

A taxonomic study on the families Lecanidae and Lepadellidae (Rotifera: Monogononta) of Turkey and three new records for Turkish inland waters

Ahmet BOZKURT*

Faculty of Marine Sciences and Technology, İskenderun Technical University, İskenderun, Hatay, Turkey

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Abstract: In this study, 39 rotifer species from the families Lecanidae and Lepadellidae were identified after examination of samples collected from 47 different localities in Turkey. *Lecane acanthinula*, *L. thalera*, and *L. unguitata* are new records for the Turkish rotifer fauna.

Key words: Lecanidae, Lepadellidae, inland waters, new records

Rotifera includes three groups: freshwater Monogononta, Bdelloidea and marine epizoid Seisonacea, and Monogononta. The most well-known and diverse is Monogononta, which contains 1450 species distributed across 29 families and 106 genera in the world (Segers, 2002). The family Lecanidae consists of one genus, *Lecane* Nitzsch, 1827, with five genera: *Colurella* Bory de St. Vincent, 1824; *Lepadella* Bory de St. Vincent, 1826; *Xenolepadella* Hauer, 1926; *Paracolurella* Myers, 1936; and *Squatinella* Bory de St. Vincent, 1826 (Segers, 2002). *Colurella* is a large genus that tolerates a wide range of salinity, so the number of species recorded worldwide is noteworthy. The genus *Lepadella* has been traditionally split into three subgenera distinguished by the morphology of the toes: *Lepadella* (equal toes; completely separate); *Heterolepadella* (unequal toes); and *Xenolepadella* (joined toes, either totally or partially) (Manuel Barrabin, 2000).

Many studies were conducted to reveal Turkish rotifers (Altındağ and Sözen, 1996; Akbulut, 2001; Bekleyen, 2003; Ustaoglu et al., 2004; Kaya and Altındağ, 2009; Bozkurt and Tepe, 2011), but many new records have been added to Turkish rotifer fauna recently. To determine the real number of rotifers in Turkey, many more studies are required.

The samples of rotifers were collected from 47 different freshwater localities by using a plankton net with 60 µm mesh size. The samples were fixed with 4% buffered formaldehyde. The rotifer species examination, counting, and drawings were done using an Olympus CH40 microscope. Rotifer photographs and measurements were made with a Zeiss microscope and camera. To identify the

species the works of Ruttner-Kolisko (1974), Koste (1978), Stemberger (1979), and Segers (1995) were reviewed. All sampling points in freshwater except Titreyen Lake (Side, Antalya) are slightly brackish water. The sampling localities and sampling dates are given in Table 1.

Thirty-nine rotifer species were studied taxonomically from 48 localities in Turkey. Twenty-eight species from Lecanidae and 11 species from Lepadellidae were identified (Table 2). Three of the four genera of Lepadellidae are represented: *Colurella* Bory de St. Vincent, 1824 with three species; *Lepadella* Bory de St. Vincent, 1826 with seven species; and *Squatinella* Bory de St. Vincent, 1826 with one species. Twenty-eight species of Lecanidae were found in the present study. *Lecane acanthinula* (Hauer 1938), *L. thalera* (Harring & Myers, 1926), and *L. unguitata* (Fadeev, 1925) were new records for Turkish inland waters.

According to the Table 2, the most widespread species from Lepadellidae, *L. patella*, was found in 15 localities, followed by *C. adriatica* and *L. ovalis* (13 localities), and *C. uncinata* and *L. acuminata* (9 localities). The present study indicated that *L. closterocerca* (22 localities), *L. lunaris* (17 localities), and *L. luna* (14 localities) were obtained from Lecanidae. *Sq. mutica* from the family Lepadellidae and *L. acanthinula*, *L. aculeata*, *L. arcuata*, *L. hornemanni*, *L. ivli*, *L. nana*, *L. obtusa*, *L. punctata*, *L. thalera*, *L. thienemanni*, and *L. unguitata* from the family Lecanidae were all found in only one locality of Turkey (Table 2).

Approximately 80 studies were conducted in 200 wetlands for planktonic study in Turkey (Table 3). The most common species from Lepadellidae was *L. patella*, found from 35 localities, followed by *C. uncinata* (21 localities),

* Correspondence: ahmetbozkurt1966@yahoo.com

Table 1. List of sampling localities.

No.	Sampling localities and sampling dates
1.	Çatal Pond (Feke, Adana): 18.08.2005
2.	Zencirli Pond (Kozan, Adana): 18.08.2005
3.	Kocagöl Pond (Kozan, Adana): 18.08.2005
4.	Küçükgöl Pond (Kozan, Adana): 18.08.2005
5.	Yenikuyu Well (Kozan, Adana): 18.08.2005
6.	Pınargözü (Kozan, Adana): 21.08.2005, 25.03.2011, 22.03.2014
7.	Mustafabeli Drainage Channel (Ceyhan, Adana): 19.05.2005
8.	Ceyhan Pond (Adana, Ceyhan): 12.05.2005
9.	Beşikgöl (Dört Yol, Hatay): 11.12.2005
10.	Köprüçay River (Beşkonak, Antalya): 18.08.2006
11.	Yeni yurt Pond (Dört Yol, Hatay): 09.04.2005, 16.07.2007
12.	Well1 (Kozan, Adana) (37°41'00.99"N, 35°59'09.10"E): 17.08.2006, 24.10.2006, 26.08.2006, 17.08.2007, 12.04.2015
13.	Well2 (Kozan, Adana) (37°41'09.63"N, 35°59'06.59"E): 17.08.2007, 12.04.2015
14.	Titreyen Lake (Side, Antalya): 17.08.2006, 06.08.2010, 20.08.2012
15.	Harbiye Waterfall (Hatay): 05.08.2007
16.	Yeni yurt Creek (Dört Yol, Hatay): 22.06.2006, 22.04.2008, 12.06.2015
17.	Gölköy Channel (Dört Yol, Hatay): 28.04.2006, 26.07.2008
18.	Puddle (Çarşamba, Samsun): 14.04.2007
19.	Ceyhan River (Ceyhan, Adana): 09.06.2007
20.	Gebere Dam (Niğde): 08.08.2010
21.	Manavgat River (Manavgat, Antalya): 15.08.2012
22.	Aladağ Dam (Bolu): 26.09.2012
23.	Yalıntaş Dam (Gülşehir, Nevşehir): 19.01.2012
24.	Karkamış Dam (Gaziantep): 22.03.2012
25.	Şuğul Creek (Gürün, Sivas): 10.09.2012
26.	Gölköy Dam (Bolu): 26.09.2012
27.	Sarıseki Stream (İskenderun, Hatay): 26.11.2011, 28.12.2011, 30.01.2012, 26.02.2012, 21.03.2012, 16.04.2012
28.	Sarıseki Wetlands (İskenderun, Hatay): 26.11.2011, 30.01.2012, 26.02.2012, 21.03.2012, 18.04.2012, 28.12.2012, 12.06.2015
29.	Cimis Drainage Channel (Hatay): 23.10.2011, 25.10.2011, 01.12.2011, 30.12.2011, 02.02.2012, 30.03.2012
30.	38°00'54.51"N, 35°50'37.15"E (Feke, Adana): 30.10.2014
31.	Fırnız Creek (Kahramanmaraş): 05.12.2014
32.	36°56'09.85"N, 36°02'48.21"E (Erzin, Hatay): 22.04.2014
33.	Yukarı Burnaz Pond (Erzin, Hatay): 22.4.2014
34.	Well3, 37°41'05.52"N, 35°59'08.46"E (Kozan, Adana): 17.04.2015
35.	Keban Dam (Elazığ): 08.02.2015
36.	Yılanlıgöl (Bayburt): 21.02.2015, 17.05.2015
37.	Kırksu Creek (Kozan, Adana): 12.04.2015
38.	Tatarlı Kaynargöz (Osmaniye): 13.05.2015
39.	Aras River (Kars): 26.04.2015
40.	Deniz Lake (Kars): 26.04.2015
41.	İlisu Waterfall (Gülnar, Mersin): 27.05.2015
42.	37°22'48.39"N, 36°07'55.58"E (Kadirli, Osmaniye): 13.05.2015
43.	Deliçay (Dört Yol, Hatay): 11.06.2015
44.	Döngel (Kahramanmaraş): 13.05.2015
45.	36°36'14.06"N, 35°23'23.35"E (Karataş, Adana): 28.05.2015
46.	Dragon Creek (Anamur, Mersin): 28.6.2015
47.	Fırat River (Birecik, Şanlıurfa): 21.06.2015

Table 2. Detected species in the sampling localities.

Species	Locality
<i>Colurella adriatica</i> Ehrenberg, 1831	11, 14, 16, 21, 26, 27, 28, 29, 30, 31, 36, 39, 44
<i>C. colurus</i> (Ehrenberg, 1830)	10, 12, 24, 29, 31, 32, 37
<i>C. uncinata</i> (Müller, 1773)	11, 12, 25, 26, 27, 28, 29, 32, 33
<i>Lepadella acuminata</i> (Ehrenberg, 1834)	7, 11, 14, 26, 28, 29, 37, 39, 45
<i>L. (Heterolepadella) ehrenbergi</i> (Petry, 1850)	12, 14, 27, 28
<i>L. ovalis</i> (Müller, 1786)	9, 15, 16, 17, 26, 27, 28, 30, 31, 32, 33, 36, 47
<i>L. patella</i> (Müller, 1773)	6, 11, 16, 24, 26, 27, 28, 29, 32, 33, 38, 39, 42, 44, 46
<i>L. quadricarinata</i> (Stenroos, 1898)	7, 17, 21, 25, 30, 33, 47
<i>L. rhomboides</i> (Gosse, 1886)	11, 14, 16, 26, 27, 28
<i>L. triptera</i> (Ehrenberg, 1832)	14, 28
<i>Squatinnella mutica</i> (Ehrenberg, 1832)	11
* <i>Lecane acanthinula</i> (Hauer 1938)	14
<i>L. aculeata</i> (Jabuski, 1912)	14
<i>L. arcuata</i> (Bryce, 1891)	34
<i>L. bulla</i> (Gosse, 1886)	7, 11, 14, 16, 17, 19, 26, 28, 29, 34, 37
<i>L. closterocerca</i> (Schmarda, 1859)	6, 7, 11, 14, 16, 17, 19, 20, 25, 26, 27, 28, 29, 31, 33, 36, 37, 38, 42, 45, 46, 47
<i>L. curvicornis</i> (Murray, 1913)	11, 42, 44
<i>L. flexilis</i> (Gosse, 1886)	14, 21, 26, 27, 28, 29, 31, 37, 44
<i>L. grandis</i> (Murray, 1913)	14, 21
<i>L. hastata</i> (Murray, 1913)	14, 26, 29
<i>L. hamata</i> (Stokes, 1896)	11, 14, 26, 27, 28, 29, 31, 45
<i>L. hornemanni</i> (Ehrenberg, 1834)	14
<i>L. inermiş</i> (Bryce, 1892)	14, 21
<i>L. ivli</i> (Wiszniewski 1935)	19
<i>L. leontina</i> (Turner, 1892)	14, 19
<i>L. luna</i> (Müller, 1776)	7, 9, 11, 15, 17, 19, 20, 25, 26, 27, 28, 29, 45, 47
<i>L. lunaris</i> (Ehrenberg, 1832)	6, 9, 11, 12, 13, 14, 15, 16, 17, 19, 21, 27, 28, 29, 30, 37, 46
<i>L. ludwigi</i> (Eckstein, 1893)	17, 26, 27, 28
<i>L. nana</i> (Murray, 1913)	33
<i>L. obtusa</i> (Murray, 1913)	14
<i>L. papuana</i> (Murray, 1913)	19, 29, 42
<i>L. punctata</i> (Murray, 1913)	14
<i>L. pyriformis</i> (Daday, 1905)	14, 45
<i>L. rhenana</i> Hauer, 1929	16, 37
<i>L. quadridentata</i> (Ehrenberg, 1830)	14, 29, 47
<i>L. stenroosi</i> (Meissner, 1908)	11, 14, 16, 19, 26, 27, 28, 29
* <i>L. thalera</i> (Harring & Myers, 1926)	14
<i>L. thienemanni</i> (Hauer, 1938)	29
* <i>L. unguitata</i> (Fadeev, 1925)	26

*New record.

Table 3. Prior studies made concerning the zooplankton species of Turkish inland waters.

1	Yenişehir Lake (Reyhanlı, Hatay) (Bozkurt, 2006)
2	Gala Lake (Edirne) (Erdoğan and Güher, 2005)
3	Lake Akşehir (Konya), Lake Abant, Yedigöller (Bolu), Kesikköprü Dam Lake (Ankara), Lake Burdur (Burdur) (Altındağ and Yiğit, 2001)
4	Lake Karın, Lake Kızılot (Gündoğmuş-Antalya) (Ustaoglu et al., 2005)
5	Asartepe Dam Lake (Ankara) (Buyurgan et al., 2010)
6	Karaman Stream, Antalya (Altındağ et al., 2009)
7	Çatalan Dam Lake (Adana) (Aladağ, 2010)
8	Karagöl (Ankara) (Erdoğan, 2010)
9	Hirfanlı Dam Lake (Emir Akbulut, 2001)
10	Topboğazi Dam Lake (Hatay) (Bozkurt and Dural, 2004)
11	Gölbaşı Lake (Hatay) (Bozkurt and Güven, 2009)
12	Lake Gölbaşı (Hatay-Turkey) (Bozkurt and Tepe, 2011)
13	Birecik Baraj Gölü (Bozkurt and Sagat, 2008)
14	Asi River (Hatay-Turkey) (Bozkurt and Güven, 2010)
15	Beyhan Dam Lake (Elazığ) (Bulut and Saler, 2014)
16	Murat River (Bulut and Saler, 2014)
17	Lake Kuru (Karabük), Çayrüzü Pond (Kayseri), Lake Titreyen (Antalya) (Altındağ et al., 2005)
18	Tigris River (Bekleyen et al., 2011)
19	İnanlı Pond (Tekirdağ), Değirmen Stream, Soğucak Stream, Kömürköy Stream, Kofçaz Stream, Kırklareli Dam lake (Kırklareli), Alıç Pond (Edirne) (Erdoğan and Güher, 2012)
20	Lake Gala (Edirne) (Güher et al., 2011)
21	Lake Sapanca (Dorak and Albay, 2015)
22	Kurugöl (Bolu) (Akıncı, 2012)
23	Seyfe Lake (Kırşehir) (Altındağ and Sözen, 1996)
24	Lake Seyfe (Kırşehir) (Altındağ and Yiğit, 2001)
25	Şeker Dam Lake (Kayseri) (Kaya et al., 2009)
26	Lake Akşehir (Emir Akbulut, 2000)
27	Yeşilirmak (Bozkurt and Akın, 2012)
28	Hayrabolu Pond, Ulaş Pond (Tekirdağ), Mecidiye Pond (Edirne), Lake Pedina, Lake Hamam (Kırklareli) (Erdoğan and Güher, 2012)
29	Yamansaz Lake (Antalya) (Yalım, 2006)
30	Karaman Stream (Altındağ et al., 2009)
31	Göksu Dam Lake (Bekleyen, 2003)
32	Çiftlikköy Pond, Budakdoğanca Pond (Edirne), Sarıcaali Pond, Lake Pedina, Lake Hamam (Kırklareli) (Erdoğan and Güher, 2012)
33	Yedigöller (Bolu) (Altındağ, 2000)
34	Sarımsaklı Dam Lake (Kayseri) (Ölmez Aydın and Altındağ, 2004)
35	Yedigöller (Bolu) (Altındağ and Yiğit, 2001)
36	Beyşehir Lake (Altındağ and Yiğit, 2004)
37	Lake Dipsiz (Bozkır-Konya) (Ustaoglu et al., 2005)
38	Bozalan Lake (Menemen-İzmir) (Balık et al., 2006)
39	Lake Eğrigöl (Aygen et al., 2009)
40	Devegeçidi Dam Lake (Bekleyen, 2001)
41	Seyfe (Kırşehir) (Altındağ and Sözen, 1996)
42	Yedigöller (Bolu) (Altındağ and Yiğit, 2001)

Table 3. (Continued).

43	Kumalı Park (Kayseri) (Kaya et al., 2009)
44	Lake Sazlıgöl (Ustaoğlu et al., 2004)
45	Yuvarlak Stream (Köyceğiz-Muğla) (Özdemir Mis et al., 2011)
46	Çatalan Dam Lake (Adana) (Aladağ, 2010)
47	Gölkent Lake (Bozkurt and Güven, 2009)
48	Hayrabolu Pond (Tekirdağ) (Erdoğan and Güher, 2012)
49	Lake Akgöl (Ustaoğlu et al., 2012)
50	Aslantas Dam Lake (Osmaniye) (Bozkurt and Göksu, 2010)
51	Orduzu Dam Lake (Malatya) (Gürel and Saler, 2015)
52	Parmaksız Pond, İnanlı Pond, Şarköy Pond (Tekirdağ), Osmanlı Pond, Küküler Pond (Edirne Havsa), Kiyıköy Stream, Madara Stream (Kırklareli) (Erdoğan and Güher, 2012)
53	Kesikköprü Dam Lake (Ankara) (Yiğit, 2002)
54	Yenicaga Lake, Turkey (Saygı Başbuğ and Yiğit, 2004)
55	Lake Seyfe (Kırşehir), Lake Akşehir (Konya), Kesikköprü Dam Lake (Ankara), Lake Yay (Sultan Marshes, Kayseri) (Altındağ and Yiğit, 2001)
56	Hirfanlı Dam Lake (Kırşehir) (Yiğit and Altındağ, 2005)
57	Asartepe Dam Lake (Ankara) (Buyurgan et al., 2010)
58	Lake Sazlıgöl (Menemen, İzmir) (Ustaoğlu et al., 2004)
59	Lake Karın, Lake Karıncalı, Lake Duruca, Lake İlvat (Gündoğmuş-Antalya), Lake Sülüklü (Bozkır-Konya), Lake Kovalı, Lake Gavur (Seydişehir-Konya), Lake Kara, Lake Çinili (Ulukışla-Niğde) (Ustaoğlu et al., 2005)
60	Bozalan Lake (Menemen-İzmir) (Balık et al., 2006)
61	Lake Eğrigöl (Gündoğmuş, Antalya) (Aygen et al., 2009)
62	Lake İlvat (Gündoğmuş-Antalya), Lake Kovalı, Lake Dipsiz (Seydişehir-Konya) (Ustaoğlu et al., 2005)
63	Lake Balık Bafra-Samsun (Ustaoğlu et al., 2012)
64	Yenişehir Lake (Reyhanlı, Hatay) (Bozkurt, 2006)
65	Lake İznik (Bursa, Turkey) (Apaydın Yağcı and Ustaoğlu, 2012)
66	Sakaryabaşı-Batı Dam Lake (Uzbilek Kırkağaç and Demir, 2006)
67	Gerede (Segers et al., 1992)
68	Çamkoru Pond (Ankara) (Akbulut Emir and Kaya, 2007)
69	Yarseli Dam Lake (Hatay) (Bozkurt et al., 2004)
70	Birgi Dam Lake (Urfa, İzmir), Sazlıgöl Lake (Karaburun, İzmir) (Balık et al., 2004)
71	Tahtalı Dam Lake (İzmir) (Özdemir Mis et al., 2009)
72	Lake Eğrigöl (Gündoğmuş, Antalya) (Aygen et al., 2009)
73	Lake Mogan (Emir) (Akbulut and Akbulut, 2002)
74	Tahtaköprü Dam Lake (Gaziantep) (Ulgı and Bozkurt, 2015)
75	Lake Tatlıgöl (Bafra-Samsun) (Ustaoğlu et al., 2012)
76	Abant (Bolu) (Altındağ, 1999)
77	Lake Dalyan (Ustaoğlu et al., 2012)
78	Lake Uzungöl (Bafra-Samsun) (Ustaoğlu et al., 2012)
79	Buldan Dam Lake (Denizli) (Ustaoğlu et al., 2010)
80	Lake Balıklıgöl (Şanlıurfa) (Bekleyen and Ipek, 2010)
81	Karataş Lake (Apaydın Yağcı, 2013)
82	Zincidere Dam Lake (Kaya et al., 2009)
83	Taurus Range (Ustaoğlu et al., 2005)
84	Lake Bafra (Emir, 1990)

L. acuminata (20 localities), and *C. adriatica*, *C. colurus*, and *L. ovalis* (17 localities). Our study indicated that Lecanidae showed a similar distribution pattern according to results of other studies in Turkey. These species were *L.*

luna (41 localities) and *L. closterocerca* and *L. lunaris* (30 localities), followed by *L. bulla* (25 localities), *L. hamata* (20 localities), *L. stenroosi* (16 localities), and *L. flexilis* and *L. quadridentata* (14 localities) (Table 4).

Table 4. Different plankton species and localities reported by other scientists in Turkey (see Table 3 for locality numbers).

Species	Localities
<i>Colurella adriatica</i>	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
<i>Colurella colurus</i>	2, 5, 6, 8, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
<i>Colurella uncinata</i>	2, 8, 12, 17, 18, 19, 20, 21, 22, 25, 26, 27, 28, 29, 33, 34, 35, 36, 37, 38, 39
<i>Lepadella acuminata</i>	6, 8, 17, 18, 19, 22, 23, 30, 31, 32, 33, 36, 39, 40, 41, 42, 43, 44, 45, 46
<i>L. (H.) ehrenbergi</i>	6, 18, 19, 47, 48, 49
<i>Lepadella ovalis</i>	2, 5, 8, 14, 15, 17, 18, 19, 34, 39, 45, 47, 50, 51, 62, 63, 84
<i>L. patella</i>	2, 5, 6, 8, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 29, 33, 36, 45, 46, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 64, 65
<i>L. quadricarinata</i>	5, 6, 8, 12, 18, 22, 25
<i>L. rhomboides</i>	12, 14, 18
<i>L. triptera</i>	2, 8, 20, 58
<i>Squatinella mutica</i>	8, 21, 66, 67
<i>Lecane acanthinula</i>	-
<i>Lecane arcuata</i>	18, 68
<i>L. aculeata</i>	18
<i>L. bulla</i>	2, 5, 6, 8, 10, 12, 14, 15, 18, 19, 20, 22, 25, 37, 45, 50, 60, 61, 64, 65, 67, 69, 70, 73, 81
<i>L. closterocerca</i>	2, 4, 5, 6, 8, 12, 14, 16, 17, 18, 19, 20, 22, 24, 25, 33, 34, 36, 45, 49, 51, 58, 60, 65, 67, 70, 71, 72, 73, 74
<i>L. curvicornis</i>	14
<i>L. flexilis</i>	6, 10, 17, 18, 19, 22, 36, 45, 47, 59, 61, 64, 70, 71
<i>L. grandis</i>	17, 23, 24, 36, 58
<i>L. hastata</i>	12, 18, 19, 24, 75
<i>L. hamata</i>	2, 3, 4, 6, 8, 14, 17, 18, 19, 20, 22, 29, 33, 34, 45, 47, 58, 60, 67, 76
<i>L. hornemanni</i>	18, 71
<i>L. inermis</i>	19, 67, 70, 77
<i>L. ivli</i>	18
<i>L. leontina</i>	18, 64
<i>L. luna</i>	2, 5, 6, 8, 10, 12, 14, 15, 16, 17, 18, 19, 20, 24, 25, 26, 31, 33, 36, 39, 40, 45, 47, 50, 51, 53, 55, 56, 58, 59, 60, 64, 65, 69, 70, 71, 73, 74, 78, 81, 84
<i>L. lunaris</i>	5, 6, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 22, 27, 29, 36, 45, 46, 47, 50, 51, 56, 58, 59, 60, 61, 65, 71, 76, 82
<i>L. ludwigi</i>	8, 12, 47, 60, 70, 83
<i>L. nana</i>	2, 8, 18, 19, 23, 24, 26, 45, 67
<i>L. obtusa</i>	17
<i>L. papuana</i>	12, 14, 18, 45, 58, 67, 78
<i>L. punctata</i>	6, 17, 67
<i>L. pyriformis</i>	6, 18, 19, 28
<i>L. rhenana</i>	9
<i>L. quadridentata</i>	2, 4, 12, 14, 18, 19, 20, 22, 28, 38, 45, 47, 58, 78
<i>L. stenroosi</i>	2, 10, 12, 18, 19, 20, 31, 37, 45, 47, 50, 61, 65, 64, 71, 79
<i>L. thalera</i>	-
<i>L. thienemanni</i>	18, 80
<i>L. unguitata</i>	-

L. acanthinula, *L. thalera*, and *L. unguitata* are new additional records of rotifers from the Turkish fauna. *L. acanthinula* is an oriental, cosmopolitan, cosmopolitan species (Segers, 1994; Sharma and Sharma, 2005). It was found only in Titreyen Lake (Side, Antalya) by the sea in this study.

It may have been confused with *L. furcata* (Segers, 1996). Lorica is strong. Dorsal plate anteriorly narrower, medially wider than ventral, smooth. Head aperture margins coincident, straight, with small anterolateral spines. Ventral plate slightly longer than wide, with incomplete transverse and longitudinal folds, smooth. Lateral sulci deep. Lateral margins with anterior notches, parallel. Foot plate broad, rounded posteriorly, coxal plates rounded. Prepedal fold elongate, narrow, posteriorly with median projection. Foot pseudosegment simple, not or slightly projecting. Single parallel-sided toe, two completely separated claws (Segers, 1995).

In this study, ten specimens were examined from Titreyen Lake (Side, Antalya). Length of dorsal plate: 58–63 μm ; width of dorsal plate: 61–65 μm ; length of ventral plate: 68–71 μm ; width of ventral plate: 51–53 μm ; toe: 21–22 μm ; claws: 7–8 μm (Figures 1a and 1b).

The other new species, *L. thalera*, is a cosmopolitan species that lives in slightly saline but also in fresh waters (Sharma and Sharma, 2005) and was found only in Titreyen Lake (Side, Antalya) in this study.

It can be confused with *L. lunaris*. It differs from the latter by the lateral margins of its dorsal plate not reaching the head aperture. Lorica of *L. thalera* is strong. Dorsal plate anteriorly narrower, medially more or less as wide as the ventral plate, both smooth. Head aperture margins dorsally and ventrally strongly concave, anterolateral corners acutely pointed. Lateral margins of dorsal plate do not reach head aperture. Ventral plate elongate, transverse fold incomplete. Lateral margins smooth, curved. Foot region broad, coxal plates rounded or acutely triangular, occasionally projecting. Prepedal fold short, broad, with rounded posterior margin. Posterior edge of foot plate smoothly rounded. Foot pseudosegment simple, not projecting. Toe single, bearing long, fused pseudoclaws and accessory claws (Segers, 1995).

Five specimens examined from Titreyen Lake (Side, Antalya). Length of dorsal plate 130–155 μm , length of ventral plate 141–153 μm , width of dorsal plate 92–102 μm , width of ventral plate 90–98 μm ; width of anterior ventral margin 53–57 μm ; length of toe 44–46 μm , claw 12–17 μm . (Figures 1c and 1d).

The last new species, *L. unguitata*, is common in the subtropical and tropical regions of the Old World and Australia (Segers, 1995). It was found only in the freshwater reservoir Gököl Dam Lake (Bolu) in this study.

It is characterized by the shape of its head aperture margins, being straight dorsally and having a pair of

characteristic anterosublateral projections and a distinct median sinus ventrally. The species is related to *L. amazonica* (Murray, 1913), *L. stenroosi*, and *L. sylviae*, which differ in the shape of the projections on the ventral head aperture margin (Segers, 1995).

Lorica of the species is stiff, nearly circular. Dorsal plate of lorica is narrower than the ventral plate and smooth. Lateral margins reach anterior end of lorica. Dorsal head aperture margin straight, ventral with clear median sinus, intermediate straight parts and sublateral, rounded triangular projections. Anterolateral corners angulate or rounded. Ventral plate as wide as long or slightly longer than wide, widest medially, smooth. Transverse fold complete. Lateral margins smooth, strongly curved. Posterior region of ventral plate occasionally with lateral outgrowths, these may be asymmetrical. Lateral sulci deep. Foot plate relatively narrow, coxal plates rounded triangular. Prepedal fold broad, distally rounded. Foot pseudosegment not projecting. Toe single, constricted basally then nearly parallel-sided, bearing two long pseudoclaws and accessory claws (Segers, 1995).

Nine specimens examined from Gököl Dam (Bolu). Length of dorsal lorica: 82–95 μm , width of dorsal lorica: 81–89 μm , length of ventral lorica: 90–101 μm , width of ventral lorica: 81–90 μm , length of toe 36–42 μm , length of claw 11–14 μm (Figures 1e and 1f).

In this study, a total of 47 localities were sampled and 39 rotifer species were identified. The majority of species were found in Lecanidae (28 species), followed by Lepadellidae (11 species). They have high tolerance ranges of temperature and salinity, so they can be found among the macrophytes in every kind of aquatic ecosystem (Koste, 1978; Manuel Barrabin, 2000; Fontenato et al., 2008; Erdoğan and Güher, 2012). In particular, the widespread genera *Colurella*, *Lepadella*, and *Squatinella* are well represented among bryophyte collections. A fourth genus, *Paracolurella*, was also known from bryophytes.

The Lepadellidae species of Turkey were studied by Kaya and Altındağ (2007) from different freshwater localities. Nine taxa were reported in that study, and the same species from Lepadellidae were found in our study, except for *Colurella obtusa* (Gosse, 1886) and *Lepadella biloba* Hauer, 1958.

Littoral *Lecane* exhibited a wide variety of distribution patterns but did not usually prefer the open water environment and they were found on a benthic substrate with higher frequency such as Lepadellidae. Obviously all of them preferred periphytic environments, but within these they seem to be very euryoecious, appearing as often in floating-leaved vegetation as among submersed plants and halophytes. No confinement to any special type of plant could be traced. However, a few species seem to prefer bogs (Pejler and Berzins, 1994).

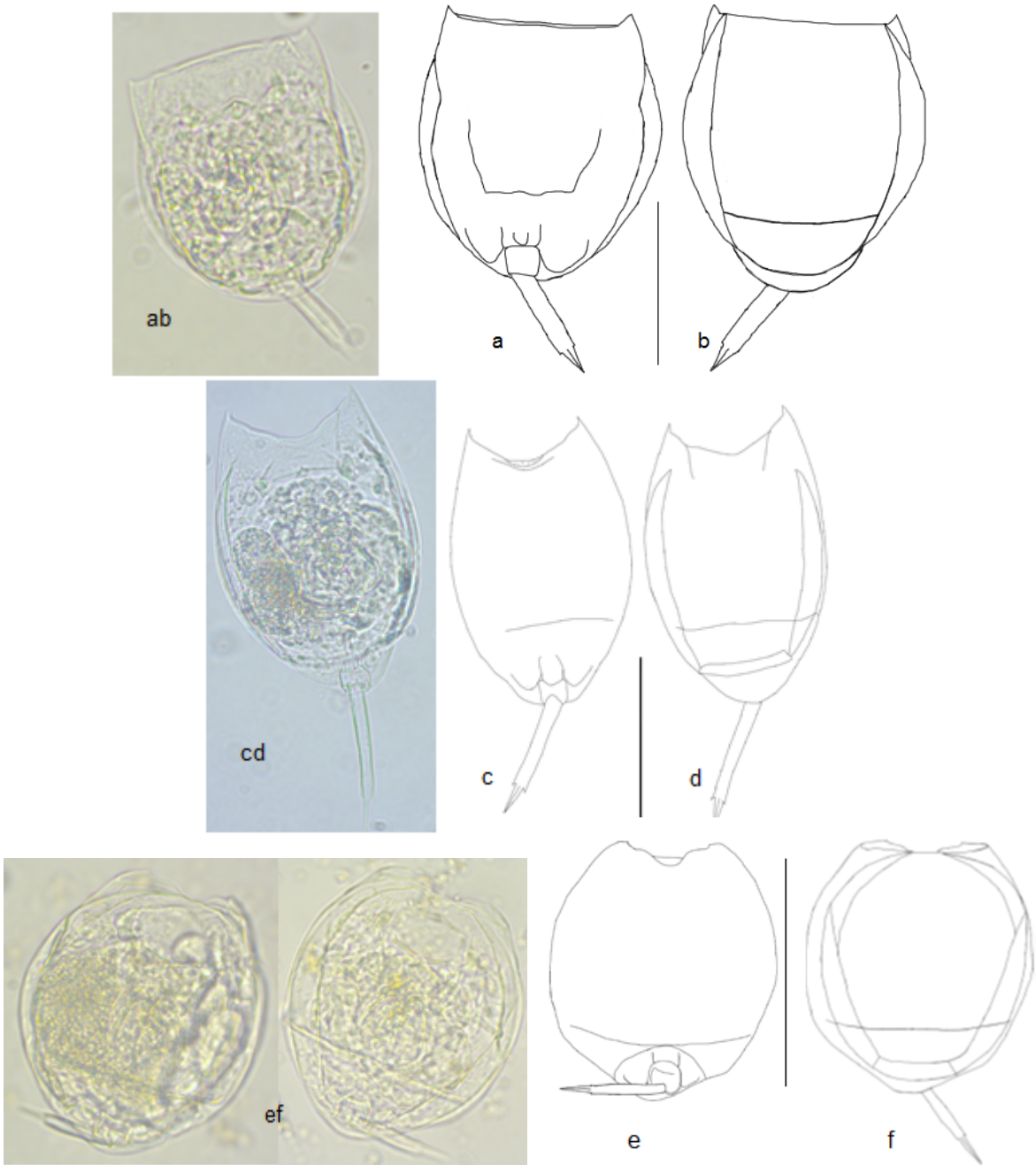


Figure 1. ab. *Lecane acanthinula* ventral view (a- ventral view, b- dorsal view), bar 50 μ m; cd. *L. thalera* dorsal view (c- ventral view, d- dorsal view), bar 100 μ m; ef. *L. unguitata* first ventral, second dorsal view (e- ventral view, f- dorsal view), bar 100 μ m. Photographs original.

Almost all species detected in the study were cosmopolites with wide distribution, except *Sq. mutica*, *L. ivli*, and *L. papuana*. Some of the species in the study, *C. adriatica*, *C. colurus*, *C. uncinata*, *L. ovalis*, *L. patella*, *L. triptera*, *L. closteroerca*, *L. grandis*, *L. inermis*, *L. luna*, *L. nana*, and *L. thalera*, tolerate a wide range of salinity (De Smet 1996). While *L. acuminata* and *Sq. mutica* prefer

acidic waters, *L. flexilis* and *L. bulla* prefer alkaline waters (Pejler, 1962; Koste, 1978). *C. adriatica* and *L. inermis* can live in very different extreme environments. The first was detected in mineral springs and activated sludge (Klimowicz, 1973; Doohan, 1975) and the second was detected in thermal springs and even a geyser environment at 62.5 °C (Margalef, 1948, 1949; Donner, 1970).

Sq. mutica, *L. acanthinula*, *L. aculeata*, *L. arcuata*, *L. hornemanni*, *L. ivli*, *L. nana*, *L. obtusa*, *L. punctata*, *L. thalera*, *L. thienemanni*, and *L. unguitata* were found in one locality. *L. triptera*, *L. grandis*, *L. inermis*, *L. leontina*, *L. pyriformis*, and *L. rhenana* were found in 2 localities. They showed similar distribution patterns to other studies in Turkey, except the new records and *Sq. mutica*, *L. nana*, and *L. grandis*.

Distribution of the species was quite closely related to the ecological characteristics of the species and all species in the study could be found in tropical and subtropical climate zones, such as found in the study.

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- The species *L. acanthinula*, *L. thalera*, and *L. unguitata* were not reported in any study in Turkey until now (Ustaoglu et al., 2012; Ustaoglu, 2015). Therefore, they are new records for the Turkish rotifer fauna.
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