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## The Copepoda (Crustacea) Freshwater Fauna of Turkish Thrace Region (Edirne, Kırklareli, Tekirdağ)

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**Abstract:** As a consequence of the examination of the materials that were collected from 58 different localities between the years 1987-1998 in Turkish Thrace region (Edirne, Kırklareli, Tekirdağ), total 28 Copepoda species were determined. The first records of the Thrace region are *Paracyclops affinis*, *Paracyclops fimbriatus*, *Cyclops scutifer*, *Cyclops kolensis*, *Megacyclops (Acanthocyclops) gigas*.

**Key words:** Copepoda, freshwater, fauna thrace

### INTRODUCTION

The Copepoda species, which are one of the most important elements of the food chain in the aquatic environments form the inevitable food for fishes, show wide dispersion in all kinds of aquatic eco-systems.

The first comprehensive research on the Copepoda species, which lives in the inland waters of Turkey was carried out by Mann<sup>[1]</sup>. After that, Kiefer<sup>[2,3]</sup>, Lindberg<sup>[4-6]</sup>, Noodt<sup>[7]</sup>, Margaritora and Cottarelli<sup>[8]</sup>, Margaritora *et al.*<sup>[9]</sup>, Gündüz<sup>[10,11]</sup>, Güher<sup>[12]</sup> and Ustaoglu *et al.*<sup>[13,14]</sup> performed researches in the various inland waters in different regions of Turkey.

Demirhindi<sup>[15]</sup>, Ortak and Kirgiz<sup>[16]</sup> study in Turkish Thrace region in Gala lake (Edirne), Güher and Kirgiz<sup>[17]</sup> worked in 49 localities taking part within the boundaries of Edirne province, Güher<sup>[18]</sup> performed in Mert, Erikli, Hamam and Pedina (Kırklareli) lakes on Copepoda. There is no research in Tekirdağ province. These researches remain insufficient and very limited with some certain

areas. In order to determine the fauna of Copepoda of Thrace region which shelters lots of fresh water eco-systems.

Turkish Thrace is one of the increasingly polluted regions with the aquatic eco-systems under the influence of industrialisation, modernisation in agriculture and rapid urbanisation. As a result the wetlands for some very important species inland are being gradually narrowed.

The purpose of this research is to determine the species, which are under the danger of extinction studying on the unknown sections in the region so far and to make contributions to the studies of clarification of Copepoda fauna of Turkey.

### MATERIALS AND METHODS

The samples were collected from 58 localities (Fig. 1) in Turkish Thrace (except Istanbul and Çanakkale provinces) between 1987-1998. The sampling dates and localities are given in numerical order in Table 1.

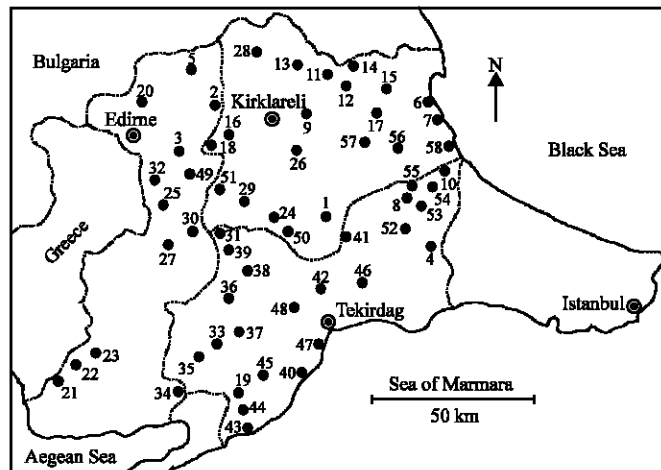


Fig. 1: Sampling localities in the study area (in numerical order)

Table 1: Sampling localities and identification numbers according to sampling date (types of water sources are indicated in parentheses)

Locality Number	Locality Name	Country	Sampling Date
1	Evrensekiz (stream)	Kirklareli	06.06.1987
2	Keramettin (dam)	Edirne	14.11.1987
3	Oğulpaşa (stream)	Edirne	01.06.1989
4	Çerkezköy (stream)	Tekirdağ	28.02.1990
5	Hacidanışment Village (pond)	Edirne	01.06.1991
6	Saka Lake	Kirklareli	12.06.1991
7	Panayir quay (stream)	Kirklareli	12.06.1991
8	Saray (stream)	Tekirdağ	05.08.1991
9	Üsküp (stream)	Kirklareli	17.09.1991
10	Bahçeköy (stream)	Tekirdağ	03.10.1996
11	Armutveren Village (tough)	Kirklareli	18.10.1996
12	Dupnisa Cavern (stream)	Kirklareli	18.10.1996
13	Dereköy (pond)	Kirklareli	18.10.1996
14	Şükrüpaşa Village (tough)	Kirklareli	18.10.1996
15	Demirköy-Sivrilir (stream)	Kirklareli	18.10.1996
16	Ürünlü (stream)	Kirklareli	02.11.1996
17	Yeniceköy-Demirköy (tough)	Kirklareli	02.11.1996
18	Azizbaba-Ürünlü (stream)	Kirklareli	02.11.1996
19	Çınarlıdere (stream)	Tekirdağ	05.04.1997
20	Avariz Village Tunca River	Edirne	09.05.1997
21	Gala Lake	Edirne	21.07.1997
22	Pamuklu Lake	Edirne	21.07.1997
23	Karpuzlu (pond)	Edirne	23.07.1997
24	Sarıcaali (pond)	Kirklareli	03.10.1997
25	Saçlımüsellim Village (tough)	Edirne	03.10.1997
26	Bayramdere (stream)	Kirklareli	03.10.1997
27	Malkoç Village (pond)	Edirne	03.10.1997
28	Koçaz (stream)	Kirklareli	03.10.1997
29	Babaeski (stream)	Kirklareli	03.10.1997
30	Muhacirkadi Village (pond)	Edirne	03.10.1887
31	Hedeyli Village (tough)	Tekirdağ	03.10.1997
32	Doyran Village (pond)	Edirne	03.10.1997
33	Isakça Village (tough)	Tekirdağ	04.10.1997
34	Kadiköy (dam)	Edirne	04.10.1997
35	Malkara (tough)	Tekirdağ	04.10.1997
36	Örenköy (stream)	Tekirdağ	04.10.1997
37	Karademir (dam)	Tekirdağ	04.10.1997
38	Hayrabolu (tough)	Tekirdağ	04.10.1997
39	Çerkezmüsellim (pond)	Tekirdağ	04.10.1997
40	Yeniköy (tough)	Tekirdağ	05.10.1997
41	Büyükkariştira (tough)	Tekirdağ	05.10.1997
42	Yeşilsirt (pond)	Tekirdağ	05.10.1997
43	Şarköy (pond)	Tekirdağ	05.10.1997
44	Tatarlı Village (tough)	Tekirdağ	05.10.1997
45	Sağlamtaş Village (tough)	Tekirdağ	05.10.1997
46	Yenice Village (tough)	Tekirdağ	05.10.1997
47	Barbaros (pond)	Tekirdağ	05.10.1997
48	Kaşıkcı (stream)	Tekirdağ	05.10.1997
49	Havsa (pond)	Edirne	04.08.1998
50	Alacaoglu Village (tough)	Kirklareli	04.08.1998
51	Necatiye (pond)	Kirklareli	04.08.1998
52	Büyükyoncalı Village (stream)	Tekirdağ	04.08.1998
53	Saray (tough)	Tekirdağ	05.04.1998
54	Güngörmez (stream)	Tekirdağ	05.08.1998
55	Ayvacık Village (stream)	Tekirdağ	05.08.1998
56	Kömürköy (stream)	Kirklareli	05.08.1998
57	Soğucak (stream)	Kirklareli	05.08.1998
58	Kiyiköy (stream)	Kirklareli	05.08.1998

The most attention for choosing the sampling localities was paid to the areas that are not involved in previous works but cover the region<sup>[17,18]</sup>.

Materials were collected with several plankton nets (the cell diameter of 55 µm) fixed in 70% alcohol. The

identification methods for the materials were obtained from Margaritora *et al.*<sup>[9]</sup>, Dussart<sup>[19,20]</sup>, Kiefer<sup>[21]</sup>, Apostolov and Marinov<sup>[22]</sup>.

The species that were identified during the present study are given according to localities and to provinces.

## RESULTS AND DISCUSSION

In the research, 28 species were determined as 22 from Cyclopoida, 4 from Calanoida, 2 from Harpacticoida orders. These species and their distribution according to the provinces (Table 2).

### Subclass: Copepoda

### Order: Cyclopoida

### Family: Cyclopidae (Sars, 1913)

### Subfamily: Eucyclopinae (Kiefer, 1927)

- 1) Species: *Macrocyclops albidus* (Jurine, 1820)  
Distribution in Turkish Thrace: 3, 4, 8, 10, 15, 21, 36, 53, 54, 55, 56.
  - 2) Species: *Macrocyclops fuscus* (Jurine, 1820)  
Distribution in Turkish Thrace: 3, 4, 8, 27.
  - 3) Species: *Ectocyclops phaleratus* (Koch, 1838)  
Distribution in Turkish Thrace: 21, 22, 24, 32.
  - 4) Species: *Eucyclops speratus* (Lilljeborg, 1901)  
Distribution in Turkish Thrace: 2, 4, 22, 28, 35, 40, 41, 42, 45, 46, 48, 53.
  - 5) Species: *Eucyclops serrulatus* (Fischer, 1851)  
Distribution in Turkish Thrace: 1, 2, 3, 4, 11, 13, 14, 17, 21, 25, 28, 29, 31, 33, 35, 36, 38, 40, 41, 44, 45, 46, 48, 50, 53, 56, 57.
  - 6) Species: *Eucyclops macruroides* (Lilljeborg, 1901)  
Distribution in Turkish Thrace: 5.
  - 7) Species: *Eucyclops macrurus* (Sars, 1863)  
Distribution in Turkish Thrace: 37.
  - 8) Species: *Paracyclops affinis* (Sars, 1863)  
Distribution in Turkish Thrace: 24, 53.
  - 9) Species: *Paracyclops fimbriatus* (Fischer, 1853)  
Distribution in Turkish Thrace: 11, 12, 25, 35.
  - 10) Species: *Tropocyclops prasinus* (Fischer, 1860)  
Distribution in Turkish Thrace: 31, 53.
- ### Subfamily: Cyclopinae (Kiefer, 1927)
- 11) Species: *Cyclops vicinus* (Uljanin, 1875)  
Distribution in Turkish Thrace: 13, 19, 24, 28, 30, 37, 42, 47, 57.
  - 12) Species: *Cyclops strenuus* (Fischer, 1851)  
Distribution in Turkish Thrace: 39.
  - 13) Species: *Cyclops scutifer* (Sars, 1863)  
Distribution in Turkish Thrace: 4, 26.
  - 14) Species: *Cyclops kolensis* (Lilljeborg, 1901)  
Distribution in Turkish Thrace: 24.

Table 2: Distribution of the species according to provinces (E: Edirne, K: Kırklareli, T: Tekirdağ)

Species	E	K	T
<i>Macrocylops albidus</i> (Jurine, 1820)	+	+	+
<i>Macrocylops fuscus</i> (Jurine, 1820)	+		+
<i>Ectocylops phaleratus</i> (Koch, 1838)	+	+	
<i>Eucyclops speratus</i> (Lilljeborg, 1901)	+	+	+
<i>Eucyclops serrulatus</i> (Fischer, 1851)	+	+	+
<i>Eucyclops macrurides</i> (Lilljeborg, 1901)	+		
<i>Eucyclops macrurus</i> (Sars, 1863)			+
<i>Paracyclops affinis</i> (Sars, 1863)		+	+
<i>Paracyclops fimbriatus</i> (Fischer, 1853)	+	+	+
<i>Tropocyclus prasinus</i> (Fischer, 1860)			+
<i>Cyclops vicinus</i> (Uljanin, 1875)	+	+	+
<i>Cyclops strenuus</i> (Fischer, 1851)			+
<i>Cyclops scutifer</i> (Sars, 1863)		+	+
<i>Cyclops kolensis</i> (Lilljeborg, 1901)		+	
<i>Cyclops abyssorum</i> (Sars, 1863)	+	+	+
<i>Acanthocyclus robustus</i> (Sars, 1863)	+	+	+
<i>Acanthocyclus venustus</i> (Norman et Scott, 1906)	+	+	+
<i>Megacyclops (Acanthocyclus) viridis</i> (Jurine, 1820)	+	+	+
<i>Megacyclops (Acanthocyclus) gigas</i> (Claus, 1857)		+	+
<i>Diacyclops bicuspidatus</i> (Claus, 1857)	+	+	
<i>Mesocyclus leuckarti</i> (Claus, 1857)		+	
<i>Thermocyclus crassus</i> (Fischer, 1853)	+		
<i>Calanipeda aquedulcis</i> Kritschagin, 1873	+		+
<i>Arctodiaptomus wierzejskii</i> (Richard, 1888)	+	+	+
<i>Mixodiaptomus kupelwieseri</i> (Brehm, 1907)		+	
<i>Eurytemora velox</i> (Lilljeborg, 1853)		+	
<i>Cantocamptus microstaphylinus</i> (Wolf, 1905)		+	
<i>Nitocra hibernica</i> (Brady, 1880)	+	+	+
Total of species	17	21	19

- 15) Species: *Cyclops abyssorum* (Sars, 1863)  
Distribution in Turkish Thrace: 26, 27, 30, 42, 47.
- 16) Species: *Acanthocyclus robustus* (Sars, 1863)  
Distribution in Turkish Thrace: 2, 12, 20, 21, 22, 23, 25, 27, 29, 34, 36, 44, 47, 51, 58.
- 17) Species: *Acanthocyclus venustus* (Norman et Scott, 1906)  
Distribution in Turkish Thrace: 5, 12, 21, 22, 27, 31, 36, 39, 42, 43, 49.
- 18) Species: *Megacyclops (Acanthocyclus) viridis* (Jurine, 1820)  
Distribution in Turkish Thrace: 6, 8, 16, 18, 20, 21, 22, 38, 39, 42, 51, 52, 53, 55.
- 19) Species: *Megacyclops (Acanthocyclus) gigas* (Claus, 1857)  
Distribution in Turkish Thrace: 6, 39.
- 20) Species: *Diacyclops bicuspidatus* (Claus, 1857)  
Distribution in Turkish Thrace: 6, 9, 12, 26, 29, 49.
- 21) Species: *Mesocyclus leuckarti* (Claus, 1857)  
Distribution in Turkish Thrace: 7.
- 22) Species: *Thermocyclus crassus* (Fischer, 1853)  
Distribution in Turkish Thrace: 49.

**Order: Calanoida**

**Family: Pseudodiaptomidae (Sars, 1903)**

- 23) Species: *Calanipeda aquedulcis* Kritschagin, 1873  
Distribution in Turkish Thrace: 22, 23, 43.

**Family: Diaptomidae (Sars, 1903)**

**Subfamily: Diaptominae (Kiefer, 1932)**

- 24) Species: *Arctodiaptomus wierzejskii* (Richard, 1888)  
Distribution in Turkish Thrace: 26, 34, 37.
- 25) Species: *Mixodiaptomus kupelwieseri* (Brehm, 1907)  
Distribution in Turkish Thrace: 58.

**Family: Temoridae (Sars, 1903)**

- 26) Species: *Eurytemora velox* (Lilljeborg, 1853)  
Distribution in Turkish Thrace: 6, 7.

**Order: Harpacticoida**

**Family: Canthocamptidae (Sars, 1906)**

- 27) Species: *Cantocamptus microstaphylinus* Wolf, 1905  
Distribution in Turkish Thrace: 13.

**Family: Ameiridae (Monard, 1927 and Lang, 1936)**

- 28) Species: *Nitocra hibernica* (Brady, 1880)  
Distribution in Turkish Thrace: 21, 24, 34, 43.

**DISCUSSION**

Twenty eight species of Copepoda were found as a result of the examination of the materials that were collected from 58 localities including the lakes, ponds, rivers and water heaps in Thrace region. While these species are distributed among lots of aquatic ecosystems in Turkey, *Paracyclops affinis*, *Paracyclops fimbriatus*, *Cyclops scutifer*, *Cyclops kolensis*, *Megacyclops (Acanthocyclus) gigas* were firstly recorded in Thrace region. The most widely found species in the region is *Eucyclops serrulatus* and it is followed by *Acanthocyclus robustus*, *Acanthocyclus venustus*, *Eucyclops speratus*. The most species were found in Kırklareli province with 21 species, followed by Tekirdağ with 19 species and Edirne with 17 species, respectively (Table 2).

Twenty nine species were recorded as a consequence of the research. Together with the added new species, Copepoda fauna of the Thrace region is represented by 34 species.

All of the species, which are determined in this research, are known in Bulgaria as well. Because of this reason, we may say that Thrace Copepoda fauna possibly has the similar characteristic in the neighbouring<sup>[23]</sup>.

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