

## New records of Rotifers from Iran with biogeographic considerations

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**Abstract:** The rotifer fauna of Iran is poorly known. This comprehensive study presents the results of an investigation of rotifers sampled in 51 freshwater sites of Tehran and neighboring provinces of Iran, from May 2006 to May 2007. Of the 115 species identified, 72 from 19 genera and 5 families are new for the fauna of Iran. Including the present records, the number of known Iranian rotifers has now reached 143. So far, the species found in Iran are overwhelmingly Palearctic. The present study is a first step towards more similar studies to update the existing species list of rotifers from all over Iran.

**Key words:** Rotifera, new records, diversity, biogeography, Iran

### Introduction

Rotifers, “the wheel animalcules”, are microscopic aquatic animals of the phylum Rotifera. Because of their high adaptability, these opportunistic organisms are widely distributed in freshwater, marine, and limnoterrestrial habitats. According to Segers (2007), more than 2000 species of rotifers are known worldwide and are classified in 3 main groups: the marine Seisonida (3 species), Monogononta (1570 species), and the exclusively parthenogenetic Bdelloidea (461 species) (Segers, 2007).

Iran is the 18th largest country in the world, with an area of 1,648,000 km<sup>2</sup>, and is characterized by a high climatic heterogeneity. As a consequence, a wide range of living organisms inhabit the country, with rotifers being one of the more poorly studied

groups. To date, and despite numerous studies in neighboring countries, especially Turkey (Dumont and De Ridder, 1987; Segers et al., 1992; Ustaoglu, 2004; Kaya et al., 2008; Altındağ et al., 2009), studies on the rotifer fauna of Iran are restricted to the contributions by Löffler (1959, 1961), who reported 81 taxa (65 species, 14 subspecies, 2 genera), and by Ruttner-Kolisko (1974), on the central deserts of Iran; the latter, unfortunately, was never published.

All of the above mentioned issues made us decide to resume research on the rotifer of Iran, after an interruption of 50 years. Here we report on the rotifer fauna of Tehran province, which, because of its diverse geographic and climatic situation, we considered likely to harbor a rich fauna.

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**Materials and methods**

Tehran province is located at latitude 34°-36.5°N and longitude 50°-53°E, covers an area of 18,909 km<sup>2</sup>, and lies on the north of the central plateau of Iran (Figure 1). Its climate is mild in spring, hot and dry in summer, cool and rainy in autumn, and cold in winter. The average annual rainfall is approximately 200 mm, with a maximum during the winter. On the whole, Tehran province has a semi-arid, steppe climate in the south and an alpine climate in the north. Most of the precipitation occurs from mid-autumn to mid-spring, while the hottest month is July (mean minimum and maximum temperatures are 23 °C and 36 °C), and the coldest is January (mean minimum and maximum temperatures are -1 °C and 8 °C). Because of its central location and because of the diversity of its aquatic systems, ranging from highland ponds and lakes to low land streams, this province was selected as the most suitable province to start studying the Iranian rotifer fauna.

Rotifer samples were collected from 51 sites in Tehran and neighboring provinces (Table 1), including temporary and permanent pools and

ponds, swamps, a reservoir, roadside canals, rivers, streams, and dammed lakes, from May 2006 to May 2007. Samples were taken with a handmade plankton net, with a 20-cm mouth diameter and 40-µm mesh size; the net was dragged horizontally and vertically through the water column, and horizontally on the substrate, submerged gravels and sands, sediments, and through aquatic vegetation.

After collection, samples were preserved and fixed in 4% formaldehyde. Because of the difficulty of identifying fixed Bdelloids rotifers (Ricci and Melone, 2000), 1 unfixed sample was collected from each site. This live material was studied by light microscope as quickly as possible in the lab. Specimens were photographed using a video camera mounted on a compound microscope (Zeiss, Axioplan 2 imaging). For exact identification, some trophi were extracted and prepared for scanning electron microscopy (SEM), applying the method described by De Smet (1998).

Monogononta were studied using light stereo- and compound microscopes. Species identification was done using methods in accordance with the works



Figure 1. Locations of Tehran province, the study area (the area marked), in Iran.

Table 1. List of the sampling sites of the present study (with coordinates and altitude)

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1.	Dalichai River (Firouzkouh Road): 35°35'N; 52°29'E; 1634 m
2.	Havir Village: 35°42'N; 52°19'E; 2536 m
3.	Dehnar Village: 35°41'N; 52°25'E; 2961 m
4.	Aaro Village: 35°40'N; 52°24'E; 2364 m
5.	Arjomand District: 35°49'N; 52°29'E; 2167 m
6.	Namroud Village: 35°43'N; 52°39'E; 1844 m
7.	Asor Village (Arjomand District): 35°47'N; 52°25'E; 2434 m
8.	Vazna Village (Arjomand District): 35°47'N; 52°18'E; 2742 m
9.	Village Lasem (Gaznak District): 35°48'N; 52°12'E; 2577 m
10.	Firouzkouh City: 35°45'N; 52°46'E; 1934 m
11.	Spring of Khamdeh Village (Firouzkouh): 35°39'N; 52°41'E; 1758 m
12.	Mozdaran (Hableh River): 35°34'N; 52°35'E; 1668 m
13.	Polur: 35°51'N; 52°05'E; 2204 m
14.	Abali: 35°45'N; 51°58'E; 2362 m
15.	Lar River and Dam Lake: 35°53'N; 51°57'E; 2471 m
16.	Bumehen (Jajroud River): 35°44'N; 51°52'E; 1741 m
17.	Zardar Village: 35°37'N; 51°53'E; 1518 m
18.	Latian River and Dam Lake: 35°47'N; 51°40'E; 1581 m
19.	Ammameh-Ye Deh Bala (Fasham Village): 35°55'N; 51°34'E; 2596 m
20.	Hajiabad (Fasham Village): 35°52'N; 51°31'E; 1889 m
21.	Lalun: 35°59'N; 51°34'E; 2491 m
22.	Latian Rive: 35°55'N; 51°32'E; 2161 m
23.	Tehran (Darakeh River): 35°48'N; 51°23'E; 1674 m
24.	Emamzadeh Davod: 35°51'N; 51°21'E; 2618 m
25.	Chaloos Road (Karaj River): 36°01'N; 51°08'E; 1948 m
26.	Amir Kabir Dam Lake (Karaj): 35°58'N; 51°05'E; 1740 m
27.	Sadd-e Taleqan Dam Lake (Qazvin City): 35°58'N; 50°38'E; 1715 m
28.	Saran (kilan District): 35°30'N; 52°01'E; 1691 m
29.	Eyvanekey (ab-e shour River): 35°20'N; 52°03'E; 1702 m
30.	Hasanabad Village (Eyvanekey): 35°25'N; 52°01'E; 1205 m
31.	Cheshmeh Nadi Village (Eyvanekey): 35°17'N; 51°59'E; 962 m
32.	Sharisabad District (Pakdasht City): 35°26'N; 51°46'E; 1077 m
33.	Parchin Village (Sharisabad District): 35°31'N; 51°46'E; 1191 m
34.	Mamazan Village (Sharisabad District): 35°29'N; 51°43'E; 1124 m
35.	Varamin City: 35°19'N; 51°39'E; 916 m
36.	Ab Barik (Varamin City): 35°14'N; 51°36'E; 874 m
37.	Pishva District (Varamin City): 35°18'N; 51°43'E; 948 m
38.	Kahrizak District (Islam Shahr City): 35°20'N; 51°50'E; 959 m
39.	Deh Abbas (Chahar Dange District): 35°33'N; 51°16'E; 1060 m
40.	Hasanabad District (Robat Karim City): 35°22'N; 51°15'E; 952 m
41.	Aliabad Village (Qom City): 35°07'N; 50°57'E; 1092 m
42.	Qal'e Sangi Village (Qom City): 35°07'N; 50°57'E; 1090 m
43.	Aderan Village (Robat Karim City): 35°32'N; 50°06'E; 1066 m
44.	Parandak Village (Robat Karim City): 35°22'N; 50°41'E; 1229 m
45.	Robat Karim City: 50°32'N; 50°32'E; 1030 m
46.	Zavye District: 35°24'N; 50°32'E; 1322 m
47.	Ma`muniyeh District: 35°17'N; 50°30'E; 1269 m
48.	Nazarabad District (Hashtgerd City): 35°56'N; 50°36'E; 1198 m
49.	Buiinzahra (Haji Arab River): 35°47'N; 50°06'E; 1193 m
50.	Aliabad-e Band Village (Gara Chai, Saveh City): 34°54'E; 50°13'E; 1050 m
51.	Sveh Dam Lake: 35°53'N; 50°08'E; 1141 m

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by Donner (1965), Ruttner-Kolisko (1974), Koste (1978), Shiel and Koste (1992), Nogrady et al. (1995), Segers (1995), De Smet (1996), De Smet and Pourriot (1997), Ricci and Melone (2000), and Nogrady and Segers (2002). Nomenclature and classification throughout the present work follow Segers (2007, 2008). The PC ORD software based on the Jaccard similarity index was used for principle component analyses (PCA).

### Results and discussion

During our study we found 115 rotifer taxa, including 104 species of *Monogononta* and 11 species of *Bdelloidea* (Table 2), belonging to 23 families and 41 genera. Of these 115 species, 72 species (indicated by asterisks in Table 2), representing 5 families and 19 genera, are reported as the first records from Iran. These new families are *Habrotrochidae*, *Philodinavidae*, *Epiphanidae*, *Proalidae*, and *Flosculariidae*. With the present records, the total number of known rotifers from Iran increased to 143 species. In our studied region, *Lecane* is the most common genus (13.04%, 15 species), followed by *Brachionus* (9.56%, 11 species), *Lepadella* (6.95%, 8 species), and *Trichocerca* and *Cephalodella* (both 6.08%, 7 species) (Figure 2). The most diverse family was *Brachionidae*, with 30 species, followed by

*Lecanidae* (15 species), *Lepadellidae* (13 species), and *Notommatidae* (12 species).

When comparing the fauna of neighboring countries, the rotifer fauna of Turkey is the best documented of the region. From 1940 to 2008, 281 species of rotifers were recorded from Turkey (Dumont and De Ridder, 1987; Segers et al., 1992; Ustaoglu, 2004; Kaya et al., 2008; Altındağ et al., 2009). The most diverse genera in Turkey are *Lecane* (14.59%, 41 species), followed by *Brachionus* and *Trichocerca* (both 7%, 22 species), and *Cephalodella* (5%, 15 species). The fauna of the Arabian Peninsula is known to consist of 118 species of monogonont rotifers, with just as diverse genera: *Lecane* (32%, 38 species), followed by *Cephalodella* (15%, 18 species), and *Brachionus* and *Lepadella* (both 6%, 6 species) (Segers and Dumont, 1993). In Armenia, with only 46 species on record, the most common species were *Brachionus rubens*, *Keratella quadrata*, *Filinia longiseta*, *Hexarthra fennica*, and *Conochilus hippocrepis* (Ministry of Nature Protection, Yerevan, 1999).

In contrast to neighboring countries in the West, the rotifer fauna of countries to the East of Iran, (e.g., Turkmenistan, Afghanistan, and Pakistan), has hardly been studied, and so it remains difficult to discuss geographical affinities of the Iranian rotifer fauna

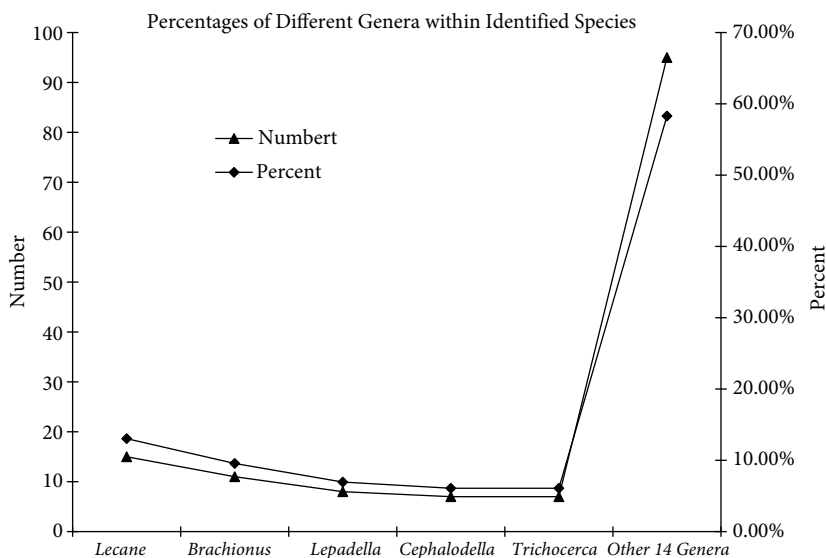


Figure 2. Proportion of different genera of rotifers found in the present work.

Table 2. List of the identified rotifers in the present study.

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<i>Asplanchna brightwellii</i> Gosse, 1850	<i>Lecane scutata</i> (Harring & Myers, 1926) *
<i>Asplanchna girodi</i> de Guerne, 1888 *	<i>Lecane sympoda</i> Hauer, 1929
<i>Asplanchna priodonta</i> Gosse, 1850	<i>Lepadella (Lepadella) biloba</i> Hauer, 1958 *
<i>Beauchampiella eudactylota</i> (Gosse, 1886) *	<i>Lepadella (Lepadella) costata</i> Wulfert, 1940 *
<i>Brachionus angularis</i> Gosse, 1851	<i>Lepadella (Lepadella) eurysterna</i> Myers, 1942 *
<i>Brachionus bidentatus</i> Anderson, 1889 *	<i>Lepadella (Lepadella) ovalis</i> (Müller, 1786) *
<i>Brachionus calyciflorus</i> Pallas, 1766	<i>Lepadella (Lepadella) patella</i> (Müller, 1773)
<i>Brachionus diversicornis</i> (Daday, 1883) *	<i>Lepadella (Lepadella) punctata</i> Wulfert, 1939 *
<i>Brachionus leydigii</i> Cohn, 1862	<i>Lepadella (Lepadella) quadricarinata</i> (Stenroos, 1898) *
<i>Brachionus plicatilis</i> Müller, 1786	<i>Lepadella (Lepadella) triptera</i> (Ehrenberg, 1832)
<i>Brachionus quadridentatus</i> Hermann, 1783	<i>Lophocharis salpina</i> (Ehrenberg, 1834)
<i>Brachionus rubens</i> Ehrenberg, 1838 *	<i>Monommata actices</i> Myers, 1930 *
<i>Brachionus urceolaris</i> Müller, 1773	<i>Monommata longiseta</i> (Müller, 1786) *
<i>Brachionus variabilis</i> Hempel, 1896 *	<i>Notholca acuminata</i> (Ehrenberg, 1832) *
<i>Cephalodella catellina</i> (Müller, 1786) *	<i>Notholca labis</i> Gosse, 1887 *
<i>Cephalodella forficula</i> (Ehrenberg, 1830) *	<i>Notholca squamula</i> (Müller, 1786)
<i>Cephalodella gibba</i> (Ehrenberg, 1830)	<i>Notholca striata</i> (Müller, 1786) *
<i>Cephalodella maior</i> (Zawadovsky, 1926) *	<i>Notommata aurita</i> (Müller, 1786)
<i>Cephalodella misgurnus</i> Wulfert, 1937 *	<i>Notommata copeus</i> Ehrenberg, 1834 *
<i>Cephalodella plicata</i> Myers, 1924 *	<i>Platyias quadricornis</i> (Ehrenberg, 1832)
<i>Cephalodella stenroosi</i> Wulfert, 1937 *	<i>Pleurotrocha petromyzon</i> (Ehrenberg, 1830) *
<i>Collotheca heptabrachiata</i> (Schoch, 1869) *	<i>Polyarthra dolichoptera</i> Idelson, 1925
<i>Collotheca ornata</i> (Ehrenberg, 1832) *	<i>Polyarthra remata</i> Skorikov, 1896 *
<i>Collotheca pelagica</i> (Rousselet, 1893) *	<i>Polyarthra vulgaris</i> Carlin, 1943
<i>Colurella adriatica</i> Ehrenberg, 1831	<i>Proales theodora</i> (Gosse, 1887) *
<i>Colurella colurus</i> (Ehrenberg, 1830)	<i>Ptygura furcillata</i> (Kellicott, 1889) *
<i>Colurella obtusa</i> (Gosse, 1886) *	<i>Scaridium longicaudum</i> (Müller, 1786)
<i>Colurella uncinata</i> (Müller, 1773)	<i>Sinantherina semibullata</i> (Thorpe, 1893) *
<i>Conochilus (Conochiloides) dossuarius</i> Hudson, 1885 *	<i>Squatinella rostrum</i> (Schmarda, 1846)
<i>Conochilus (Conochilus) hippocrepis</i> (Schränk, 1803) *	<i>Stephanoceros fimbriatus</i> (Goldfusz, 1820) *
<i>Dicranophoroides caudatus</i> (Ehrenberg, 1834)	<i>Synchaeta oblonga</i> Ehrenberg, 1832
<i>Epiphanes senta</i> (Müller, 1773) *	<i>Synchaeta pectinata</i> Ehrenberg, 1832
<i>Euchlanis dilatata</i> Ehrenberg, 1832	<i>Synchaeta stylata</i> Wierzejski, 1893 *
<i>Euchlanis incisa</i> Carlin, 1939 *	<i>Synchaeta vorax</i> Rousselet, 1902 *
<i>Filinia limnetica</i> (Zacharias, 1893) *	<i>Testudinella incisa</i> (Ternetz, 1892) *
<i>Floscularia ringens</i> (Linnaeus, 1758) *	<i>Testudinella mucronata</i> (Gosse, 1886) *
<i>Hexarthra intermedia</i> (Wiszniewski, 1929)	<i>Testudinella parva</i> (Ternetz, 1892) *
<i>Hexarthra mira</i> (Hudson, 1871)	<i>Testudinella patina</i> (Hermann, 1783)
<i>Hexarthra oxyuris</i> (Sernov, 1903) *	<i>Trichocerca cylindrica</i> (Imhof, 1891) *
<i>Hexarthra polyodonta</i> (Hauer, 1957) *	<i>Trichocerca elongata</i> (Gosse, 1851) *
<i>Kellicottia longispina</i> (Kellicott, 1879) *	<i>Trichocerca longiseta</i> (Schränk, 1802)
<i>Keratella cochlearis</i> (Gosse, 1851) *	<i>Trichocerca myersi</i> (Hauer, 1931) *
<i>Keratella quadrata</i> (Müller, 1786)	<i>Trichocerca porcellus</i> (Gosse, 1851) *
<i>Keratella tropica</i> (Apstein, 1907)	<i>Trichocerca pusilla</i> (Jennings, 1903)
<i>Keratella valga</i> (Ehrenberg, 1834) *	<i>Trichocerca stylata</i> (Gosse, 1851)
<i>Lecane bulla</i> (Gosse, 1851)	<i>Trichotria tetractis</i> (Ehrenberg, 1830)
<i>Lecane closteroerca</i> (Schmarda, 1859)	<b>Bdelloidea:</b>
<i>Lecane elsa</i> Hauer, 1931 *	<i>Dissotrocha macrostyla</i> (Ehrenberg, 1838) *
<i>Lecane furcata</i> (Murray, 1913)	<i>Embata laticeps</i> (Murray, 1905) *
<i>Lecane grandis</i> (Murray, 1913) *	<i>Habrotracha constricta</i> (Dujardin, 1841) *
<i>Lecane hamata</i> (Stokes, 1896)	<i>Macrotrachela quadricornifera</i> Milne, 1886 *
<i>Lecane lamellata</i> (Daday, 1893) *	<i>Philodina citrina</i> Ehrenberg, 1832 *
<i>Lecane leontina</i> (Turner, 1892) *	<i>Philodina roseola</i> Ehrenberg, 1832 *
<i>Lecane luna</i> (Müller, 1776) *	<i>Philodinavus paradoxus</i> (Murray, 1905) *
<i>Lecane lunaris</i> (Ehrenberg, 1832)	<i>Rotaria neptunia</i> (Ehrenberg, 1830)
<i>Lecane nana</i> (Murray, 1913) *	<i>Rotaria mucrura</i> Ehrenberg, 1832) *
<i>Lecane obtusa</i> (Murray, 1913)	<i>Rotaria rotatoria</i> (Pallas, 1766) *
<i>Lecane opias</i> (Harring & Myers, 1926) *	<i>Rotaria socialis</i> (Kellicott, 1888) *

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within a Central Asian context. In China, however, 447 species of rotifers have been reported, the most species-rich genera being *Lecane*, *Cephalodella*, *Trichocerca*, and *Brachionus* (Zhuge et al., 1998). In Southeast Asia, the most diverse genera are *Lecane* and *Brachionus* (Segers, 2001). This fauna contains a fair share of regional endemics (Segers, 2001); whether any of these reach the Eastern Provinces of Iran remains to be determined.

The Palearctic is the best studied zoogeographical region (1350 species: Segers, 2008). Iran forms part of this region and is located at its south-central part; its position makes it transitional between the Afrotropical and Oriental regions (Figure 3). Therefore, it can be expected to contain representative elements of all 3 regions. We found *Cephalodella maior*, *Lecane sympoda*, and *Notholca acuminata*, which have previously been recorded from both the Palearctic and Afrotropical regions, as well as *Lepadella punctata*, which is known from the Palearctic and Oriental regions. However, principle component analyses (PCA) (Figure 4) based on the Jaccard similarity index (Figure 5) suggest that the Iranian rotifer fauna is best characterized as Palearctic, as could be expected.

A majority of rotifers are widespread and cosmopolitan, whereas only a few species have restricted distributions (Segers, 2007). Species of *Brachionus* and *Trichocerca* inhabit either eutrophic

or oligotrophic waters, respectively (Sládeček, 1983; Saksena, 1987). Thus, the greater diversity of *Brachionus* species in our samples indicates that freshwater systems of Tehran province tend to be eutrophic.

The analysis of the Asian rotifer faunas reveals *Lecane* as the predominant genus, followed, in most cases, by one of the genera *Brachionus*, *Trichocerca*, *Cephalodella*, or *Lepadella*. The almost high diversity of rotifers appears to reflect the high diversity of the aquatic habitats of Tehran, and is representative of the whole of the Iranian rotifer fauna, in particular, the south and east of Iran, where tropical species are most likely. Because of its diverse geographic and climatic heterogeneity, the water bodies of Tehran are expected to support diverse faunas. On the other hand, this area of Tehran province is only about 1.2% of the total surface of the country, and the province is situated in the north; hence it is unlikely that its fauna has been thoroughly studied. This implies that a large number of rotifers are left to be reported from Iran.

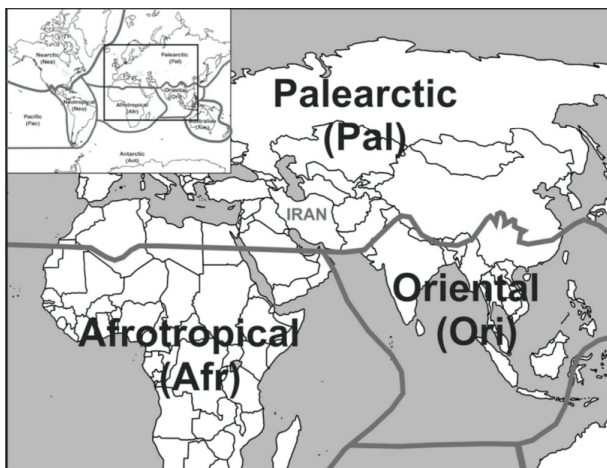


Figure 3. Situation of Iran in the Palearctic region. (after Segers, 2007, Zootaxa 1564).

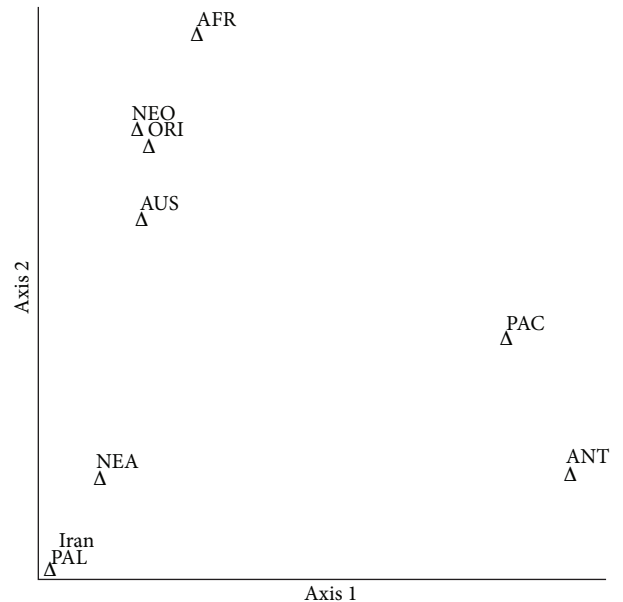


Figure 4. PCA analysis of the rotifer fauna of Tehran province (Iran) and those of major zoogeographical regions (AFR, Afrotropical; ANT, Antarctica; AUS, Australian; NEA, Nearctic; NEO, Neotropical; ORI, Oriental; PAL, Palearctic; PAC, Pacific).

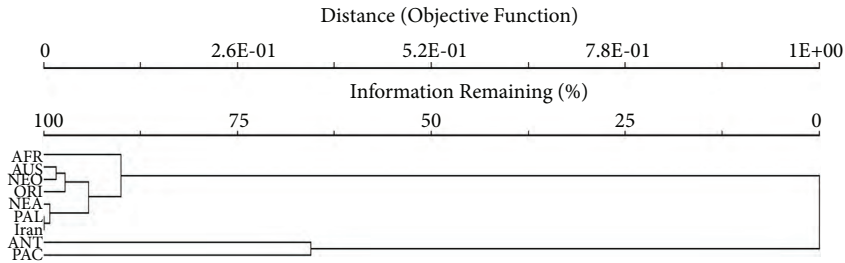


Figure 5. Dendrograph based of Jaccard similarity index of rotifer fauna of Tehran province (Iran) and those of the major zoogeographical regions (AFR, Afrotropical; ANT, Antarctica; AUS, Australian; NEA, Nearctic; NEO, Neotropical; ORI, Oriental; PAL, Palearctic; PAC, Pacific).

In conclusion, we strongly suggest studying representative habitats from all over Iran. Performing molecular analysis of the taxa encountered will most certainly reveal results in line with those for other taxonomic groups. Not only do we expect to report novel species from Iran in the future, but we also expect that reports coming from Iran will be remarkable concerning molecular taxonomy of the rotifers.

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### References

- Altındağ, A., Segers, H. and Kaya, M. 2009. Some Turkish rotifer species studied using light and scanning electron microscopy. *Turk. J. Zool.* 33: 73-81.
- De Smet, W.H. 1996. Rotifera. Vol. 4: The Proalidae (Monogonota). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World 9. SPB Academic Publishing.
- De Smet, W.H. and Pourriot, R. 1997. Rotifera, Vol. 5: The Dicanophoridae (Monogonota) and the Ituridae (Monogonota). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. SPB Academic Publishing.
- De Smet, W.H. 1998. Preparation of rotifer trophi for light and scanning electron microscopy. *Hydrobiologia.* 387/388: 117-21.
- Donner, J. 1965. Ordnung Bdelloidea (Rotatoria, Rädertiere). Berlin: Akademie-Verlag. 297pp.
- Dumont, H.J. and De Ridder, M.. 1987. Rotifer from Turkey. *Hydrobiologia* 147: 65-73.
- Kaya, M., Altındağ, A. and Sezen, G. 2008. The genus *Sinantherina* Bory de St. Vincent, 1826, a new record for the Turkish rotifer fauna. *Turk. J. Zool.* 32: 71-74.
- Kaya, M. and Altındağ, A. 2009. New record rotifer species for the Turkish fauna. *Turk. J. Zool.* 33: 7-12.
- Koste, W. 1978. Rotatoria. Die Rädertiere Mitteleuropas. Gebr. Borntraeger, Berlin, Stuttgart. 2 Vols.
- Löffler, H. 1959. Beiträge zur Kenntnis der Iranischen Binnenge Wässer. I. Der Nirzsee und sein Einzugsgebiet. *Int. Rev. Hydrobiol.* 44: 227-276.
- Löffler, H. 1961. Beiträge zur Kenntnis der Iranischen Binnenge Wässer. II. Regional-limnologische Studie Crustaceen Fauna. *Hydrobiol.* 46: 309-406.

- Ministry of Nature Protection, Yerevan. 1999. Republic of Armenia First National Report to the Convention on Biological Diversity Incorporating. Produced by the Ministry of Nature Protection, Yerevan, March 1999. 102 pp.
- Nogrady, T., Pourriot, R. and Segers, H. 1995. Rotifera. Vol. 3: The Notommatidae and the Scaridiidae. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World, 8. SPB Academic Publishing.
- Nogrady, T. and Segers, H. 2002. Rotifera. Vol. 6: Asplanchnidae, Gastropodidae, Lindiidae, Microcodidae, Synchaetidae, Trochosphaeridae and Filinia (Monogononta). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World (Zooplankton Guides). 18. Backhuys.
- Ricci, C. and Melone, G. 2000. Key to the identification of the genera of bdelloid rotifers. *Hydrobiologia*. 418: 73-80.
- Ruttner-Kolisko, A. 1974. Plankton Rotifers, biology and taxonomy. *Die innengewasser*, Vol. XXVI\1, Supplement.
- Saksena, D.N. 1987. Rotifers as indicators of water quality. *Acta hydrochimica et hydrobiologica*. 15: 481-485.
- Segers, H., Emir, N. and Merstens, J. 1992. Rotifera from north and northeast Anatolia (Turkey). *Hydrobiologia* 245: 179-189.
- Segers, H. and Dumont, H.J. 1993. Rotifers from Arabia, with description of two new species. *Fauna of Saudi-Arabia* 13: 3-26.
- Segers, H. 1995. Rotifera. Vol. 2: The Lecanidae (Monogononta). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. 6. SPB Academic Publishing, The Hague, The Netherlands.
- Segers, H. 2001. Zoogeography of the Southeast Asian Rotifera. *Hydrobiologia*. 446/447: 233-246.
- Segers, H. 2007. Annotated checklist of the rotifers (Phylum Rotifera), with notes on nomenclature, taxonomy and distribution. *Zootaxa*. 1564: 1-104.
- Segers, H. 2008. Global diversity of rotifers (Rotifera) in freshwater. *Hydrobiologia*. 595: 49-59.
- Shiel, R.J. and Koste, W. 1992. Rotifera from Australian inland waters. VIII. Trichocercidae (Rotifera: Monogononta). *Trans. R. Soc. S. Aust.* 116: 1-27.
- Sládeček, V. 1983. Rotifers as indicators of water quality. *Hydrobiologia*. 100: 169-201.
- Ustaoglu, M.R. 2004. A Check-list for Zooplankton of Turkish Inland Waters. *E.U. Journal of Fisheries & Aquatic Science*. 21: 191-199.
- Zhuge, Y., Huang, X. and Koste, W. 1998. Rotifera recorded from China, 1893-1997, with remarks on their composition and distribution. *Hydrobiology*. 83: 217-232.