

A Faunistic Study on the Freshwater Copepoda (Crustacea) of Balıkesir

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Abstract

Freshwater copepods of Balıkesir Province (Turkey) were investigated by sampling 26 various freshwater bodies and a total of 12 species were identified. *Megacyclops viridis*, *Macrocyclus albidus*, *Mesocyclus leuckarti*, *Paracyclops chiltoni*, *Bryocamptus (B.) minutus*, *B. (R.) pygmaeus* and *B. (B.) tarnogradskyi* were recorded for the first time from Balıkesir. *Bryocamptus (B.) tarnogradskyi* was also a new record for the Turkish inland waters and it was partially described.

Key words: Fauna, copepod, *Bryocamptus (B.) tarnogradskyi*, Taxonomy, Turkey

INTRODUCTION

The subclass Copepoda contains over 11500 species [1,2] and constitutes a widely distributed group of crustaceans with free-living, parasitic and associated forms [2]. Members of the families Cyclopidae in the Cyclopoida, Canthocamptidae in the Harpacticoida, and the Diaptomidae in the Calanoida are particularly successful in all kinds of freshwater habitats and they play a vital role in the food web as a part of zooplanktonic community [3].

Considerable amount of studies were carried out on zooplankton of Turkish inland waters since early 1900's. Ustaoglu [4] presented a checklist by compiling about 115 papers published between 1940 and 2004. After Ustaoglu's [4] checklist, additional taxonomical and ecological works were published on zooplankton of ponds [5,6], rivers [7], dam lakes [8-12], mountain lakes [13], natural lakes and springs [14-19].

On the other hand, freshwater copepods of Balıkesir have not sufficiently been studied so far. Some copepod records were given only from İkiçetepeler Dam Lake [20] and Manyas Lake [21-24]. Therefore, 26 various freshwater bodies of Balıkesir were sampled in order to contribute to the copepod fauna of Balıkesir and Turkey.

MATERIAL and METHODS

The samples were collected, by using 100 µm mesh sized plankton net, from 26 stations (Fig. 1) within the border of Balıkesir province between 2001 and 2005. The specimens were instantly preserved in 4% formaldehyde and later transferred into alcohol. The specimens were dissected using Olympus SZX12 or SZX16 stereomicroscopes and were identified by using Olympus BX-50 or BX-51 equipped with differential interference contrast microscopes. Fragments of coverslip were placed between the slide and the coverslip to avoid crushing and to facilitate rotation, which allowed the appendages to be viewed from all angles. All drawings were made with the aid of a drawing tube attached to Olympus BX-51 microscope. The descriptive terminology is adopted from Huys et al. [25].

Abbreviations used in the text are: ae, aesthetasc; P1-P6, for swimming legs 1-6; exp (enp)-1 (-2, -3) to denote the proximal (middle, distal) segment of a ramus. The sampling dates and localities are given in Table 1. The specimens were identified according to Einsle [26], Karaytuğ [27], Ueda and Reid [28], Borutzky [29], Damian-Georgescu [30], Wells [31]. Martin and Davis [32] were followed for higher classification of the species.

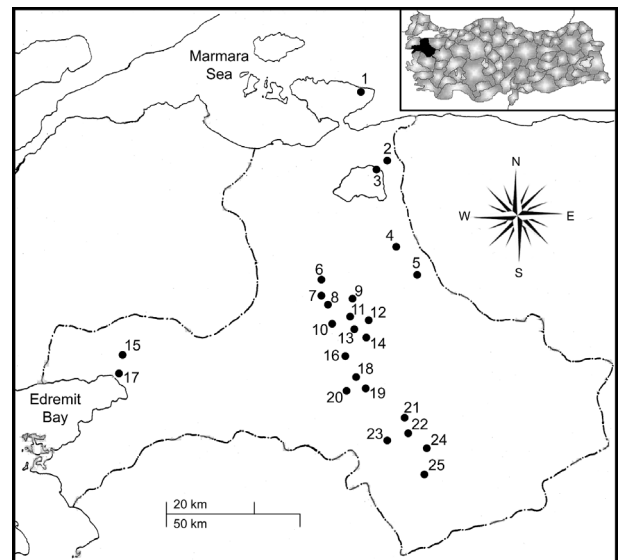


Figure 1. Sampling localities; 1. A pond in Kapıdağ Peninsula, 2. Karadere (Manyas), 3. Manyas Lake, 4. Söve pond, 5. Çaylak waterfall (Susurluk), 6. Ilıca pond, 7. Armutalan pond, 8. Şamlı pond, 9. Halkapınar pond, 10. Kavaklı pond, 11. Karakol pond, 12. İbirler pond, 13. Kötelyi dam lake, 14. Değirmenboğazi stream, 15. Small creek in Kazdağı (near Kalkım), 16. Temporary pools in Balıkesir fair, 17. Small water pool near Yeni Mahalle (Akçay), 18. Bostancı I stream, 19. Bostancı II stream, 20. Pamukçu (Ilıca) stream, 21. A fountain through in Yeşilköy (near Eski Balatlı), 22. Simav brook, 23. Yörücekler regulator, 24. Kocabey pond, 25. Çaygören dam lake.

RESULTS

A total of 12 species were determined (Table 1). The species are as follows:

Station No.	Dates	Cyclopoida							Harpacticoida				
		<i>A. robustus</i>	<i>M. viridis</i>	<i>E. serrulatus</i>	<i>C. vicinus</i>	<i>M. albidus</i>	<i>T. prasinus</i>	<i>M. leuckarti</i>	<i>P. chiltoni</i>	<i>B. (B.) minutus</i>	<i>B. (B.) tarnogradskyi</i>	<i>B. (R.) pygmaeus</i>	<i>N. hibernica</i>
1	18.05.2001			+									
2	07.04.2004	+				+							
3	01.05.2004	+	+										
4	09.06.2001	+			+								
5	07.04.2004	+											
6	09.06.2001			+		+	+						
7	09.06.2001	+											
8	04.06.2001	+											
9	09.06.2001	+											
10	09.06.2001	+											
11	09.06.2001	+											
12	09.06.2001	+											
13	09.06.2001			+		+	+	+					
14	09.06.2001	+		+		+							
14	28.07.2001						+	+					
15	12.05.2005	+		+		+	+			+	+	+	
16	09.10.2003	+											
17	17.04.2005		+	+									
18	13.04.2001	+	+										
19	16.06.2002					+							+
20	10.10.2001	+				+							
21	08.11.2002								+				
22	16.06.2002	+	+	+									
23	16.06.2002	+											
24	16.06.2002					+							
25	16.06.2002	+											

Table 1. List of identified species regard to the stations and dates

Class: Maxillopoda Dahl, 1956

Subclass: Copepoda Milne-Edwards, 1840

Infraclass: Neocopepoda Huys & Boxshall, 1991

Superorder: Podoplea Giesbrecht, 1882

Order: Cyclopoida Burmeister, 1834

Family: Cyclopidae Dana, 1846

Subfamily: Eucyclopiniae Kiefer, 1927

Eucyclops serrulatus (Fischer, 1851)

Material Examined: 12 ♀♀, 3 ♂♂ (st1), 2 ♀♀ (st6), 1 ♀ (st13), 6 ♀♀, 4 ♂♂ (st14), 1 ♀ (st15), 4 ♀♀, 2 ♂♂ (st17), 20 ♀♀, 20 ♂♂ (st22).

Macrocyclops albidus (Jurine, 1820)

Material Examined: 1 ♀ (st2), 1 ♀ (st6), 5 ♀♀, 1 ♂ (st13), 1 ♀ (st14), 3 ♀♀ (st15), 20 ♀♀, 20 ♂♂ (st19), 20 ♀♀, 20 ♂♂ (st20).

Paracyclops chiltoni (Thomson, 1882)

Material Examined: 13 ♀♀, 2 ♂♂ (st21)

Tropocyclops prasinus (Kiefer, 1978)

Material Examined: 1 ♀ (st6), 4 ♀♀, 2 ♂♂ (st13), 20 ♀♀, 20 ♂♂ (st14), 30 ♀♀, 30 ♂♂ (st15).

Subfamily : Cyclopiniae Kiefer, 1927

Acanthocyclops robustus (G.O. Sars, 1863)

Material Examined: 10 ♀♀, 10 ♂♂ (st2), 20 ♀♀, 20 ♂♂ (st3), 20 ♀♀, 20 ♂♂ (st4), 8 ♀♀ (st5), 2 ♀♀, 1 ♂ (st7), 30 ♀♀, 30 ♂♂ (st8), 20 ♀♀, 20 ♂♂ (st9), 11 ♀♀, 4 ♂ (st10), 10 ♀♀, 10 ♂♂ (st11), 2 ♀♀, 10 ♂♂ (st12), 2 ♀♀ (st14), 20 ♀♀, 20 ♂♂ (st15), 3 ♀♀, 8 ♂♂ (st16), 20 ♀♀, 20 ♂♂ (st18), 20 ♀♀, 20 ♂♂ (st20), 20 ♀♀, 20 ♂♂ (st22), 16 ♀♀, 1 ♂ (st23), 20 ♀♀, 20 ♂♂ (st25).

Megacyclops viridis (Jurine, 1820)

Material Examined: 20 ♀♀, 20 ♂♂ (st3), 10 ♀♀, 5 ♂♂ (st17), 20 ♀♀, 20 ♂♂ (st18), 20 ♀♀, 20 ♂♂ (st22).

Mesocyclops leuckarti (Claus, 1857)

Material Examined: 30 ♀♀, 10 ♂♂ (st13), 20 ♀♀, 20 ♂♂ (st14).

Cyclops vicinus Uljanin, 1875

Material Examined: 20 ♀♀, 20 ♂♂ (st4), 20 ♀♀, 20 ♂♂ (st24).

Order: Harpacticoida G. O. Sars, 1903.

Family: Ameiridae Boeck, 1865

Nitokra hibernica (Brady, 1880)

Material Examined: 4 ♀♀, 5 ♂♂ (st19).

Family: Canthocamptidae G.O. Sars, 1906

Bryocamptus (Rheocamptus) pygmaeus (G.O. Sars, 1863)

Material Examined: 3 ♀♀, 5 ♂♂ (st15).

Bryocamptus (Bryocamptus) minutus (Claus, 1863)

Material Examined: 1 ♀ (dissected), (st15).

Bryocamptus (B.) tarnogradskyi Borutzky, 1934

Material Examined: 1 ♀ (dissected), (st15).

Supplementary description of female *B. (B.) tarnogradskyi*: Total body length from tip of rostrum to posterior margin of caudal rami 684 µm. Ornamentation of the body as figured (Fig. 2A). Cephalosome with smooth margin and with medially constricted dorsal hyaline window. Hyaline frills of thoracic somites plane while those of abdominal somites denticulated. Urosomites with rows of spinules posterolaterally. Antennule 8-segmented (Fig. 2A). Exopod of antenna 2-segmented, distal segment with 3 setae. Anal somite (Fig. 2B) with row of spinules on posteroventral margin; anal operculum with 6 well developed spinules. Length/width ratio of caudal rami 1.25 (Fig. 2B). Caudal rami ornamented with

spinules; two spinules near the base of seta II, a large spinule near the base of seta III and a group of spinules around inner distal margin as figured (Fig. 2B). Each ramus with seven setae; seta I small; seta VII naked, located dorsally and triarticulated at base. P1-P4 with 3-segmented exopod. P1, P2 and P3 (Fig. 2D) with 3-segmented endopod, P4 with 2-segmented endopod (Fig. 2E). P1 endopod longer than exopod; first endopodal segment slightly exceeding exp-2 (Fig. 2C). Setal formula of swimming legs as follows:

Exopod	Endopod	
P1	0.1.121	1.1.120
P2	0.1.132	1.1.121
P3	0.1.223	1.1.221
P4	0.1.223	1.221

P5 (Fig. 2F) outer basal seta long and naked with a spinule at base. Baseoendopod with 5 spinulose setae (innermost seta smallest) and with 2 small setae at outer margin. Exopod about 1.8 times longer than broad; with 1 naked outer seta with a spinule row near base, 1 spinulose seta at outer distal corner and 3 terminal setae (2 naked and 1 spinulose); inner margin with 3 spinules.

Remarks: Although our specimen has an extra seta on the baseoendopod of P5 (arrowed in Fig. 2F) and has 6 spinules on the distal margin of anal operculum, it can best be attributable to *Bryocamptus (B.) tarnogradskyi*. No other detailed comparison can be made with the published descriptions of *B. (B.) tarnogradskyi* [29,33,34] because of the inadequacy in the descriptions. The genus *Bryocamptus* Chappuis, 1929 requires urgent worldwide revision.

DISCUSSION

Examination of the previous literature on the zooplankton of Turkish inland waters revealed that only İkizcetepeler Dam Lake [20] and Manyas Lake [21-24] were previously investigated in Balıkesir province by various authors. The Manyas Lake was studied by Noodt [23], Kiefer [22], Demirhindi [6], Ustaoglu and Balik [9]. Noodt [23] recorded *Nitokra hibernica*; Kiefer [22] reported *Eucyclops serrulatus* and *Mesocyclops leuckarti aequatoralis* (now synonym of *Mesocyclops aequatoralis*); Demirhindi [21] reported *Cyclops agilis* = *C. serrulatus* (now synonyms of *E. serrulatus*), *C. vernalis* (now synonym of *Acanthocyclops robustus*), *C. leuckarti aequatoralis* (now synonym of *Mesocyclops aequatoralis*), *C. vicinus* and *Calanipeda aquaedulis*; Ustaoglu and Balik [9] determined *C. vicinus*, *A. robustus* and *N. hibernica*. Alper et al. [5] studied the Cladocera and Copepoda fauna of İkizcetepeler Dam Lake and they reported 4 copepod species; *C. vicinus*, *A. robustus*, *Tropocyclops prasinus* and *E. serrulatus*. So, 7 species have been reported from Balıkesir so far according to the previous literature. On the other hand, 12 copepod species were identified in our study, and 7 of which (*Megacyclops viridis*, *Macrocyclus albidus*, *Mesocyclops leuckarti*, *Paracyclops chiltoni*, *B. (B.) minutus*, *B. (R.) pygmaeus* and *B. (B.) tarnogradskyi*) are new records for Balıkesir province.

The recent addition of some new copepod records to the Turkish inland waters have proved that there are still many

copepod species waiting to be reported especially from mountain lakes, rivers and from cryptic habitats. The following records of copepods have recently been added to Copepoda fauna of Turkey. Ustaoglu et al. [13] studied the zooplankton of 16 mountain lakes in the Taurus Range and found *Arctodiaptomus (Rh.) alpinus*. Bozkurt [18] reported the harpacticoid copepods, *Phyllognathopus viguieri* (Maupas, 1892) and *Leptocaris brevicornis* (Van Douwe, 1904) from the lakes Gölbaşı and Gökler respectively. Güher and Kirgiz [19] found two species of darcythompsoniid harpacticoids, *Horsiella brevicornis* (Van Douwe, 1904) and *Horsiella trisetosa* Kunz, 1935. Güher and Kirgiz [19] claimed that these two species were new records for the Turkish fauna. But, Kunz [35] considered *Leptocaris* T. Scott and *Horsiella* Gurney as synonymous due to the discovery of several species constituting transitions between the two genera and hence retained only the genus *Leptocaris*. Therefore these two species should be cited as *Leptocaris brevicornis* (Van Douwe, 1904) and *Leptocaris trisetosus* (Kunz, 1935).

The specious genus *Bryocamptus* contains 118 species and subspecies worldwide and they were collected from almost all kinds of freshwater bodies [2]. Four species of *Bryocamptus* have previously been reported from Turkish inland waters: *B. (R.) zschokkei* (Schmeil, 1893) [36], *B. (R.) pygmaeus* [4, 36], *B. (R.) thylops* (Mrazek, 1893) [36] and *B. (B.) minutus* [4,5,36]. Among the three *Bryocamptus* species identified in this study, *B. (B.) tarnogradskyi* has not previously been reported from Turkey and thus it is a new record for the Turkish fauna. *B. (B.) tarnogradskyi* was originally described from Teberda, Caucasus [34] and was subsequently reported from Europe [37].

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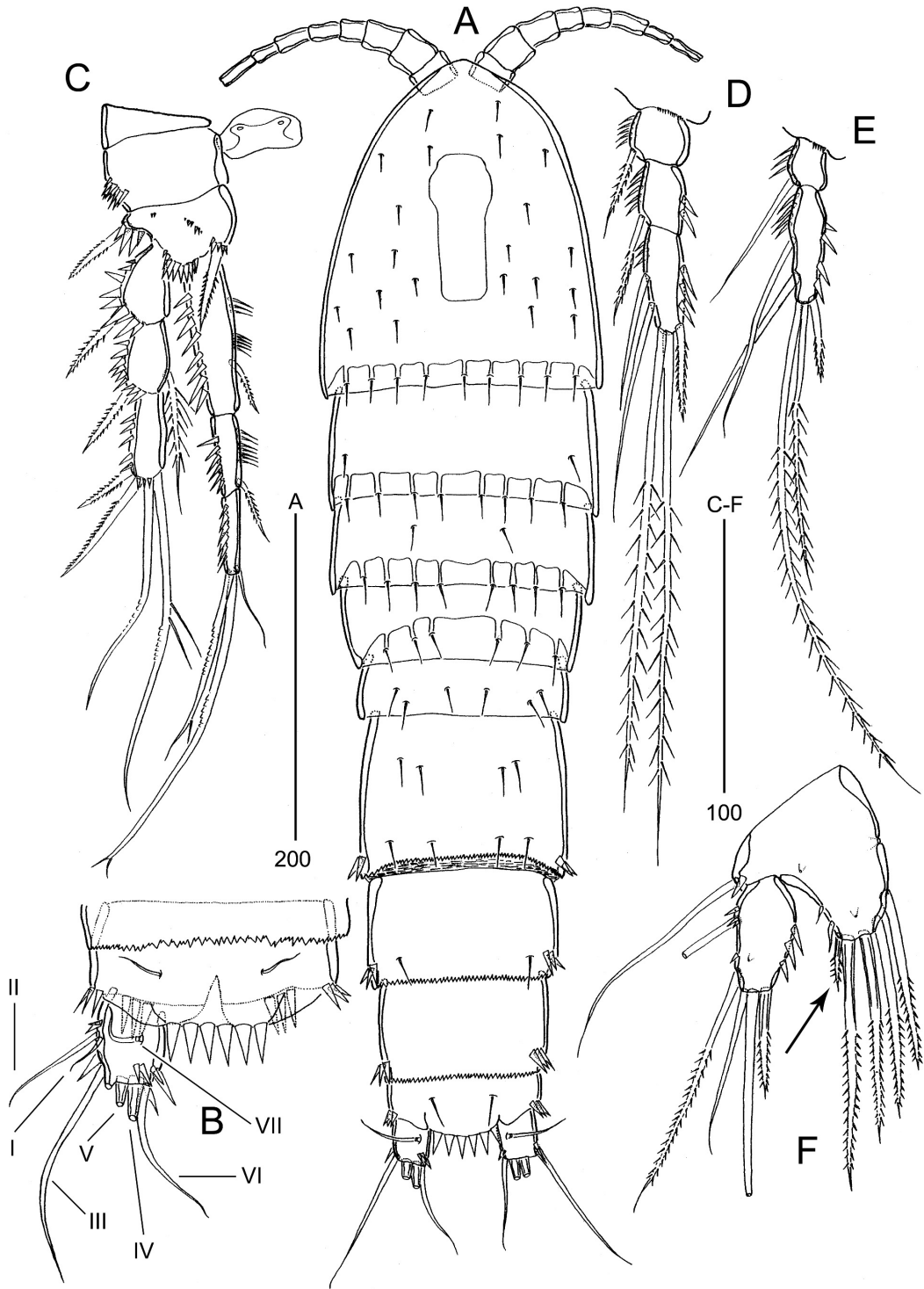


Figure 2. *Bryocampus (B.) tarnogradskyi* ♀ A. Habitus, dorsal; B. Anal operculum and caudal ramus, dorsal; C. P1, anterior; D. P3 endopod, anterior; E. P4 endopod, anterior; F. P5, anterior.