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Research Article

The Ephemeroptera (Insecta) Fauna of Lake Ulubat Basin

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Abstract: In this study, 1812 Ephemeroptera nymphs were collected in order to determine the Ephemeroptera fauna of Lake Ulubat Basin between April 1996 and September 1999. The distribution of 38 species belonging to 22 genera and 10 families is presented.

Among these, the genus *Brachycercus* Curtis, 1834 and the species *Brachycercus harrisella* Curtis, 1834 are recorded in Turkey for the first time.

In addition, previous records on the distribution of all 38 species in Turkey are given.

Key Words: Ephemeroptera, nymph, fauna, distribution, Lake Ulubat, Turkey.

Ulubat Gölü Havzası'nın Ephemeroptera (Insecta) Faunası

Özet: Bu çalışmada Ulubat Gölü Havzası'nın Ephemeroptera faunasını tespit etmek için Nisan 1996 ile Eylül 1999 tarihleri arasında 1812 adet nimf toplanmış ve 10 familyaya ait 22 cinsden 38 türün dağılımı sunulmuştur.

Bunlardan *Brachycercus* Curtis, 1834 cinsi ile *B. harrisella* Curtis, 1834 türü Türkiye Ephemeroptera faunası için yeni kayıttır.

Çalışmada ayrıca belirlenen 38 türün Türkiye'den bilinen yayılışları verilmiştir.

Anahtar Sözcükler: Ephemeroptera, nimf, fauna, yayılış, Ulubat Gölü, Türkiye.

Introduction

Approximately 2,200 species of the order Ephemeroptera have been classified to date (1). These species show a hemimetabolous (prometabolous) development and spend a large portion of their life-span as nymphs in fresh water. In large part due to their being herbivores or feeders on detritus, they play a large role in the food chain there, especially in secondary production. It has been reported that nymphs in unpolluted natural waters constitute 10-25% of macrozoobenthos (2). Because they constitute such an important link in the food chain in aquatic environments, their species types and population sizes give accurate indications of the biological productivity of the water (3,4).

Ephemeroptera nymphs, due the fact that they are very sensitive to water pollution, are used as bioindicator organism groups in various methods, such as T.B.I. (Trent Biotic Index), C.B.S. (Chandler Biotic Score) and B.M.W.P. (Biological Monitoring Working Party Score), for research on both short- and long-term pollution (5-10).

The Ephemeroptera, being one of the oldest insect orders and under some constraints regarding their distribution, such as having an extremely short life-span at the (adult) imago phase, being weak flyers, and spending the nymph phase in water, is one of the more important groups to be made a subject of zoogeographical study (11,12).

It is known that approximately 220 species exist in the whole of Europe including England, Ireland, Iceland and in Asia from east of the Ural Mountains to the Caspian Sea, in the Mediterranean islands and in North Africa (13).

The studies on the Ephemeroptera fauna in Turkey are not sufficient at present. Even though Demoulin

(14,15), Geldiay (16), Puthz (17), Jacob (18), Soldan and Landa (19), Koch (20-22), Berker (23), Braasch (24,25), Kazancı (26-36), Kazancı and Braasch (37,38), Kazancı and Thomas (39), Sova et al. (40), Tanatmış (41-43) and Belfiore et al. (44) have studied the subject in Turkey, the number of species known is about 107 (36,43,45). For this reason the Ephemeroptera fauna of Lake Ulubat Basin, which has been located in an important transitional area between Europe and Anatolia since the glacial age, was studied in order to contribute to the knowledge of the Ephemeroptera fauna of Turkey.

Materials and Methods

In this study, 1812 Ephemeroptera nymphs were collected at 41 locations in different areas of Lake Ulubat Basin between April 1996 and September 1999 (Figure).

Lake Ulubat is an eutrophic lake situated to the south of the Marmara Sea. It covers an area of 160 km^2 and has a total drainage area of 10,555 km^2. The lake is largely fed by the Mustafakemalpaşa (Kirmasti) stream, formed by the conflux of two streams, Emet and Orhaneli, in the vicinity of the village of Camandar. The waters flowing out of the lake outlet join the Susurluk (Simav) stream, to the north of Karacabey, and empty into the Marmara Sea (46). Lake Ulubat is also one of the most important wetlands in Turkey (47).

To identify the samples, Eaton (48), Grandi (49), Müller-Liebenau (50), Malzacher (51,52), Keffermüller and Sova (53), Zurwerra et al. (54), Elliot et al. (6), Harker (4), Sauter (11), Bauernfeind (55-57) and Haybach (58) were used.

Collecting Localities

The altitudes and the localities in Lake Ulubat Basin where the Ephemeroptera nymphs were collected are as follows :

1- Bursa (Ulubat Village), Ulubat Stream; 10 m. 2- Bursa (Eskikaraağaç Village), Lake Ulubat; 10m. 3- Bursa (Gölyazı Village), Lake Ulubat; 10 m. 4- Bursa (Mustafakemalpaşa), Mustafakemalpaşa Stream; 100 m. 5- Bursa (Hacıali Village), Mustafakemalpaşa Stream; 105 m. 6- Bursa (Kestelek), Orhaneli Stream; 120 m. 7- Balıkesir (Dursunbey-Tepeköy Village), Balat Stream; 390 m. 8- Balıkesir (Dursunbey-Beyel Village), Dursunbey Stream; 400 m. 9- Balıkesir (Dursunbey-Hopanlar Village), Emet Stream; 360 m. 10- Kütahya (Simav-Darıcı Village) Kocaçay Stream; 790 m. 11- Kütahya (Simav-Darıcı Village), Esse Stream; 800 m. 12- Kütahya (Simav-Hamzabey Village), Kocaçay Stream; 850 m. 13- Bursa (Harmancık), Kınık Stream; 740 m. 14- Bursa (Harmancık-Ballısaray Village), Kınık Stream; 760 m. 15- Kütahya (Tavşanlı- Değirmisaz Village), Emet Stream; 680 m. 16- Kütahya (Tavşanlı-Değirmisaz Village), Değirmisaz Stream; 690 m. 17- Kütahya (Tavşanlı-Emet Road), Obanözü Village; 760 m. 18- Kütahya (Tavşanlı-Emet Road), Kovalı Village; 1010 m. 19- Kütahya (Tavşanlı-Emet Road), Köprücek Village; 1020 m. 20- Kütahya (Emet-Sarıayak Village), Gencerler Stream; 1040 m. 21- Kütahya (Emet), Emet Stream; 700 m. 22- Bursa (Orhaneli-M.Kemalpaşa Road), Orhaneli Stream; 450 m. 23- Bursa (Keles-Issızören Village), Orhaneli Stream; 610 m. 24- Kütahya (Domaniç-Soğucak Village), Orhaneli Stream; 650 m. 25- Kütahya (Domaniç), Yeşilköy Village; 825 m. 26- Kütahya (Domaniç), Durabey Village; 1205 m. 27- Kütahya (Domaniç), Sefaköy Village; 1230 m. 28- Kütahya (Domaniç-Ilıcaksu Village), Sarıkız Stream; 810 m. 29- Kütahya (Domaniç-Karaköy Village), Sarıkız Stream; 740 m. 30- Kütahya (Domaniç-Kırıkköy Village); Kırıkdere Stream; 680 m. 31- Kütahya (Domaniç-Muhacirler Village), Orhaneli Stream; 690 m. 32- Kütahya (Tunçbilek); Kocasu Stream; 780 m. 33- Kütahya (Tavşanlı-Harmancık Road), Sorgun Village; 840m. 34- Kütahya (Tavşanlı), Kocasu Stream; 800 m. 35- Kütahya (Tavşanlı), Kayıköy Village; 815 m. 36- Kütahya (Tavşanlı-Kayıköy Village); Kocasu Stream; 810 m. 37- Kütahya (Tavşanlı-Yeşilyurt Village), Kocasu Stream; 810 m. 38- Kütahya (Tavşanlı-Akçaşehir Village), Kocasu Stream; 835 m. 39- Kütahya (Emet-Esatlar Village), Kocasu Stream; 950 m. 40-Kütahya (Çavdarhisar), Bedir Stream; 1060 m. 41- Kütahya (Çavdarhisar-Front of Çavdarhisar dam), Bedir Stream; 1060 m.

The number of the localities that samples were collected from are given in parentheses right after the number of examined individuals.

Results

This study gives the distribution of 38 species from 22 genera belonging to 10 families found in Lake Ulubat Basin and the up to date distribution of the these species in Turkey.

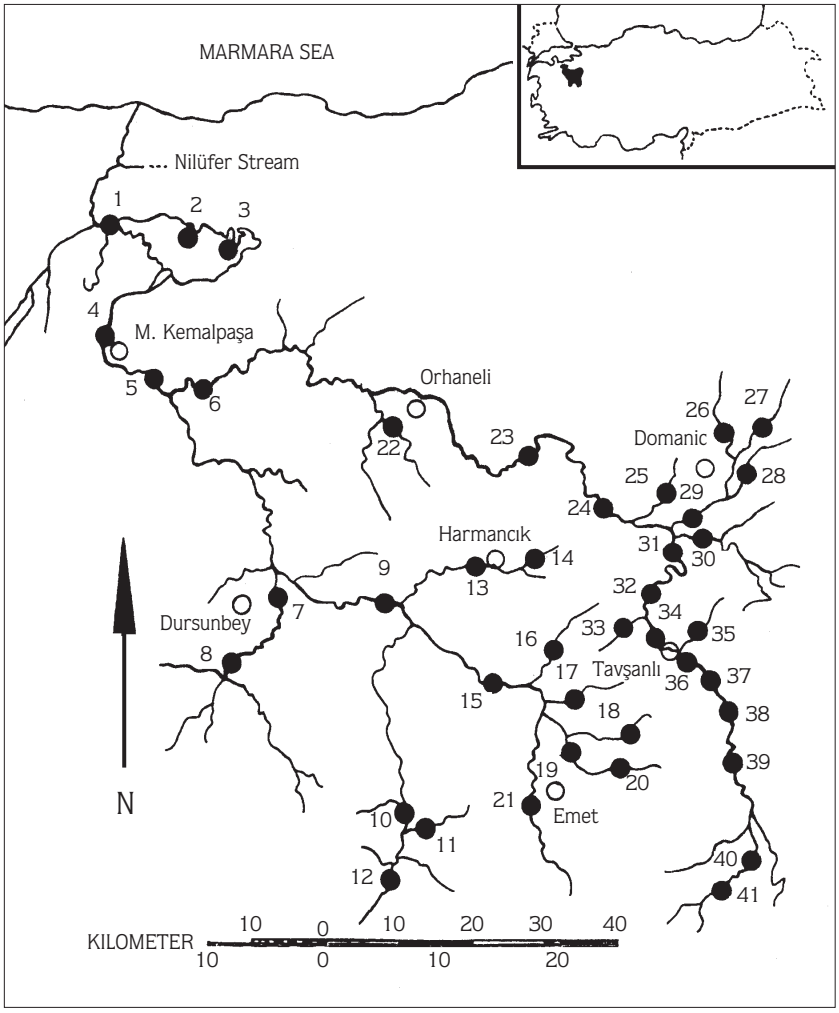

Figure. The distribution of the localities in Lake Ulubat Basin.

Baetidae

1. *Baetis buceratus* Eaton, 1870

Material examined: 30.6.1997, 7 nymphs (7); 28.8.1997, 11 nymphs (8); 3.7.1996, 2 nymphs; 30.6.1997, 10 nymphs; 15.8.1998, 18 nymphs (9); 18.8.1996, 11 nymphs (13); 19.7.1997, 15 nymphs (15); 4.7.1996, 24 nymphs (21); 1.7.1996, 27 nymphs (31); 18.8.1996, 1 nymph (37).

Previous Records from Turkey: Ağrı, Ankara, Antalya, Bayburt, Bingöl, Bolu, Elazığ, Erzurum, Isparta, Kırşehir, Konya, Muş, Sıvas, Van (26); Antakya, Şanlıurfa (22); and Balıkesir (43).

2. *Baetis fuscatus* (Linnaeus, 1761)

Material examined: 19.7.1997, 12 nymphs (15); 4.7.1996, 1 nymph (21), 26.7.1996, 2 nymphs (22), 25.7.1996, 14 nymphs (14); 18.8.1996, 2 nymphs (37).

Previous Records from Turkey: Ankara, Bingöl (26); Balıkesir (43); Erzincan, Gümüşhane (12); Erzurum, Kars (12,26); Muş (26); Tekirdağ (42).

3. *Baetis gracilis* Bogoescu & Tabacaru, 1957

Material examined: 19.5.1997, 1 nymph (4); 30.6.1997, 2 nymphs; 29.7.1998, 2 nymphs; 15.8.1998, 1 nymph (9).

Previous Records from Turkey: Balıkesir (43).

4. *Baetis lutheri* Müller-Liebenau,1967

Material examined: 25.7.1996, 9 nymphs (23).

Previous Records from Turkey: Antakya (22); Balıkesir (43); Muş (21); Sivas (26).

5. *Baetis meridionalis* Ikonomov,1954

Material examined: 1.7.1997, 18 nymphs (4); 30.6.1997, 5 nymphs (7); 15.8.1998, 20 nymphs (9); 19.7.1997, 16 nymphs (38).

Previous Records from Turkey: Ankara, Muş, Sivas (26); Balıkesir, Bursa, Kütahya (43).

6. *Baetis muticus* (Linnaeus, 1758)

Material examined: 17.5.1997, 1 nymph (10); 25.7.1996, 18 nymphs (24); 2.7.1996, 5 nymphs (25); 2.7.1996, 5 nymphs; 5.7.1999, 8 nymphs; 11.7.1999, 6 nymphs (27); 2.7.1996, 4 nymphs (30); 4.7.1996, 2 nymphs (39).

Previous Records from Turkey: Balıkesir (43); Bingöl, Van (26); Arvin, Erzincan, Erzurum, Kars (12); Adapazarı, Ankara, Bilecik, Bolu, Bursa, Eskişehir (41), Kütahya (41,43); İstanbul, Kırklareli, Tekirdağ (42).

7. *Baetis pavidus* Grandi, 1949

Material examined: 26.7.1996, 8 nymphs (5); 17.5.1997, 6 nymphs (11); 3.7.1996, 6 nymphs (13); 4.7.1996, 10 nymphs (17); 25.7.1996, 5 nymphs (24); 1.7.1996, 19 nymphs; 25.7.1996, 6 nymphs (29); 27.6.1996, 2 nymphs (41).

Previous Records from Turkey: Balıkesir (43); Elazığ, Tunceli (23); Bilecik, Bolu Bursa, Eskişehir (41).

8. *Baetis pentaphlebodes* Ujhelyi, 1966

Material examined: 2.7.1996, 9 nymphs (28); 14.4.1996, 5 nymphs (32); 3.7.1996, 2 nymphs (33); 14.4.1996, 22 nymphs (34); 19.7.1997, 5 nymphs (36); 18.8.1996, 7 nymphs (37).

Previous Records from Turkey: Erzurum, Kars (26); Kütahya (43).

9. *Baetis rhodani* (Pictet, 1843)

Material examined: 17.5.1997, 28 nymphs (10); 17.5.1997, 11 nymphs (11); 3.7.1996, 4 nymphs (14); 4.7.1996, 8 nymphs (18); 4.7.1996, 13 nymphs (19); 4.7.1996, 8 nymphs (20); 2.7.1996, 12 nymphs (25); 25.7.1996, 11 nymphs (26); 30.8.1997, 6 nymphs (27); 2.7.1996, 9 nymphs (28); 1.7.1996, 9 nymphs (29); 18.8.1996, 2 nymphs (37); 4.7.1996, 3 nymphs (39); 27.6.1996, 24 nymphs (41).

Previous Records from Turkey: İçel, Kahramanmaraş (17); Elazığ, Tunceli (23); Ankara (26,41); Balıkesir (26,43); Hatay (22); Bayburt, Bingöl, Erzurum, Hakkari, Kars, Van (26); Adapazarı, Bilecik, Bolu, Bursa, Eskişehir (41); Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (42); Kütahya (41,43).

10. *Baetis tricolor* Tshernova, 1928

Material examined: 25.7.1996, 2 nymphs (23).

Previous Records from Turkey: Diyarbakır (21); Artvin, Erzurum (12); Sivas (12,36); Antalya (22); Balıkesir (43).

11. *Baetis vernus* Curtis, 1834

Material examined: 19.5.1997, 13 nymphs; 1.7.1997, 24 nymphs (4); 26.7.1996, 17 nymphs (5); 26.7.1996, 5 nymphs (6); 3.7.1996, 8 nymphs (13); 19.7.1997, 12 nymphs (16); 4.7.11996, 21 nymphs (17); 4.7.1996, 20 nymphs (19); 4.7.1996, 15 nymphs (20); 25.7.1996, 5 nymphs (26); 22.7.1996, 9 nymphs (27); 1.7.1996, 8 nymphs (29); 19.7 1996, 7 nymphs (35); 27.6.1996, 2 nymphs (40); 27.6.1996, 18 nymphs (41).

Previous Records from Turkey: Elazığ (23); Ankara (26,41); Erzincan (12,26); Erzurum (12); Sivas (21); Bolu, Eskişehir (41); Kütahya (41,43); Edirne, İstanbul, Kırklareli, Tekirdağ (42); Balıkesir, Bursa (43).

12. *Cloeon dipterum* (Linnaeus, 1761)

Material examined: 27.8.1997, 4 nymphs (1); 12.9.1999, 4 nymphs (2); 12.9.1999, 26 nymphs (3); 30.6.1997, 22 nymphs (5); 28.8.1997, 13 nymphs (8); 17.5.1997, 2 nymphs (12); 19.7.1997, 9 nymphs (16); 4.7.1996, 3 nymphs (18); 2.7.1996, 24 nymphs (30); 1.7.1996, 19 nymphs (31); 14.4.1996, 17 nymphs (32); 18.7.1997, 2 nymphs (36); 18.8.1996, 1 nymph (37).

Previous Records from Turkey: Ankara (21,26); Afyon, Erzurum, Kars, Nevşehir (26); Antakya, Şanlıurfa (22); Adapazarı, Eskişehir, Kütahya (41); Edirne, İstanbul, Kırklareli, Tekirdağ (42); Balıkesir (43).

13. *Cloeon simile* Eaton, 1870

Material examined: 27.6.1996, 12 nymphs (41).

Previous Records from Turkey: Ankara, Erzincan, Kırşehir (26); Bursa (41); Balıkesir (43).

14. *Procoleon bifidum* (Bengtsson, 1912)

Material examined: 18.8.1996, 3 nymphs (37);

Previous Records from Turkey: Eskişehir (26); Kırklareli, Tekirdağ (42); Balıkesir (43).

15. *Pseudocentroptilum pennulatum* Bogoescu, 1947

Material examined: 11.7.1997, 6 nymphs (4); 26.7.1996, 3 nymphs (5); 26.7.1996, 6 nymphs (6); 30.6.1997, 18 nymphs (7); 3.7.1996, 8 nymphs; 30.6.1997, 14 nymphs; 15.8.1998, 12 nymphs (9); 18.8.1996, 3 nymphs (37).

Previous Records from Turkey: Ağrı, Ankara (26); Erzurum (12,26); Adıyaman, Antakya, Şanlıurfa (22); Çanakkale, Kırklareli (42); Balıkesir, Kütahya (43).

16. *Centroptilum luteolum* (Müller, 1776)

Material examined: 19.7.1997, 4 nymphs (15);

Previous Records from Turkey: Ankara (26,43); Sivas (21); Eskişehir (41); Çanakkale (42); Kütahya (43).

Caenidae

17. *Caenis macrura* Stephens, 1835

Material examined: 26.7.1996, 14 nymphs (5); 26.7.1996, 5 nymphs (6); 3.7.1996, 3 nymphs; 30.6.1997, 6 nymphs; 15.8.1998, 8 nymphs (9); 15.7.1997, 13 nymphs (10); 18.8.1996, 2 nymphs (13); 19.7.1997, 13 nymphs (16); 4.7.1996, 6 nymphs (17); 26.; 25.7.1996, 25 nymphs (24); 2.7.1996, 21 nymphs (30); 19.7.1997, 7 nymphs (35); 19.7.1997, 4 nymphs (36); 18.8.1996, 4 nymphs (37); 26.7.1996, 3 nymphs (40); 26.7.1996, 24 nymphs (41).

Previous Records from Turkey: Diyarbakır (21); Erzincan, Erzurum (12); Adıyaman, Hatay, Urfa (22).

18. *Caenis luctuosa* (Burmaister, 1839)

Material examined. 28.8.1997, 17 nymphs (8); 26.7.1996, 4 nymphs (22).

Previous Records from Turkey: Ankara, Bolu, Bursa, Eskişehir (41); Kütahya (41,43); Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (42); Muğla (36); Balıkesir, Bursa (43).

19. *Caenis robusta* Eaton, 1884

Material examined: 27.8.1997, 3 nymphs (1); 12.9.1999, 2 nymphs (3).

Previous Records from Turkey: Antalya, İzmir (17).

20. *Brachycercus harrisella* Curtis, 1834

Material examined: 3.7.1996, 6 nymphs; 30.6.1997, 5 nymphs, 15.8.1998, 4 nymphs (9).

This is the first record of this species in Turkey.

Ephemerellidae

21. *Ephemerella ignita* (Poda, 1761)

Material examined: 1.7.1997, 4 nymphs (4); 30.6.1997, 12 nymphs, (7); 3.7.1996, 7 nymphs; 30.6.1997, 10 nymphs; 15.8.1998, 2 nymphs (9); 17.5.1997, 7 nymphs (10); 17.5.1997, 6 nymphs (11); 3.7.1996, 7 nymphs (13); 19.7.1996, 2 nymphs (16); 4.7.1996, 2 nymphs (19); 4.7.1996, 17 nymphs (20); 4.7.1996, 5 nymphs (21); 2.7.1996, 7 nymphs (25), 5.7.1999, 5 nymphs; 11.7.1999, 4 nymphs; 2.7.1996, 1 nymph (27); 2.7.1996, 8 nymphs (28); 1.7.1996, 22 nymphs; 25.7.1996, 2 nymphs (29); 19.7.1997, 8 nymphs (36); 18.8.1996, 8 nymphs (37); 19.7.1997, 3 nymphs (38); 4.7.1996, 9 nymphs (39); 27.6.1996, 32 nymphs (41).

Previous Records from Turkey: Antalya, İzmir (17); Bolu (24,26,43); Ankara, Bingöl (26); Erzincan, Erzurum (12,26); Kars, Muş, Sivas, Tunceli, Van (26); Adıyaman, Şanlıurfa (22); Bilecik, Bursa, Eskişehir (41); Kütahya (41,43); Çanakkale, İstanbul, Kırklareli, Tekirdağ (42); Balıkesir (43).

Ephemeridae

22. *Ephemera danica* Müller, 1764

Material examined: 5.7.1999, 4 nymphs (26); 2.7.1996, 3 nymphs; 5.7.1999, 5 nymphs (27).

Previous Records from Turkey: Bolu (26); Bursa, Eskişehir (41); Kütahya (41,43); İstanbul, Kırklareli (42).

23. *Ephemera vulgata* Linneaus, 1758

Material examined: 15.8.1998, 4 nymphs (9); 19.7.1997, 4 nymphs (36).

Previous Records from Turkey: Muş (24); Bolu, Eskişehir, (26,41); Erzurum, Kars (12); Bursa, Kütahya (41); Balıkesir (43).

Heptageniidae

24. *Heptagenia coerulans* Rostock, 1878

Material examined: 26.7.1996, 1 nymph (6); 3.7.1996, 2 nymphs (9); 25.7.1996, 3 nymphs (23).

Previous Records from Turkey: Ankara (28); Erzincan, Erzurum (12); Şanlıurfa (22); Balıkesir (43).

25. *Heptagenia longicauda* (Stephens,1836)

Material examined: 26.7.1996, 9 nymphs (6); 29.7.1998, 7 nymphs; 15.8.1998, 12 nymphs (9);

25.7.1996, 5 nymphs (23); 1.7.1996, 18 nymphs (29); 19.7.1997, 3 nymphs (36); 19.7.1997, 1 nymph (38).

Previous Recort from Turkey: Eskişehir (28); Balıkesir (43).

26. *Ecdyonurus dispar* (Curtis, 1834)

Material examined: 25.7.1996, 18 nymphs; 5.7.1999, 2 nymphs (26); 2.7.1996, 15 nymphs; 30.8.1997, 13 nymphs; 5.7.1999, 5 nymphs; 11.7.1999, 4 nymphs (27).

Previous Records from Turkey: Ankara (16).

27. *Ecdyonurus insignis* (Eaton, 1870)

Material examined: 25.7.1996, 1 nymph (24); 2.7.1996, 5 nymphs (30).

Previous Records from Turkey: İstanbul, Kırklareli, Tekirdağ (42); Balıkesir, Kütahya (43).

28. *Epeorus alpicola* (Eaton, 1871)

Material examined: 2.7.1996, 17 nymphs (25); 25.7.1996, 1 nymph; 5.7.1999, 5 nymphs (26); 2.7.1996, 19 nymphs; 30.8.1997, 9 nymphs; 5.7.1997, 2 nymphs; 11.7.1999, (27).

Previous Records from Turkey: Bursa, Eskişehir (41); Kütahya (43).

29. *Electrogena antalyensis* (Kazancı & Braasch, 1986)

Material examined: 4.7.1996, 10 nymphs (17); 18.5.1996, 12 nymphs (18).

Previous Records from Turkey: Ankara (33,37); Antalya, Çorum, Yozgat (37); Bolu (33); Eskişehir, Kütahya (44).

Leptophlebiidae

30. *Choroterpes picteti* Eaton, 1871

Material examined: 11.7.1997, 1 nymph (4); 30.6.1997, 19 nymphs (7); 3.7.1996, 1 nymph (9).

Previous Records from Turkey: Ankara, Bingöl (26); Diyarbakır (21); İstanbul (42); Balıkesir, Kütahya (43).

31. *Paraleptophlebia submarginata* (Stephens, 1835)

Material examined: 1.7.1996, 2 nymphs (29).

Previous Records from Turkey: Erzincan (28); Erzurum (12); Eskişehir (41); Kırklareli (42); Balıkesir, Kütahya (43).

32. *Habrophlebia lauta* Eaton, 1884

Material examined: 26.7.1996, 1 nymph (5); 2.7.1996, 2 nymphs; 5.7.1999, 5 nymphs; 11.7.1999, 3 nymphs (27).

Previous records from Turkey: Ankara, Bolu, Giresun, Trabzon (26); Bursa, Eskişehir (41); İstanbul, Kırklareli, Tekirdağ (42); Kütahya (43).

33. *Habroleptoides confusa* Sartori & Jacob, 1986

Material examined: 2.7.1996, 5 nymphs; 30.8.1997, 1 nymph (27).

Previous Records from Turkey: Bolu, Çankırı (26); Tekirdağ (42); Balıkesir (43).

Oligoneuriidae

34. *Isonychia ignota* Walker, 1853

Material examined: 30.6.1997, 13 nymphs (7); 3.7.1996, 1 nymph; 29.7.1998, 4 nymphs; 15.8.1998, 7 nymphs (9).

Previous Records from Turkey: Samsun, Zonguldak (28); Erzincan (12); Eskişehir (41); İstanbul (42); Balıkesir (43).

35. *Oligoneuriella rhenana* (Imhoff, 1852)

Material examined: 26.7.1996, 7 nymphs (6); 30.6.1997, 8 nymphs (7); 3.7.1996, 5 nymphs; 30.6.1997, 4 nymphs; 29.7.1998, 4 nymphs (9); 4.7.1996, 2 nymphs (21); 25.7.1996, 4 nymphs (23); 1.7.1996, 28 nymphs; 25.7.1996, 4 nymphs (29).

Previous Records from Turkey: Kırklareli (28,42); Bilecik, Bolu, Eskişehir (41); Balıkesir, Kütahya (43).

Potamanthidae

36. *Potamanthus luteus* (Linnaeus, 1767)

Material examined: 1.4.1997, 14 nymphs; 19.5.1997, 1 nymph (4); 26.7.1996, 4 nymphs (6); 3.7.1996, 27 nymphs; 30.6.1997, 6 nymphs; 29.7.1998, 3 nymphs (9); 25.7.1999, 2 nymphs (23); 1.7.1996, 14 nymphs; 25.7.1996, 2 nymphs (29); 1.7.1996, 3 nymphs (31); 19.7.1997, 12 nymphs (36); 18.8.1996, 2 nymphs (37); 19.7.1997, 9 nymphs (38); 4.7.1996, 1 nymph (39).

Previous Records from Turkey: Ankara, Bolu (26,43); Çankırı (26); Erzincan, Erzurum (12); Bursa, Eskişehir, Kütahya (41), Balıkesir, Bursa (43).

Polymitarcidae

37. *Epheron virgo* (Olivier,1791)

Material examined: 29.7.1998, 2 nymphs (9).

Previous Records from Turkey: Bingöl (26); Erzurum (12); Balıkesir, Bursa (43).

Siphlonuridae

38. *Siphlonurus aestivalis* (Eaton, 1903)

Material examined:17.5.1997, 3 nymphs (12).

Previous Records from Turkey: Kırklareli, Tekirdağ (42); Balıkesir, Kütahya (43).

Discussion

At the end of this study, aimed at determining the Ephemeroptera fauna in the basin of Lake Ulubat, 38 species of 22 genera belonging to 10 families of Ephemeroptera were determined. Of these, the genus *Brachycercus* Curtis, 1834 and the species *B. harrisella* Curtis, 1834 are the first records for Ephemeroptera fauna in Turkey. Moreover, this is the first record for all those species reported from the Lake Ulubat Basin. *B. harrisella* is known to be distributed in England, France, Spain, Germany and the Scandinavian countries as well as in Northern Italy, the European part of Russia, Central Europe and the Balkans (59,60).

The Ephemeroptera fauna of Turkey consist of 107 species of 30 genera belonging to 12 families (36,43,45). The report in this study of *Brachycercus* genera and *B. harrisella* brings the genera count up to 31 and the species count to 108. If a comparison is made between the Ephemeroptera fauna of this study area and those from other sites, these could be said to be rather rich in terms of species (41-43). This seems to be largely a result of the ecological features and geographical position of the area.

Lake Ulubat Basin is on what has been an important migratory route between Europe and Anatolia since glacial ages. The glacial age brought many fauna, especially fish species of European origin, via the Danube and the Sarmatic Inland Sea (today's Black Sea) as well as the strait and the Marmara Sea, to be distributed in Anatolia (26,61).

A second reason for the basin's diversity in terms of species is its ecological characteristics. Samples were collected from various altitudes within the research area (locality no: 1; 10 m, locality no: 27; 1230 m) and the basin has varying climatic characteristics. Whilst the surroundings of Lake Ulubat are affected by the hot, parched summers and warm, rainy winters of the Mediterranean climate, going further south one finds a steppe-like climate of cold, snowy winters and hot, parched summers. In the research area, the cleanest (xenosaprobic) waters were encountered only in localities 24, 25, 26 and 27. By contrast, the wide distribution of species such as *Ephemerella ignita* (in 19 localities), *Caenis macrura* (in 14 localities), *Baetis vernus* (in 14 localities), *Cloeon dipterum* (in 13 localities), and *Potamanthus luteus* (in 10 localities) is an indication of medium-level pollution (beta-mesosaprobic) in the waters of the Ulubat Basin (6-8). On the other hand, the establishment of *Baetis buceratus, B. pentaphlebodes, B. rhodani, Cloeon dipterum* and *Caenis robusta* as species resistant to water pollution indicates that, as a result of the organic pollutants from domestic waste, localities 1,2,3,14,31,32,33,34 and 40 are highly polluted (alpha-mesosaprobic).

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