

## SOME CLADOCERAN SPECIES FROM TURKISH INLAND WATERS

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**Abstract:** Some cladoceran species in Turkish inland waters were investigated taxonomically. Thirteen taxa of Cladocera were identified from 11 different freshwater bodies. Although some specimens were contracted, some taxonomically important parts of 10 cladoceran species could be drawn.

**Key words:** *Daphnia*, Cladocera, taxonomy, Turkey

## TÜRKİYE İÇ SULARINDAN BAZI KLADOSERA TÜRLERİ

**Özet:** Türkiye iç sularındaki bazı kladoser türleri taksonomik olarak araştırıldı. 11 farklı tatlısu bölgesinden 13 kladoser türü teşhis edildi. Bazı türlerin büzülmesine rağmen, 10 kladoser türünün taksonomik açıdan önemli bölgelerinin çizimleri yapıldı.

**Anahtar kelimeler:** *Daphnia*, Kladosera, taksonomi, Türkiye

## INTRODUCTION

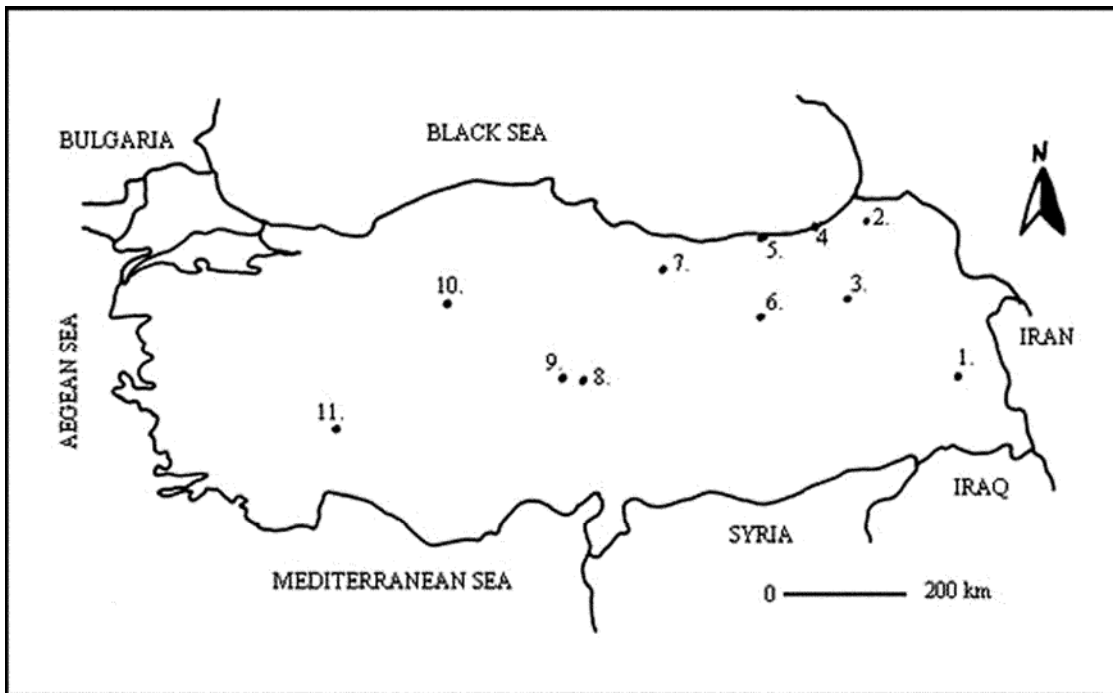
Many studies were carried out on Cladocera species of Turkey. *Ilyocryptus samsuni* GÜNDÜZ, 1990 and *Ilyocryptus anatolicus* GÜNDÜZ, 1996 were found new species to science from Turkey (GÜNDÜZ 1990, 1996). According to GÜNDÜZ (1997), a total of 80 cladoceran species living in Turkey have been recorded. After that, *Camptocercus uncinatus* SMIRNOV, 1971 and *Ceriodaphnia megops* SARS, 1862 were given new records for the Turkish fauna by YALIM (2001) and GÜHER (1999). As a checklist, 92 cladoceran taxa were reported from 1940 to 2004 in Turkish inland waters by USTAOĞLU (2004). Thereafter, *Alona mediterranea* YALIM & ÇIPLAK, 2005 was reported as a new species to science by YALIM & ÇIPLAK (2005). Including this species, a total number of cladoceran taxa increased to 93 in Turkey. After all these studies, 13 Chydorid species were identified with drawings from 13 different water bodies by KAYA & ALTINDAĞ (2006).

There are some studies conducted on Cladocera fauna of Turkey in the literature (USTAOĞLU 1986, GÜNDÜZ 1987, GÜHER & KIRGIZ 1992, GÜHER 2000, YİĞİT & ALTINDAĞ 2005).

## MATERIAL AND METHODS

Cladocera samples were collected from 11 freshwater bodies using 50 and 55  $\mu\text{m}$  mesh sized plankton nets. They were immediately fixed in 4% formalin. Specimens were examined under a stereomicroscope, and identified using a compound microscope. Drawings were made with the aid of camera lucida attached to the compound microscope. Many of these samples were collected by Prof. Dr. Henri J. DUMONT (Gent University, Belgium). The sampling localities (Figure 1) are listed below, with the sampling dates given after each locality.

1. Lake Van (Van): 10.05.1988. 2. Karagöl, Meşeliköy (Artvin): 17.07.1994. 3. Aşkale (Erzurum): 21.08.1990. 4. Lake Büyük Deniz (Rize): 23.07.1994. 5. Uzungöl (Trabzon): 17.07.1994. 6. Refahiye (Erzincan): 21.08.1990. 7. Between Turhal and Zile (Tokat): 27.07.1994. 8. Zamantı River (Kayseri): 28.12.2005. 9. Çayırözü Pond (Kayseri): 25.12.2005. 10. Lake Mogan (Ankara): 08.05.1988. 11. Lake Eğirdir (Isparta): 01.10.2005.



**Figure 1.** The sampling localities. The numbers refer to the localities given in the text.

## RESULTS AND DISCUSSION

The cladoceran samples obtained from 11 different freshwater bodies in Turkey were investigated. Thirteen species of Cladocera were recorded, some of which are recorded for the first time at these localities. The genus *Ceriodaphnia* was found the most dominant group (with 4 species), followed by the genera *Daphnia* (with 3 species), *Macrothrix* (with 2 species), *Moina* (with 2 species), *Bosmina* (with 1 species) and *Simocephalus* (with 1 species).

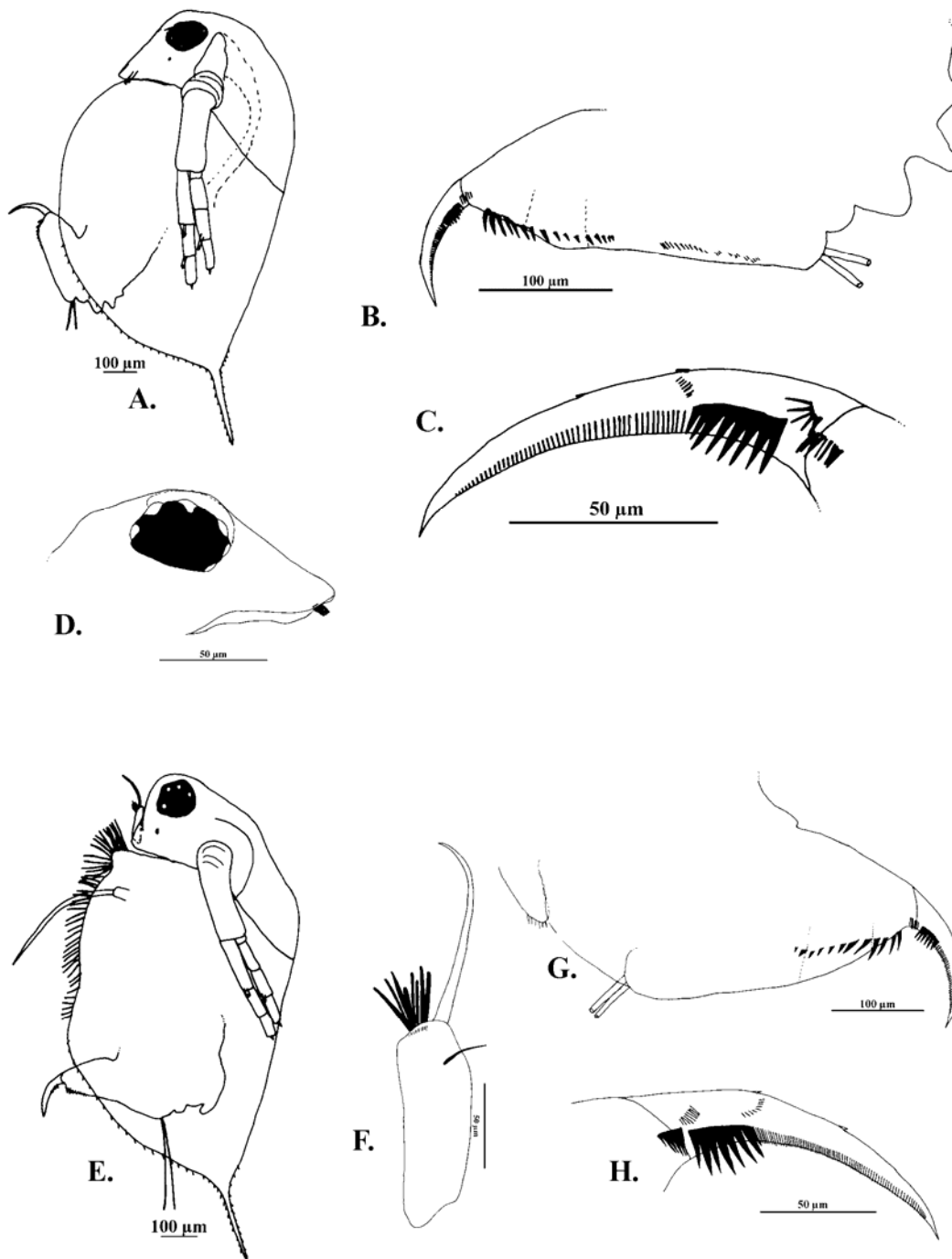
### Species List

- Bosmina longirostris* (MÜLLER, 1776): 2 (Figure 11).  
*Ceriodaphnia dubia* RICHARD, 1894: 7.  
*Ceriodaphnia laticaudata* MÜLLER, 1867: 2.  
*Ceriodaphnia quadrangula* MÜLLER, 1785: 15 ((Figure 6 C,D).  
*Ceriodaphnia reticulata* (FISCHER, 1851): 3 (Figure 6 A,B).  
*Daphnia cf. curvirostris* EYLMANN, 1887: 11 (Figure 2).  
*Daphnia longispina* (MÜLLER, 1776): 7, 15 (Figure 3-4).  
*Daphnia similis* CLAUS, 1876: 1 (Figure 5).  
*Macrothrix hirsuticornis* NORMAN & BRADY, 1867: 4 (Figure 10).  
*Macrothrix laticornis* (FISCHER, 1851): 17 (Figure 9).  
*Moina brachiata* (FISCHER, 1851): 10 (Figure 7).  
*Moina macrocopa* (STRAUS, 1820): 9 (Figure 8).  
*Simocephalus vetulus* (MÜLLER, 1776): 7, 11, 12.

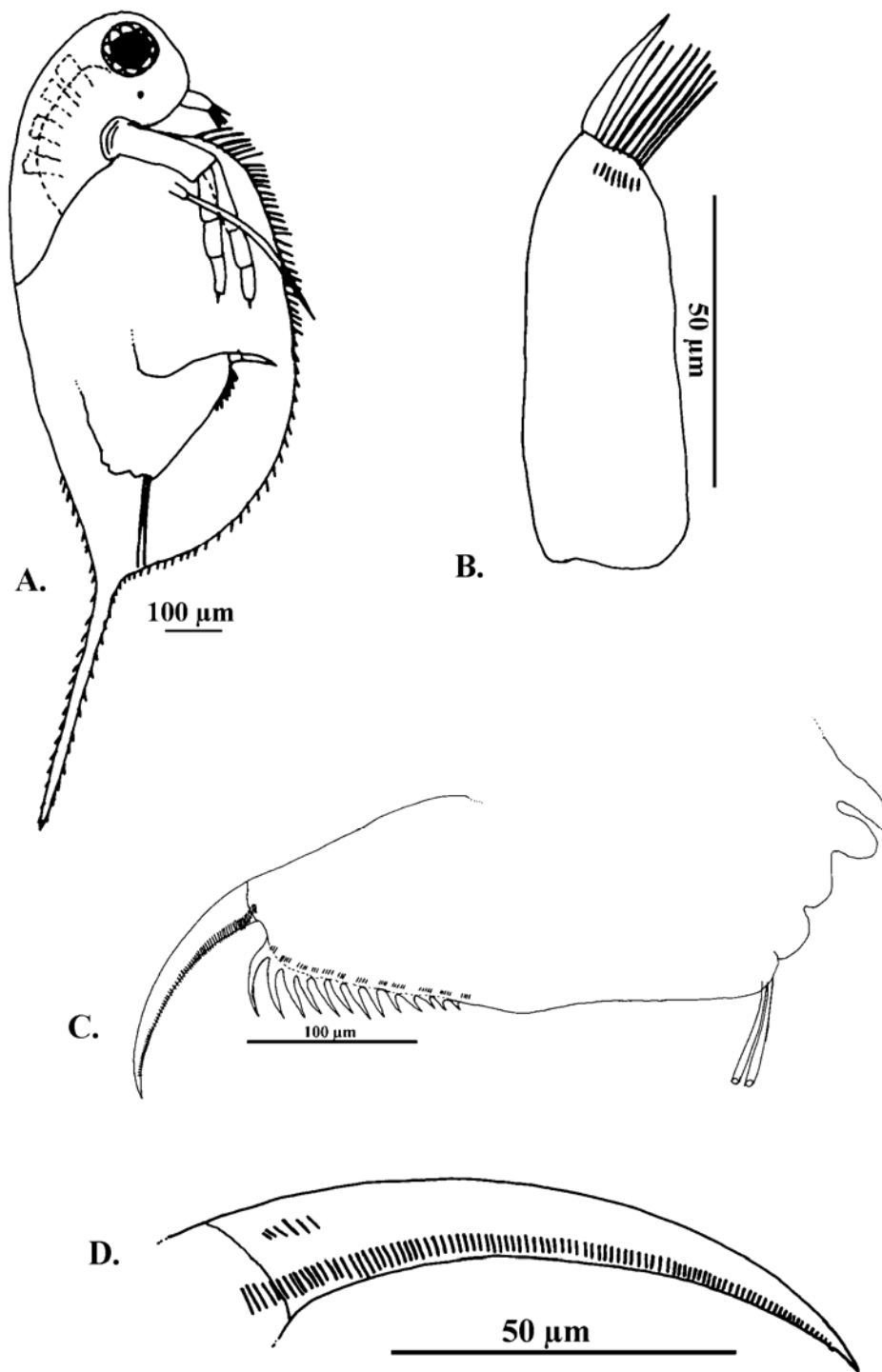
*Bosmina longirostris* (MÜLLER, 1776): It is the most common cladocer species in Turkey.

Distribution in Turkey: Karagöl (Yamanlar-İzmir), Lake Gölcük (Ödemiş-İzmir), Lake Eymir (Ankara), Demirköprü Dam Lake (Manisa), Lake Abant (Bolu), Lake Sapanca (Sakarya), Lake İznik (Bursa), Lake Gala (Edirne), Lake Bafa (Aydın), Güllük (Muğla), Lake Apolyont (Bursa), Lake Manyas (Balıkesir), Lake Salda (Burdur), Çifteler (Eskişehir), Lake Burdur (Burdur), Kazanpınar (Elmalı-Antalya), Seyhan Dam Lake (Adana), Lake Balık (Urfa), Bafra (Samsun), Lake Çavuşçu (Konya), Lake Eber (Afyon), Sultan Marshes (Kayseri), Lake Borabay (Amasya), Sarıyar Dam Lake (Ankara), Melikşah Village (Ankara), Kızılcahamam (Çamkoru-Ankara), Bayındır Dam Lake (Ankara), Pond Beytepe (Ankara), Lake Çivril (Denizli), Lake Karataş (Burdur), Helvadere Dam Lake (Aksaray), Topuz Bendi (Emirgan-İstanbul) (GÜNDÜZ 1995); Lake Seyfe (Kırşehir), Kesikköprü Dam Lake (Ankara), Kunduzlar Dam Lake (Eskişehir), Çatören Dam Lake (Eskişehir), Hirfanlı Dam Lake (Ankara), Sarıyar Dam Lake (Ankara), Lake Akşehir (Konya), Lake Abant (Bolu), Yedigöller (Bolu), Seyhan River (Adana), Seyhan Dam Lake (Adana), Ceyhan River (Adana) (ALTINDAĞ & YİĞİT 2001); Keban Dam Lake (Pertek region) (TELLİOĞLU & YILMAZTÜRK 2005); Göksu Dam Lake (Diyarbakır) (BEKLEYEN 2003); Sarımsaklı Dam Lake (Kayseri) (AYDIN et al. 2006); Gelingüllü Dam Lake (Yozgat) (KAYA & ALTINDAĞ 2007).

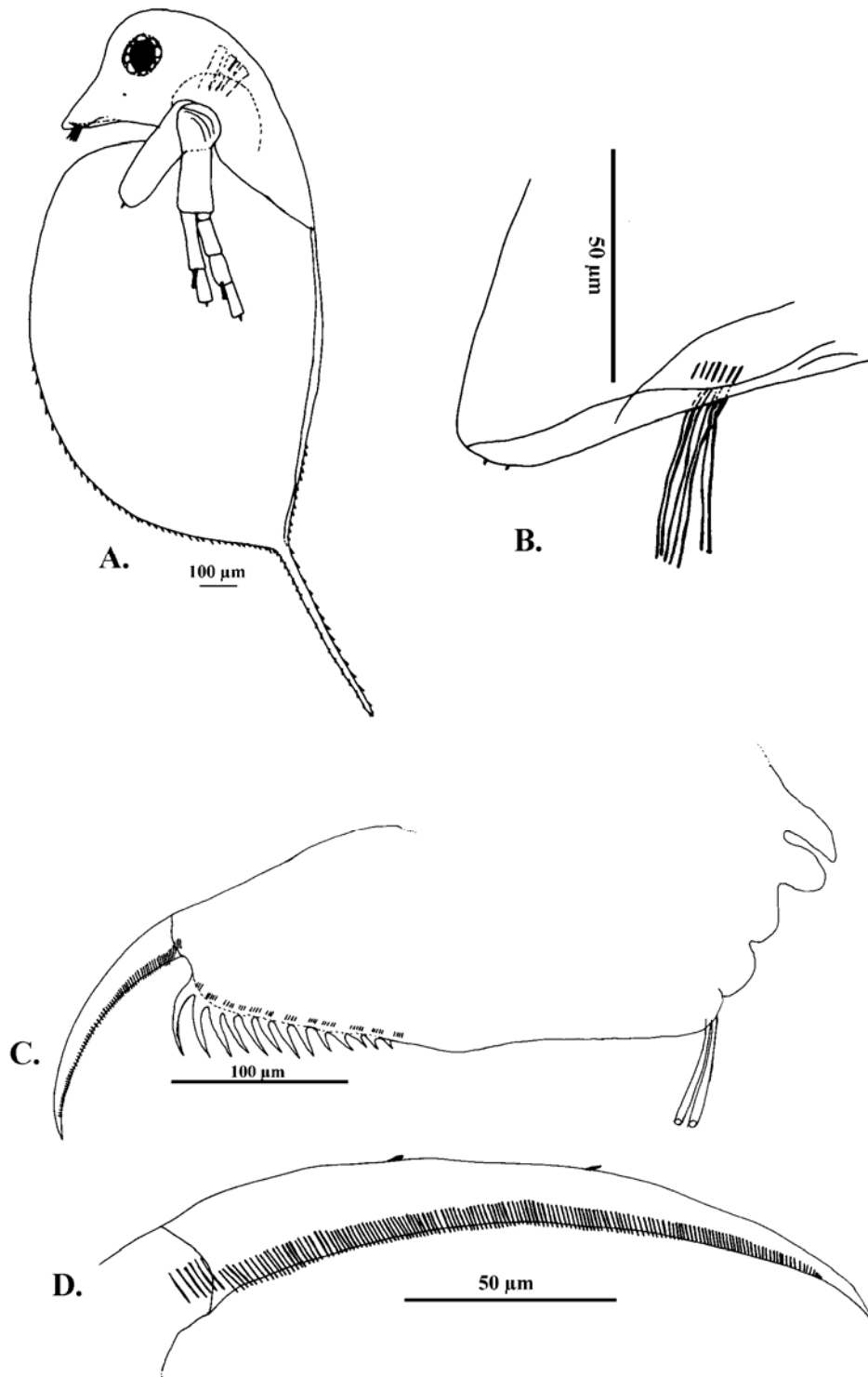
Differential diagnosis: Postabdominal claw with stout proximal pecten and vert fine distal pecten. Sensory bristle midway between eye and tip of rostrum.



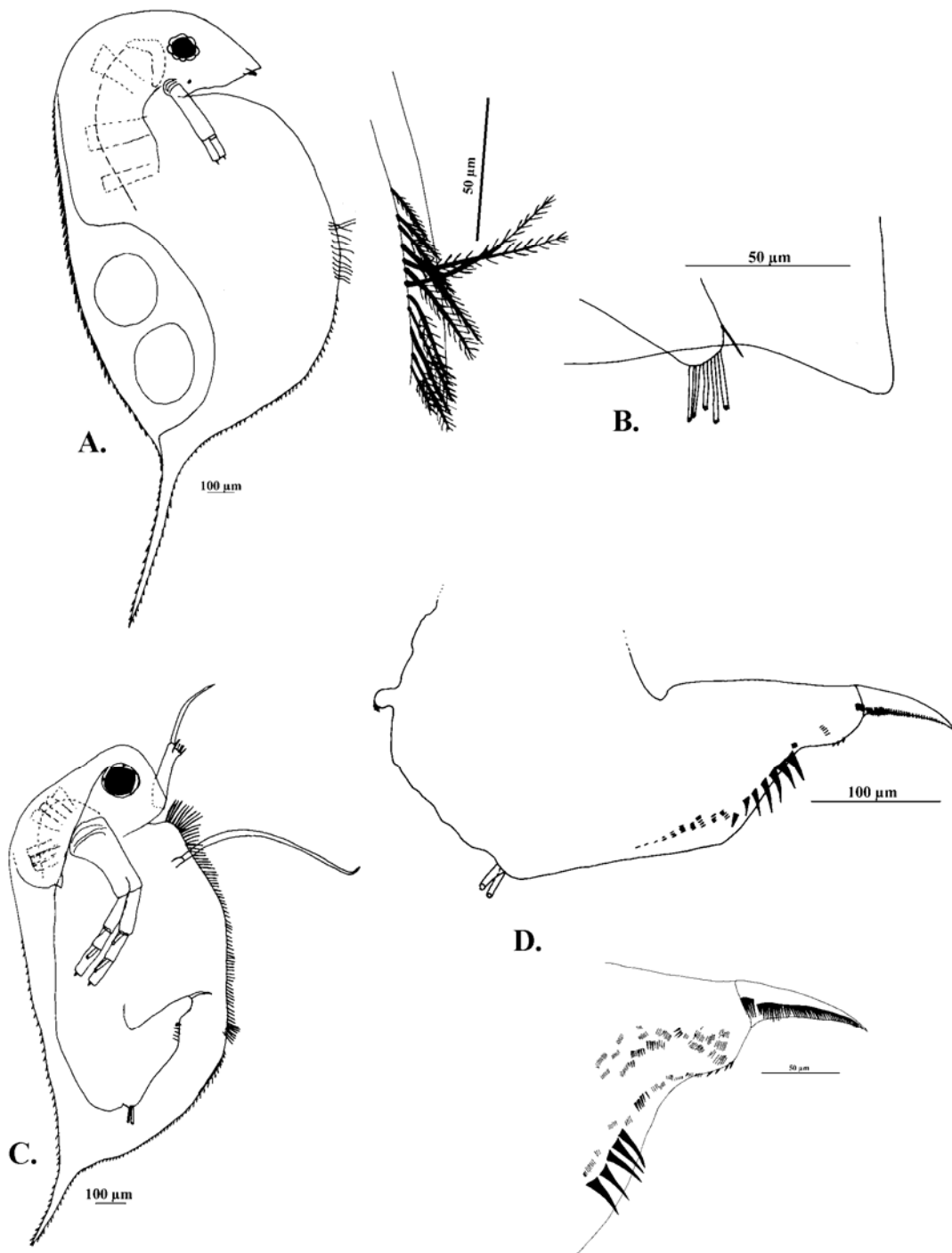
**Figure 2.** *Daphnia cf. curvirostris* (Zamantı River-Kayseri). A. Habitus, B. Postabdomen, C. Postabdominal claw, D. Head. E. Habitus, F. Antennule, G. Postabdomen, H. Postabdominal claw. A,B,C,D. Female, E,F,G,H. Male. Scale bars: A,B,G,E. 100 µm, C,D,F,H. 50 µm



**Figure 3.** *Daphnia longispina* male (Lake Mogan-Ankara). A. Habitus, B. Antennule, C. Postabdomen, D. Postabdominal claw. Scale bars: A,C. 100 µm, B,D. 50 µm



**Figure 4.** *Daphnia longispina* female (Lake Mogan-Ankara). A. Habitus, B. Antennule, C. Postabdomen, D. Postabdominal claw. Scale bars: A,C. 100 μm, B,D. 50 μm



**Figure 5.** *Daphnia similis* (Lake Van-Van). A. Habitus, B. Antennule, C. Habitus, D. Postabdomen and postabdominal claw. A,B. Female, C,D. Male. Scale bars: A,C,D. 100 µm, B. 50 µm

*Ceriodaphnia dubia* RICHARD, 1894: Distribution in Turkey: Demirköprü Dam Lake (Manisa), Pond Kurtbey (Uzunköprü-Edirne), Lake Karamuk (Çay-Afyon), Acıgöl (Konya), Gelendost (Konya), Lake Akşehir (Konya), Lake Karataş (Burdur), Lake Abant (Bolu), Sülüklügöl (Mudurnu-Bolu) (GÜNDÜZ 1997).

Differential diagnosis: *C. dubia* and *C. reticulata* are closely related. The postabdominal claw of *C. dubia* has a central pecten of 8 to 16 teeth.

*Ceriodaphnia laticaudata* MÜLLER, 1867: Distribution in Turkey: Demirköprü Dam Lake (Manisa), Lake Gülbaba (Edirne), Lake Borabay (Amasya), Lake Karamuk (Çay-Afyon), Lake Çıldır (Kars), Lake Seyfe (Kırşehir) (GÜNDÜZ 1997).

Differential diagnosis: Postabdomen very broad at midpoint, obliquely truncated distally; anal denticles short, nearly equal in length.

*Ceriodaphnia quadrangula* MÜLLER, 1785: Distribution in Turkey: Kunduzlar Dam Lake (Eskişehir), Çatören Dam Lake (Eskişehir), Sarıyar Dam Lake (Ankara), Lake Mogan (Ankara), Seyhan River (Adana) (ALTINDAĞ & YİĞİT 2001); Manisa, Aydın, Muğla, Burdur, Trabzon, Afyon, Ankara, Rize, Diyarbakır, Denizli, Kayseri, Edirne, Tekirdağ, Kırklareli (GÜHER 2002); Sarımsaklı Dam Lake (Kayseri) (AYDIN et al. 2006); Gelingüllü Dam Lake (Yozgat) (KAYA & ALTINDAĞ 2007).

Taxonomic note: Total body length of female is 0.4 mm. Differential diagnosis: Postabdomen of *C. quadrangula* is narrow with a straight or slightly concave dorsal margin. Many short spinules form a uniform row along the postabdominal claw.

*Ceriodaphnia reticulata* (FISCHER, 1851): Distribution in Turkey: Lake Eğri (Sultan Marshes-Kayseri), Lake Sarp (Sultan Marshes- Kayseri), Yedigöller (Bolu), Lake Burdur (Burdur), Seyhan River (Adana), Ceyhan River (Adana) (ALTINDAĞ & YİĞİT 2001); Kayseri, Elazığ, İzmir, Manisa, Konya, Nevşehir, Ankara, Kırklareli, Konya, Burdur, Bolu, Afyon, Edirne, Tekirdağ, Kırklareli (GÜHER 2002).

Taxonomic note: Total body length of female is 0.55 mm. Differential diagnosis: The postabdominal claw has a central pecten of 2 to 8 large triangular teeth.

*Daphnia cf. curvirostris* EYLMANN, 1887: Distribution in Turkey: Afyon, Edirne, Ankara, Muğla (GÜHER 2002).

Taxonomic note: Female: Tail spine short, rostrum short, antennule small, postabdomen conical, anal teeth 16 (normally 9-14), reduce in size from base of terminal claw. Postabdominal claw with three external combs spine size of comb 2 > comb 1 > comb 3, comb 2 with 8 spines. Male: Antennule long, flagellum long, anal teeth 12 spines, postabdominal claw has three external combs, comb 2 > comb 1 > comb 3, comb 2 with 8 spines. Some total measurements of female: length 1.27 mm, tail spine 0.23 mm. Some total measurements of male: length 1.1 mm, tail spine 0.23 mm, antennule 0.13 mm, flagellum 0.11 mm.

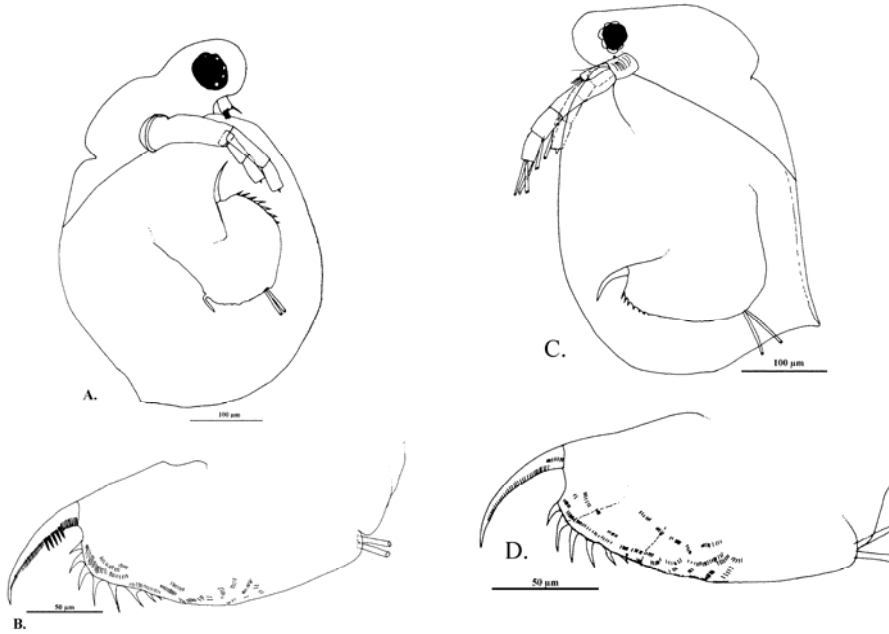


*Daphnia longispina* (MÜLLER, 1776): Distribution in Turkey: Kesikköprü Dam Lake (Ankara), Kunduzlar Dam Lake (Eskişehir), Çatören Dam Lake (Eskişehir), Lake Eğri (Sultan Marshes-Kayseri), Lake Sarp (Sultan Marshes-Kayseri), Ufuktepe (Sultan Marshes-Kayseri), Hirfanlı Dam Lake (Ankara), Lake Mogan (Ankara), Lake Beyşehir (Konya), Lake Akşehir (Konya), Lake Abant (Bolu), Yedigöller (Bolu), Lake Burdur (Burdur), Seyhan River (Adana) (ALTINDAĞ & YİĞİT 2001); Sarımsaklı Dam Lake (Kayseri) (AYDIN et al. 2006); Gelingüllü Dam Lake (Yozgat) (KAYA & ALTINDAĞ 2007).

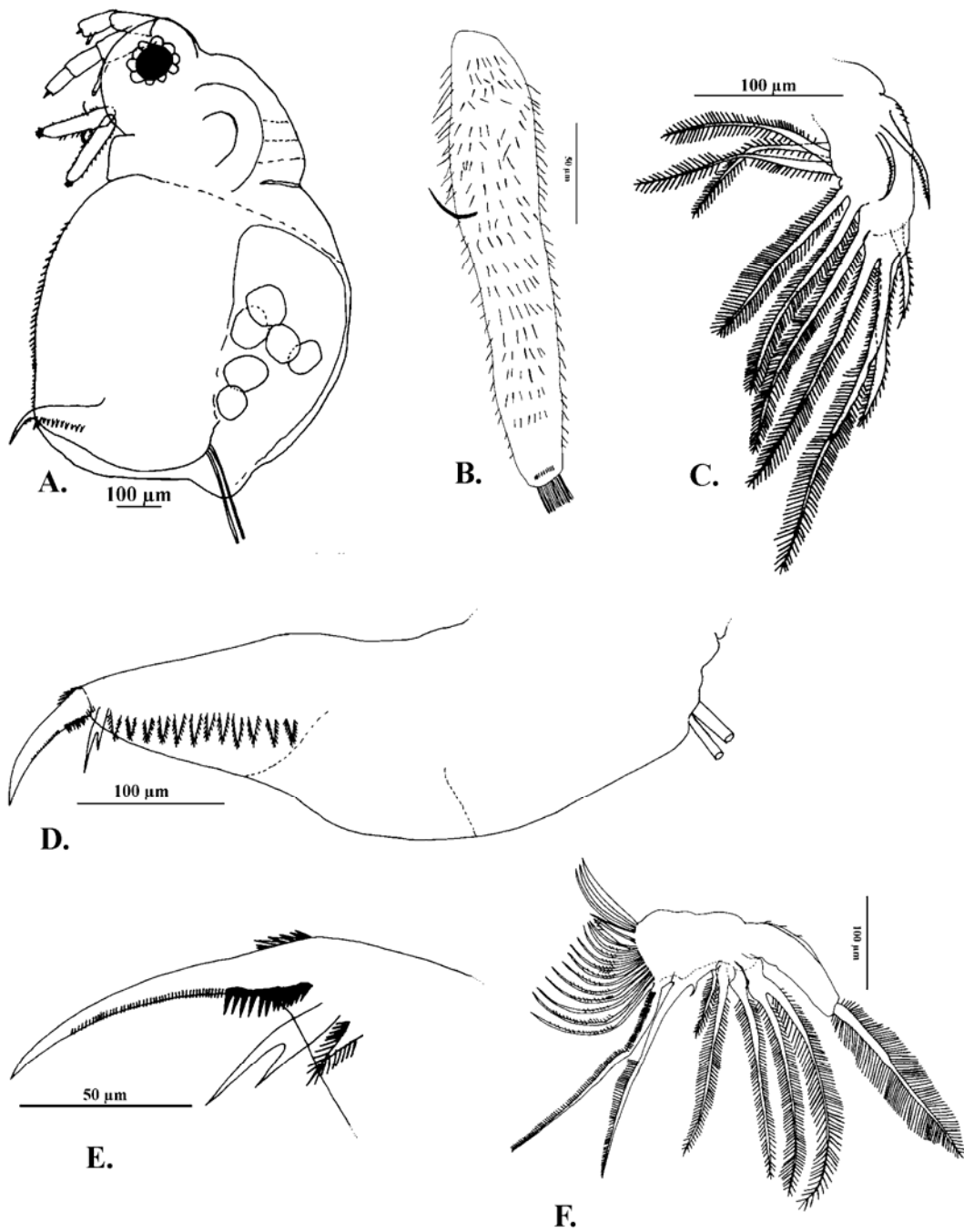
Taxonomic note: Female: Tail spine long, rostrum long. Anal teeth 12-14, reduce in size from base of terminal claw. Postabdominal claw with three external combs spine size of comb 2 = comb 1 = comb 3. Male: Antennule short, flagellum short. Postabdomen has 8 anal teeth, decrease in size from base of terminal claw. Some total measurements of female: length 1.45 mm, tail spine 0.53 mm. Some total measurements of male: length 1 mm, tail spine 0.45 mm, antennule 0.075 mm, flagellum 0.025 mm.

*Daphnia similis* CLAUS, 1876: Distribution in Turkey: Babaeski (Kırklareli), Kafkas Bağları Stream (Edirne), Yağmurca Dam Lake (Uzunköprü-Edirne) (GÜNDÜZ 1997).

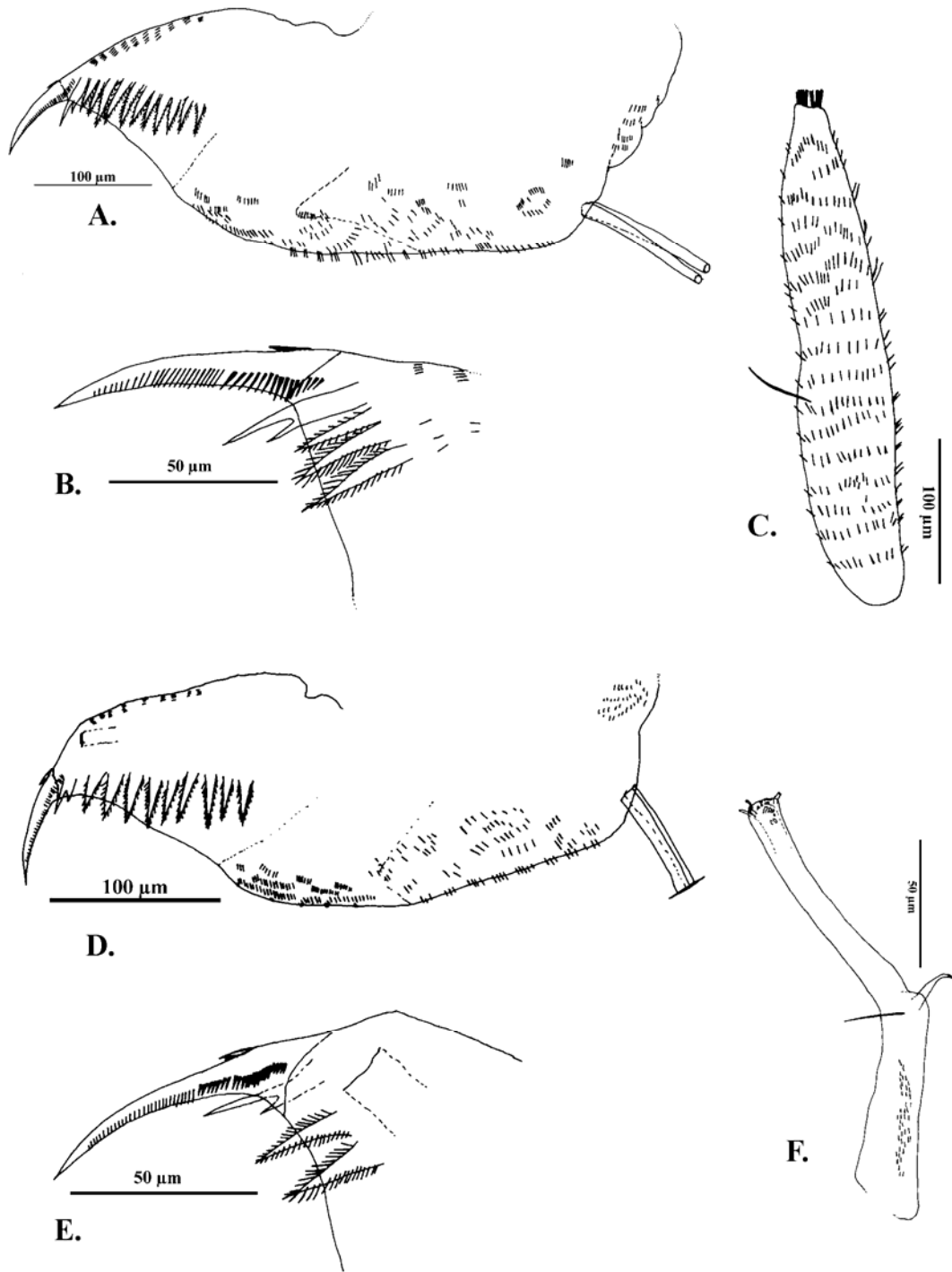
Taxonomic note: Female: Tail spine strong, rostrum short, antennule large, dorsal spine continue to head, carapace transparent and there are small setae at inner ventral margin. Male : Antennule long, flagella long (normally short). Some total measurements of female: length 1.7 mm, tail spine 0.7 mm. Some total measurements of male: length 1.4 mm, tail spine 0.28 mm, antennule 0.21 mm, flagellum 0.24 mm.



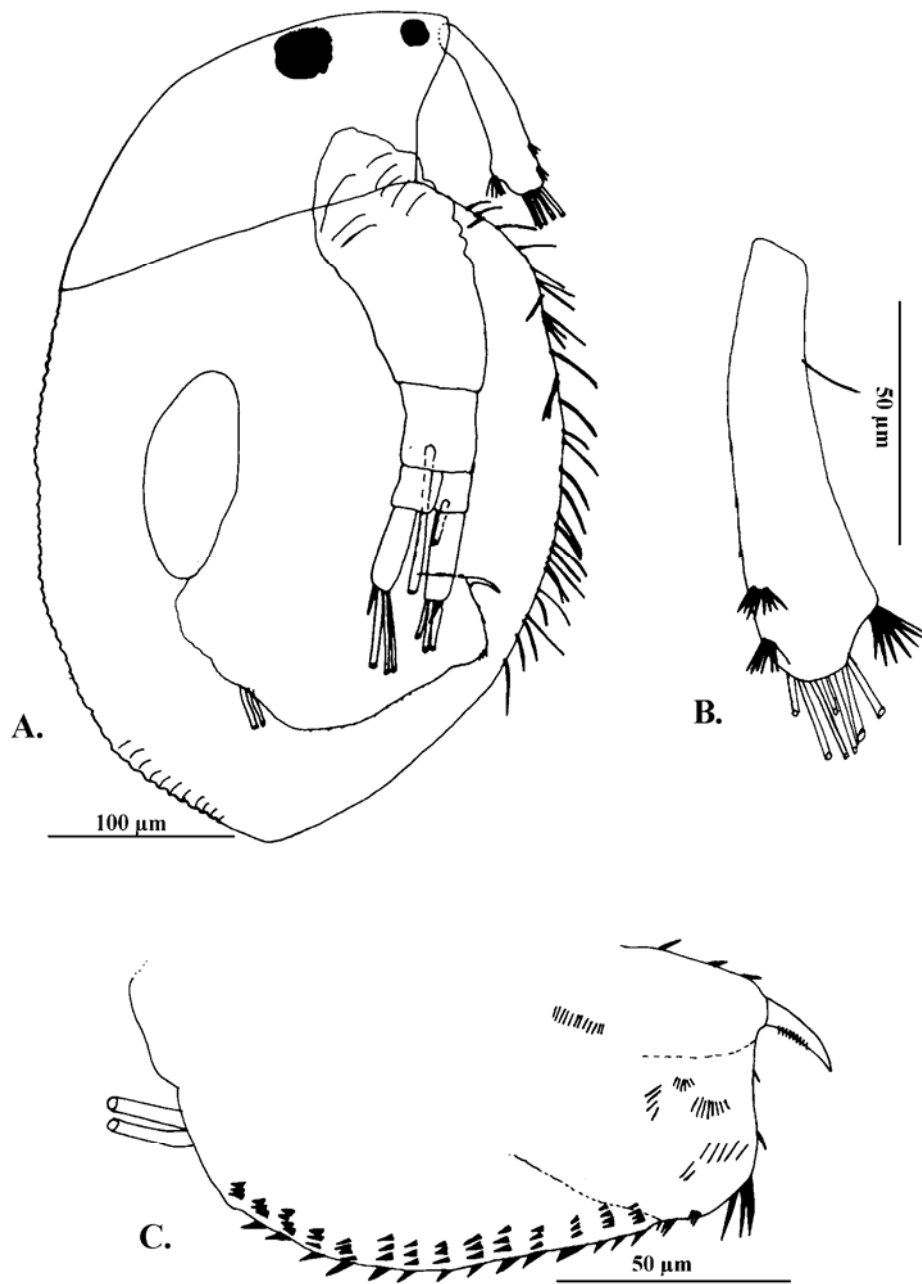
**Figure 6.** A. Habitus of *Ceriodaphnia reticulata* (Aşkale-Erzurum), B. Postabdomen of *Ceriodaphnia reticulata*, C. Habitus of *Ceriodaphnia quadrangula* (Lake Mogan-Ankara), D. Postabdomen of *Ceriodaphnia quadrangula*. Scale bars: A,C. 100 µm, B,D. 50 µm



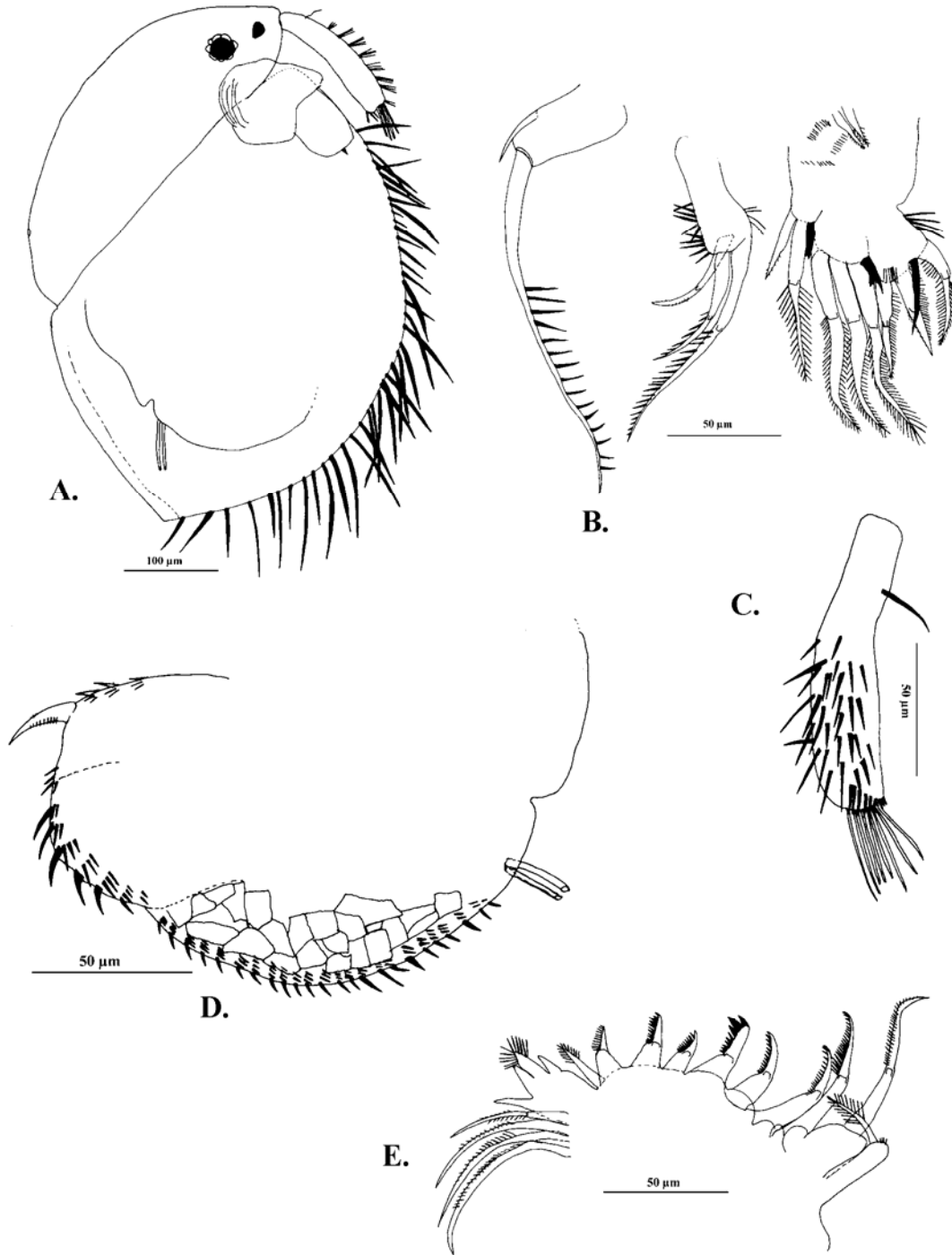
**Figure 7.** *Moina brachiata* female (Zile-Tokat). A. Habitus, B. Antennule, C. Trunk limb 1, D. Postabdomen, E. Postabdominal claw, F. Trunk limb 2. Scale bars: A, C, D, F. 100 μm, B,E. 50 μm



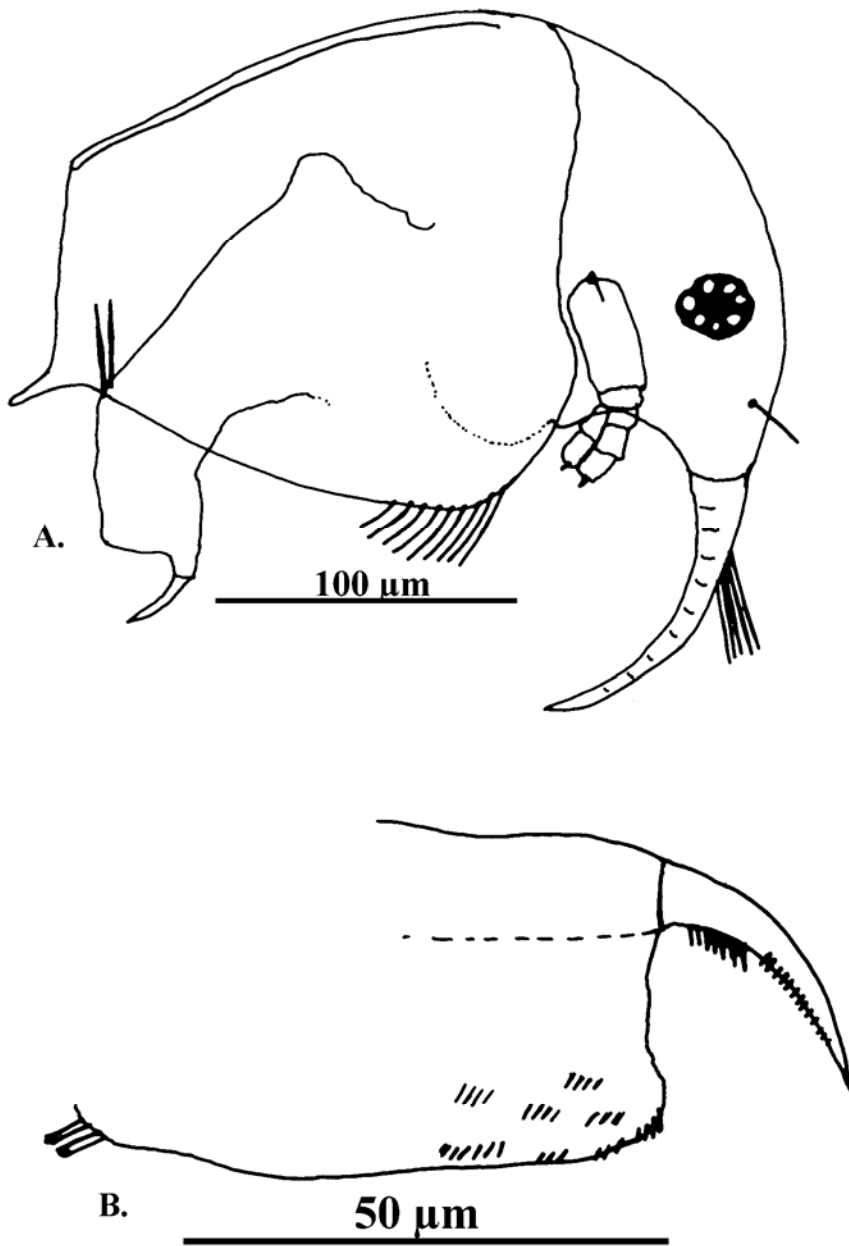
**Figure 8.** *Moina macrocopa* (Refahiye-Tokat). A. Postabdomen, B. Postabdominal claw, C. Antennule, D. Postabdomen, E. Postabdominal claw, F. Antennule. A,B,C. Female, D,E,F. male. Scale bars: A,C,D. 100 µm. B,E,F. 50 µm



**Figure 9.** *Macrothrix laticornis* female (Lake Eğirdir-Isparta). A. Habitus, B. Antennule, C. Postabdomen. Scale bars: A. 100 μm, B,C. 50 μm



**Figure 10.** *Macrothrix hirsuticornis* female (Lake Büyük Deniz-Rize). A. Habitus, B. Trunk limb 1, C. Antennule, D. Postabdomen, E. Trunk limb 2. Scale bars: A. 100 µm, B,C,D,E. 50 µm



**Figure 11.** *Bosmina longirostris* female (Zamantı River-Kayseri). A. Habitus, B. Postabdomen. Scale bars: A. 100 μm, B. 50 μm

*Macrothrix hirsuticornis* NORMAN & BRADY, 1867: Distribution in Turkey: Kayseri, Malatya, Bingöl, Kafkasbağları Stream (Edirne), Pond Budak Doğanca, Lake Beyşehir (Konya), Lake Tuz (Ankara) (GÜNDÜZ 1997).

Taxonomic note: Total body length of female is 0.57 mm. Differential diagnosis: Dorsal outline of shell smooth. Dorso-posterior corner of valves noticeable, but not pointed. Postabdomen with hairs on preanal side, and with groups of spinules on anal margin. Setae natatoriae with a long distal segment (slightly shorter than proximal segment). Antennule clublike, with groups of setae along its distal half. Largest seta of antenna with unilateral short setules. Limb I with long seta of outer distal lobe unilaterally setulated along its distal part, and with 3 setae of different length on inner distal lobe (SMIRNOV 1992).

*Macrothrix laticornis* (FISCHER, 1851): Distribution in Turkey: Lake Seyfe (Kırşehir), Kesikköprü Dam Lake (Ankara), Lake Mogan (Ankara) (ALTINDAĞ & YİĞİT 2001); Bursa, Adıyaman, Konya, Samsun, Ankara, Burdur, Bolu, Edirne, Tekirdağ (Güher, 2002); Sarımsaklı Dam Lake (Kayseri) (AYDIN et al. 2006).

Taxonomic note: Total body length of female is 0.46 mm. Differential diagnosis: Dorsal outline of valves (but not of the head) serrated. Antennule dilating distally. Venral margin of head straight. Setae natatoriae with distal segment slightly shorter than proximal one (SMIRNOV 1992).

*Moina brachiata* (FISCHER, 1851): Distribution in Turkey: Lake Gala (Edirne), Kirobası (Silifke-İçel), Lake Yarıklı (Burdur), Kastamonu, Mecitöz (Çorum), Boğazkale (Çorum), Merzifon (Amasya), Kula (Manisa), Uşak, Çay (Afyon), Sultanhanı (Niğde), Acıgöl (Nevşehir), Pınarbaşı and Pazarviran (Kayseri), Kabaköprü (Elazığ), Karabahçe (Urfa), Lake Manyas (Balıkesir), Lake Apolyont (Balıkesir), Lake Marmara (Manisa), Lake Eymir (Ankara), Lake Mogan (Ankara), Edirne (GÜNDÜZ 1997).

Differential diagnosis: Antenna of female has a lot of setae. Its postabdominal claw is easy for its identification. Postabdominal claw has two combs, comb 1 > comb 2, comb 1 with 12-14 spines.

*Moina macrocopa* (STRAUS, 1820): Distribution in Turkey: Acıgöl (Nevşehir), Yaygın (Muş) (GÜNDÜZ 1997).

Differential diagnosis: Antenna of female has a lot of setae. Postabdominal claw has two combs, comb 1 > comb 2, comb 1 has much more spines than comb 1 of *Moina brachiata*.

*Simocephalus vetulus* (MÜLLER, 1776): It was recorded from two localities in the present study. Distribution in Turkey: Ankara, Uşak, Niğde, Kayseri, Bingöl, Elazığ, Trabzon, Afyon, Samsun, Bolu, Kayseri, Ordu, Kırşehir, Rize, Edirne, Kırklareli, Tekirdağ (GÜHER 2002); Mogan Lake (Ankara) (ALTINDAĞ & YİĞİT 2001).

Taxonomic note: Female; dorso-posterior valve prominence short, with narrow base and large diameter. Its diameter greatly exceeds its length. Dorsal valve margin low, not

protruding backward. Depressions above and below dorso-posterior prominence small and shallow. Ventral headmargin straightly concave, sometimes with small prominence. Deep depression on ventral head margin near rostrum. Ocellus elongate. Differential diagnosis: *S. vetulus* differs from *S. vetulodies* and *S. mixtus* in the very small size of the dorso posterior valve prominence (ORLOVA-BIENKOWSKAJA 2001).

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