Some Turkish Rotifer Species Studied Using Light and Scanning Electron Microscopy

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Abstract: A number of records of rotifers from Turkey are discussed. An account is given on trophi morphology in 4 species of Asplanchna Gosse, 1850. Cephalodella segersi De Smet, 1998 is recorded for the second time after its description, and Lecane shieli Segers and Sanoamuang, 1994 is recorded from Turkey for the first time. Both these and a population of Hexarthra polyodonta polyodonta (Hauer, 1957) from the species’ type locality, Lake Van, are illustrated using light and scanning electron microscopic techniques.

Key Words: Rotifera, trophi morphology, new records, Asplanchna, Cephalodella, Hexarthra, Turkey

Introduction

The rotifer fauna of Turkey is relatively well known (Ustaoğlu, 2004; Kaya et al., 2008), resulting in a total of 261 taxa recorded from the country. Nevertheless, it is clear that this figure is still far from complete: there are only a few studies on the littoral and none on interstitial habitats of the region. As these are known to contain a highly diverse and specialised fauna, we expect that our knowledge of the α-diversity of aquatic ecosystems in the region is, at best, incomplete. The new records presented herein illustrate this.

One genus of pelagic rotifers that has been recorded quite frequently worldwide is Asplanchna Gosse, 1850. According to José de Paggi (2002), the family Asplanchnidae contains 15 species, 7 of which have been recorded from Turkey: Asplanchna brightwellii Gosse, 1850; A. giordi de Guerne, 1888; A. priodonta Gosse, 1850; A. sieboldii (Leydig, 1854); A. silvestrii Daday, 1902; Asplanchnopus dahlgreni Myers, 1934; and A. hyalinus Harring, 1913 (see Ustaoğlu, 2004; Erdoğan and Güher, 2005). Numerous studies dealing with aspects of the taxonomy of the genus Asplanchna are available (e.g., Salt et al., 1978; Gilbert et al., 1979; Koste and Tobias, 1980; Pourriot et al., 1984; Koste and Tobias, 1988; Shiel and Koste, 1993; José de Paggi, 2002); however, the diversity in the trophi morphology of these animals is still insufficiently documented.
Materials and Methods

Samples were collected using a 55-μm-mesh plankton net and preserved in 4% formalin. We used Leica DMLS and Olympus BX51 microscopes for identification and drawing of the species. Trophi were isolated by dissolving the soft body parts in dilute NaOCl, and were prepared for scanning electron microscopy (SEM) following the procedure of De Smet (1998a). SEM was performed using a JEOL JSM-60 60 LV on material processed with a Polaron SC 502 sputter-coater.

Results and Discussion

Here, we report the results of a taxonomic study of some rare Turkish rotifer species (Asplanchna brightwellii, A. girodi, A. priodontia, Asplanchna silvestrii, Cephalodella segersi, Hexarthra polyodonta polyodonta, and Lecane shieli). Two of these, Cephalodella segersi and Lecane shieli, are of particular biogeographic relevance and are new to the Turkish fauna.

Morphology of some Turkish Asplanchna species

Identification of Asplanchna species relies on anatomical features as well as on trophi morphology (see José de Paggi, 2002). Our material presents an extension of the known variability in several species:

Asplanchna silvestrii Daday, 1902 (Figures 1-8) has a horseshoe-shaped vitellarium containing 38-42 nuclei and has trophi bearing large lamellae behind the rami apices (Sarma and Elias-Guttierez, 1997; José de Paggi, 2002). Our specimens have a vitellarium containing 47-53 nuclei, and the trophi lack lamellae behind the rami apices. They are also relatively small (female body length 428-621 μm, trophi 135-178 μm, fulcrum 21-23 μm versus body length 800-1150 μm in José de Paggi (2002). Notwithstanding these differences, we tentatively identify the specimens as Asplanchna silvestrii, considering that Salt et al. (1978) identified similar specimens lacking lamellae behind the rami apices as such.

Sampling locality: the Turkish specimens are from Lake Akşehir (ecology: inland freshwater, Konya, Turkey), and were collected from the pelagic zone in May 1993. Lake Akşehir is a tectonic lake, and has a maximum surface of 35,000 ha. The deepest part of the lake is 7 m deep. Coordinates: 38°26’52.89”N, 31°25’26.66”E; altitude: 966 m (Altınsaçlı et al., 2000). This species, which is not uncommon in the Americas, appears to be rare in the Old World.

Asplanchna brightwellii Gosse, 1850 (Figures 9-15): Vitellarium horseshoe-shaped containing 23-31 nuclei. Our specimens are relatively small: Female body length 260-430 μm, trophi 133-197 μm, fulcrum 15-19 μm versus body length 500-1500 μm, trophi 130-270 μm, in José de Paggi (2002). Asplanchna brightwellii resembles A. sieboldii, and these 2 species have often been confused. However, their trophi are diagnostic: those of A. brightwellii have symmetrical lamellae behind the rami apices, whereas those in A. sieboldii are asymmetrical.
Figures 4-8. Trophi of *Asplanchna silvestrii*, SEM photographs. 4, 5, 7: dorsal view, 6, 8: ventral view.

Sampling locality: The material originates from Sarımsaklı Dam Lake (Kayseri, Turkey), collected on 30 August 2006. The samples were collected from the pelagic part of the lake. Coordinates: 38°53'16.50"N, 35°44'26.30"E; altitude: 1330 m, ecology: inland freshwater.

Asplanchna priodonta Gosse, 1850 (Figures 16-18): The size of the specimens falls within the range given for the species by José de Paggi (2002): Female body length 479-553 μm, trophi 63-74 μm, fulcrum 14-16 μm.

Sampling locality: The samples were collected from the pelagic part of Ağcaşar Dam Lake (Kayseri, Turkey), on 25 December 2005. Coordinates: 38°10'41.71"N, 35°23'39.39"E; altitude: 292 m, ecology: alkali inland water.

Asplanchna girodi de Guerne, 1888 (Figures 19-21): Our specimens are relatively small compared to the recorded range for the species [Female body length 453-522 μm, trophi 78-89 μm, fulcrum 15-17 μm, versus body length 500-700 μm, males 250-397 μm, trophi 93 μm in José de Paggi (2002)].
Sampling locality: The samples are from Sarıkamış (Kars, Turkey), 16 July 1986 (coll. H. J. Dumont). Coordinates: 40°19'52.78"N, 42°34'43.14"E; altitude: 2750 m, ecology: inland freshwater.

As far as can be judged from published records, *Asplanchna sieboldii* appears to be slightly more common in Turkey than *A. brightwellii*: *A. sieboldii* has been recorded from 11 different localities (Geldiay, 1949; Margaritora et al., 1977; Segers et al., 1992; Altındağ and Yiğit, 1999; Bekleyen, 2001; Bozkurt et al., 2002; Erdoğan and Güber, 2005; Bozkurt, 2006; Kaya and Altındağ, 2007), whereas *A. brightwellii* has been recorded from 7 localities, including the present study (Daday, 1903; Mann, 1940; Geldiay, 1949; Margaritora and Cottarelli, 1970; Dumont and De Ridder, 1987). This assessment is preliminary, however, as they have been confused in the past. We hope that the present illustration of their trophi, and of those of the other species, will prevent further confusion.

**Other new or rare Turkish rotifers**

*Cephalodella segersi* De Smet, 1998 (Figures 22-25): This species’ habitus, and toe and trophi shape indicate a close relationship with *Cephalodella catellina* (Müller, 1786) (De Smet, 1998b). They are easily distinguished, however, by their characteristic trophi: in *C. segersi* the right manubrium has an incompletely closed terminal loop.

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**Figure 18.** SEM trophus of *A. priodonta*. Ventral view.

with a forked ventral arm; its left manubrium ends in an open loop with a simple ventral arm (Figures 24, 25). In *C. catellina* both manubria end in an incompletely closed loop with a simple ventral arm. *C. segeri* is furthermore characterised by having a more prominent alula on its left ramus, and the less developed basal chamber of the right ramus (see De Smet, 1998b for more details).

The Turkish specimens are slightly larger than those recorded from Belgium by De Smet (1998b). Our measurements indicate a total length of 77-109 μm, toe length 15-17 μm, total trophi length of 30 μm (fulcrum 19 μm, left uncus 20 μm, right uncus 17 μm), whereas De Smet (1998b) records a total length of 68-98 μm, toe length 15-18 μm, and trophi 22-23 μm.

Even though confusion with any other of its 154 congeners (Segers, 2007) is hardly possible considering the highly characteristic trophi of *C. segeri* (Nogrady et al., 1995; see De Smet, 1998b), it is likely that the

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Figure 21. SEM trophus of *A. girodi*. Ventral view (la: lamellae).

species has been overlooked in the past. *Cephalodella segersi* was described from man-made Lake Blankaart, near the outlet of “Steenbeek” rivulet, Woumen, West Vlaanderen, Belgium.

Sampling locality: the Turkish specimens are from Lake Yeniçağ (Bolu, Turkey) and were collected on 13 July 2005. They represent the second record of the species. Coordinates: 40°42’7.05”N, 31°31’43.08”E; altitude: 900 m, inland freshwater.

*Hexarthra polyodonta polyodonta* (Hauer, 1957) (Figures 26-32): the number of the uncus teeth is 11-13. Total measurements: body length 364 μm, length of trophi 29 μm, width of trophi 47 μm, fulcrum 7 μm, ramus 21 μm. This species is known in Turkey from 2 localities only (Dumont and De Ridder, 1987). We hope that our SEM examination of the trophi of the population from the type locality of the taxon may help to clarify the status of the 2 subspecies of *H. polyodonta*, viz. *H. polyodonta soaplakeiensis* Koste, 1977 and *H. polyodonta jasperina* Dumont, Coussement and Anderson, 1978, and contribute to a better understanding of the taxon’s distribution.

Sampling locality: the specimens examined are from the species’ type locality, Lake Van (Van, Turkey; Hauer, A. ALTINDAĞ, H. SEGERS, M. KAYA

and Yiğit, 2005), the species is unmistakable by its relatively soft yet elongate and nearly parallel-sided lorica, and long toes with curved claws. It is similar to L. isanensis Sanoamuang and Savatenalinton, 2001, but the latter species lacks antero-lateral head aperture spines. The present specimens, although appearing different morphologically because they are relatively weakly contracted, clearly belong to this species and represent the first record of the taxon outside Thailand and Australia. The size of the Turkish specimens (dorsal plate length 98-103, width 61, ventral plate length 110-118, toe length 43.5-47, claw length 6.7-8.6 μm) concurs with the range given for the species by Segers and Sanoamuang (1994).

Sampling locality: The Turkish specimens were collected from Beyşehir Lake on 21 November 2000 (Konya, Turkey). Coordinates: 37°41'48.51"N, 31°37'34.10"E; altitude: 1125 m, ecology: alkali lake.

Conclusion

As a result of this study, we add 2 species to the list of Turkish rotifers, and the presence of Asplanchna silvestrii, a species that is particularly rare in the Old World and rather common in the Americas, is confirmed. The total diversity of rotifers in Turkey herewith stands at 263 species.

The SEM study of trophi in Asplanchna will hopefully clear up the uncertainty regarding species identifications in the genus.

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