye meet. The species is known from the Kırklareli and İstanbul provinces in Thrace (Boudot et al. 2004, Hacet 2009b). We found *S. borisi* at Kızılağaç village, the Cehennem Waterfalls on 31 July 2022 and on 02 July 2023, a new locality for Kırklareli province. We found it at a relatively slow-flowing stream in forest with a stony bottom, surrounded by trees, shrubs and herbaceous plants.

Taxonomy

Both *Chalcolestes viridis* as *C. parvidens* have been observed in Thrace (Hacet & Aktaş 1997, 2004, Olias et al. 2007). We found males with superior appendages that were yellow at the base and black at the apex, and with inferior appendages pointed at the tips when viewed from the lateral side. The number of teeth on the ventral side of the female ovipositor was less than 11-12. Therefore we consider our collected specimens to be *C. parvidens*.

Threats and Conservation

In the south of Kırklareli province lies the Ergene basin. This basin continues into Tekirdağ province and is an important industrialisation area (Kubaş 2012; Figure 2). The Ergene River originates from the Istranca Mountains and collects agricultural, industrial and domestic wastewater along its 283 km length and joins with the Meriç River further west (Webref 6). We were not able to find dragonflies at some of the sampling localities in the Ergene basin in south of Kırklareli province. The negative effects of water pollution and industrialisation resulted in the absence of odonates, which are indicators of clean water. In addition, it is clear that the restoration of streams in places with little industry has destroyed the habitats of odonates, and these activities negatively affect their distribution and reproduction.

Red List species

From the Odonata species observed in the Thrace Region, several are mentioned on the Red List of European Odonates. *Lestes macrostigma* and *Sympetrum pedemontanum* are assessed as Near Threatened and four species, *Cordulegaster insignis*, *C. picta*, *Somatochlora borisi* and *Sympetrum depressiusculum*, are in the Vulnerable category (De Knijf et al. 2024). As *S. borisi* is a European endemic species, it is at the same time evaluated as globally Vulnerable. Except for *Lestes macrostigma*, the other five species are known from Kırklareli province. Both the presence of Floodplain forests and the occurrence of four European threatened species within the borders of the province, make it clear that this is a very important region for nature conservation.

Acknowledgement

This research is part of a Master thesis study. We would like to thank the Research Fund of Trakya University for providing the research grant (TÜBAP-2022/24 project). We also thank Geert De Knijf for his help and suggestion in improving the manuscript.

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