

A TAXONOMICAL STUDY ON THE ROTIFER FAUNA OF CAPPADOCIA REGION (CENTRAL ANATOLIA, TURKEY)

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ABSTRACT

Many studies have been conducted on the rotifer species found in Turkey, but there are many regions that still remain to be investigated. Cappadocia (Nevşehir) is one such region that has not been studied in terms of diversity of the rotifer species. To our knowledge, the present study was the first to examine seasonal changes in rotifers in the Cappadocia region between February 2013 and April 2014. Seventy-two species of Rotifera belonging to 28 genera were recorded from 10 water bodies in the Nevşehir Province by repeatedly collecting samples in different seasons. Most species, (9, 13%) belonged to the genus *Lecane* followed by *Trichocerca* (7, 10%), *Brachionus* (7, 10%) and *Cephalodella* (5, 7%). From these results, we identified the richness of the Rotifera species in the Cappadocia region. All species that were found in this study were new records for each water source as well as for the Cappadocia (Nevşehir) region

KEYWORDS:

Rotifera, Nevşehir, biodiversity, taxonomy

INTRODUCTION

Rotifers are pseudocoelomate microorganisms that live in aquatic and limno-terrestrial ecosystems. They contribute to the second level of the food chain in aquatic ecosystems, and they provide an insight into the quality of the water body in which they live. More than 2030 species of rotifers have been identified worldwide [1]. Rotifera are common animals of aquatic systems, and there have been many publications on the Anatolian fauna of this group

Bekleyen and Taş conducted a study on Çernek Lake zooplankton fauna and they identified 18 rotifer species [2]. Ustaoglu et. al. reported 47 rotifer species from Sazlıgöl [3]. Altındağ and Yiğit, studied seasonal variation of zooplankton fauna of Beyşehir Lake and they observed 32 rotifera species [4]. Bozkurt reported 33 species from Yenişehir lake [5]. Erdoğan and Güher studied

Gala Lake and they identified 71 species belonging to rotifer [6]. Yıldız et al. reported 29 rotifera species from an eutrophic lake Marmara [7]. Didinen and Boyacı, reported 35 species from Hoyran Region in Egirdir lake [8]. Kaya and Altındağ, conducted a study from Gelingüllü Dam Lake and they report 54 Rotifera species [9]. Kaya et al. conducted a study in Turkey inland waters and they record 12 new species for the Turkey fauna [10]. Kaya and Altındağ, studied 9 different parts of Turkey and identified 13 rotifer species belonging to Lepadellidae and Trichocercidae and one of this species is new record for Turkey fauna [11]. Kaya and Altındağ, studied different water systems from Turkey and they observed 15 species belonging to Brachionidae one of this species is new record for Turkey [12]. Tellioglu and Akman aimed to figure out the rotifer fauna of Pertek region of Keban Dam lake and they reported 20 rotifera species [13]. Kaya et al. observed 18 rotifera species between Bismil and Batman provinces [14]. Kaya et al. presented 37 species belong to 20 genera from 6 different water body in Kayseri [15]. Kaya and Altındağ, recorded 47 rotifer species from 11 freshwater reservoir in Turkey [16]. Buyurgan et al., studied Asartepe Dam Lake zooplankton fauna and reported 43 rotifera species [17]. Bekleyen and İpek recorded 29 rotifera species from Lake Balıklıgöl (Şanlıurfa, Turkey) [18]. Saler, determined 8 rotifer species from Munzur stream [19]. Bekleyen et al., studied Tigris river basin and reported 175 rotifera species. 34 species of them are new record for rotifer fauna of Turkey [20]. Bekleyen studied Devegeçidi and Göksu dam lakes and 34 rotifer species collected from Devegeçidi Dam Lake and 28 species from Göksu Dam Lake [21, 22]. Bozkurt and Tepe studied zooplankton composition and water quality of lake Golbasi (Hatay-Turkey) and they determined 61 rotifer taxa [23]. A checklist is prepared by Ustaoglu, which is based on compilation of previous zooplankton studies carried out at Turkish inland waters. According to this checklist 341 rotifer species have been reported from Turkey [24].

Nevşehir is a vast plateau formed by accumulated ash and lava from the volcanic Erciyes and Hasan Mountains in Central Anatolia. The Kizilirmak River carved this plateau in depth in the

east–west direction. Furthermore, this area is fragmented into many deep valleys formed by the tributaries that flow into the Kizilirmak River from the north and south. This fragmentation resulted in the formation of many ponds of varying sizes. Climatologically, the Nevsehir is dry and hot during summer and cold and rainy during winter.

A research of the literature yielded no results on any studies regarding rotifers in the Cappadocia (Nevsehir) region. Therefore, the goal of this study was to present the rotifer fauna of the Cappadocia (Nevsehir) region.

MATERIALS AND METHODS

Samples location. This study carried out in April 2013 and February 2014. 10 different water bodies determined from Nevşehir Province (Figure 1.). 9 of this dam lake and 1 of Kizilirmak River Basin of Avanos ; Damsa Dam Lake (1st station), Sarlıdır Dam Lake (2nd station) Özkonak, Dam Lake (3rd Station) Ayhan Dam Lake (4th Station) , Kızılırmak River Basin (5th station), Karaburna Dam Lake (6th Station), Gülşehir Dam Lake (7th Station), Tuzköy Dam Lake (8th Station), Yalıntaş

Dam Lake (9th Station) and Tatlarin Dam Lake (10th Station).

The physical parameters (Ph, temperature, electrical conductivity and oxygen saturation) measured with multiparametre.

Sample collection. A Hensen type Hydro-Bios Kiel plankton net (with a 20 cm edge diameter and 55 µm eye diameter) made from nylon screen cloth was used to gather Zooplankton samples. The samples were taken in two ways: vertically and horizontally. The gathered zooplankton samples were put in 500 ml plastic bottles and formaldehyde (4%) was added.

Species identification. Rotifers were identified according to followed Koste, Edmondson and Segers [25–27]

RESULTS

72 species of Rotifera belonging to 28 genera were recorded from ten water bodies in Nevşehir Province, collecting repeated samples in different seasons (April, July, September, 2013 and, February 2014) (Table 1).

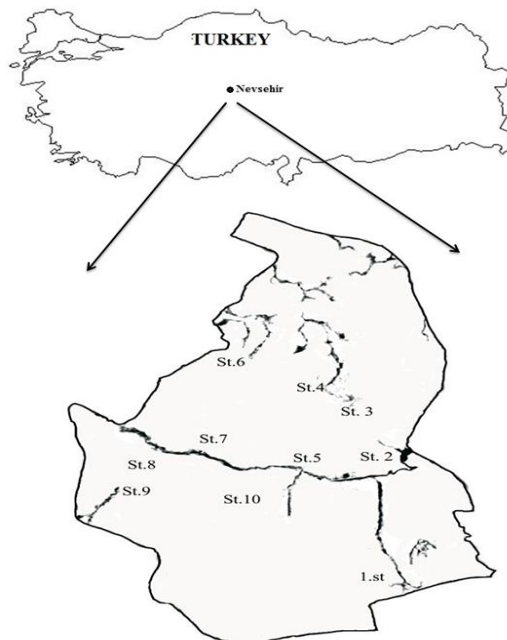


FIGURE 1
Map of study area and stations

TABLE 1
List of zooplankton taxa recorded from Nevsehir province

	spring										Summer										autumn										winter									
	stations										Stations										stations										stations									
											1										1										1									
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
<i>Ascomorpha ecuadis</i>														+				+	+										+				+							
<i>A. saltans</i>																			+										+											
<i>Asplanchna girodi</i>																			+										+											
<i>A.priodonta Gosse</i>	+		+	+	+	+	+	+	+		+	+	+	+	+				+	+							+	+				+	+							
<i>Brachionus plicatilis</i>		+									+		+													+	+						+							
<i>B. angularis</i>		+		+	+	+	+					+					+	+	+						+	+				+	+	+								
<i>B. calyciflorus</i>	+	+		+		+						+	+													+							+							
<i>B. leydigii Cohn</i>											+															+	+	+	+	+										
<i>B. quadridentatus</i>																+	+									+	+						+							
<i>B. urceolaris</i>																											+	+						+						
<i>B rubens</i>																																								
<i>Cepholedella intuta</i>	+			+		+					+	+																		+	+									
<i>C. forficula</i>																												+	+			+								
<i>C. catellina</i>		+		+							+																							+						
<i>C. gibba</i>	+		+									+																		+	+	+			+					
<i>C. ventripes</i>			+									+																		+				+						
<i>Colurella adriatica</i>																															+	+								
<i>C. colurus</i>																																			+					
<i>C. obtusa</i>												+	+															+				+								
<i>Conichilus dossuarius</i>	+	+	+																																+					
<i>C. unicornis</i>																																				+				
<i>Diclonophorus sp.</i>																																								
<i>Encentrum saundersiae</i>			+		+								+																							+				
<i>Euchlanis dilatata</i>																																			+	+				
<i>E. lyra</i>																																					+			
<i>E. deflexa</i>																																					+			
<i>Filinia cornuta</i>																																								
<i>F. longiseta</i>																																			+					
<i>F. terminalis</i>		+		+		+					+																									+				
<i>Hexertha fennica</i>																																						+		
<i>H. mira</i>																																			+	+				
<i>Kellicotia longispina</i>																																						+		
<i>Keratella cochlearis</i>	+	+	+	+	+	+	+	+	+																												+	+		
<i>K. quadrata</i>	+	+	+	+	+	+		+																														+		

<i>K. tecta</i>	+++	+++	++	+	+	+	+	+	+	+	+	
<i>K. tropica</i>	+	+										+
<i>Lapedella patella</i>		+										+
<i>L. ovalis</i>			+								+	+

Table 1 (continued)

<i>L. closterocerca</i>												+	
<i>L. hamata</i>												+	+
<i>L. luna</i>	+											+	
<i>L. inermis</i>												+	
<i>L. lunaris</i>												+	++
<i>L. nana</i>													
<i>L. stenroosi</i>												+	+
<i>L. flexilis</i>												+	+
<i>Lindia torulosa</i>		+											
<i>Monomata</i>													
<i>dentata</i>		+											
<i>Mytilina</i>													
<i>mucronata</i>		+	+									+	+
<i>Notholca salina</i>	+	+	+	+									+
<i>N. acuminata</i>			+										
<i>N. squamula</i>	++											+	+
<i>Pleurotrocha</i>													
<i>petromyzon</i>													
<i>Platyas</i>													
<i>quadricornis</i>													+
<i>P. dolichoptera</i>	++	++	++	++	++	++	++	++	++	++	++	++	++
<i>P. major</i>													+
<i>Proales fallaciosa</i>													+
<i>Pompolyx sulcata</i>													+
<i>Scaridium</i>													
<i>longicaudum</i>													+
<i>Syncetha oblonga</i>	+++++												+
<i>S. pectinata</i>	++++												+
<i>Testudinella</i>													
<i>patina</i>	+												+
<i>Testudinella</i>													
<i>truncata</i>													+
<i>Trichocerca</i>													
<i>bidens</i>	++												+
<i>T. longiseta</i>													+
<i>T. porcellus</i>													+
<i>T. pusilla</i>													+
<i>T. rattus</i>	++												+
<i>T. similis</i>													+
<i>T. weberi</i>	+												+
<i>Trichotria</i>													
<i>pocillum</i>													+
<i>T. tetractis</i>													+

DISCUSSION

A checklist was prepared by Ustaoglu et al. based on the compilation of previous zooplankton studies conducted in Turkish inland waters. In that study, the genus *Lecane* was dominant with 46 species followed by *Cephalodella* (22 species), *Trichocerca* (21 species) and *Brachionus* (15 species) [24]. In the present study, a majority of species belonged to the genus *Lecane* (9. 13%) followed by *Trichocerca* (7. 10%), *Brachionus* (7. 10%) and *Cephalodella* (5. 7%).

In the checklist, Ustaoglu et al. categorized rotifers into three main groups according to their distribution: 'recorded from only 1–5 localities, recorded from 6–10 localities, recorded from >10 localities' [24]. In our study, most species could be included in the 'recorded from 6–10 localities and recorded from >10 localities' categories. However, the species *L. torulosa*, *P. major*, *N. salina*, *C. intuta* and *P. fallicosia* fell into the 'recorded from only 1–5 localities' category.

In the Turkish checklist, Ustaoglu et al. identified 293 monogonont rotifers [24]. In contrast, in the present study, we identified 72 species, indicating that in terms of diversity of the species, the Cappadocia region constitutes up to 23% of all rotifers in Turkey.

Akbulut et al. investigated relationship between zooplankton (rotifera) distribution and physico-chemical variables in Uluabat Lake (Turkey) and they found that; rotifera was dominant in the cold period and concluded that rotifer Rotifer communities were influenced by physical factors such as temperature [28]. It is reported that although *Keratella tropica* and *K. quadrata*, which are resistant to significant temperature variations, live scattered among plants in still or slow waters and are commonly found during summer, the more temperature-sensitive *Testudinella patina* is more commonly found during the spring and autumn [29]. Our findings support this study; *K. tropica* and *K. quadrata* were seen in all seasons, but *T. patina* species were found in more stations in spring and autumn.

On examining the diversity of rotifer species, it was seen that the dominant species were similar in all stations. In terms of diversity found in the stations, the 10th Station (Tatlarin Dam) had the least diversity in all seasons, whereas the 8th (Yalintas Dam) and 9th (Tuzkoy Dam) Stations had maximum diversity. According to Bozkurt, *Pompholix sulcata*, *Brachionus angularis*, *Filinia longiseta*, *K. cochlearis* and *K. tecta* are eutrophication indicators [30]. These species were found as the dominant species at the 10th Station; for this reason, it is concluded that the low number of species is an eutrophication indicator.

Altındag et al. reported that in aquatic ecosystems, a positive correlation occurs between

species richness and temperature [31]. In the present study, we found that the richness of species was greater in summer than in winter.

Seasonal variation in the richness of zooplankton species varies depending on regions and climatic conditions. Yiğit and Altındağ, identified 29 species in autumn and 9 in winter [32]. Saler, identified 13 species in summer and 3 in winter [33]. Bozkurt and Güven (2010) identified 50 species in spring and 20 in summer [29]. In the present study, we identified 63 species in autumn and 30 in winter. It is seen that species richness varies according to the study area and sampling period. This difference can be derived from various geographic regions, sampling type, sampling frequency, temperature difference in each year and climatic changes.

Kaya and Altındağ, reported that the following were the cosmopolitan species of central Anatolia: *Asplanchna priodonta*, *B. angularis*, *B. quadridentatus*, *Cephalodella gibba*, *Colurella adriatica*, *C. colurus*, *Euchlanis dilatata*, *F. limnetica*, *F. terminalis*, *K. cochlearis*, *K. quadrata*, *Lecane bulla*, *L. closterocerca*, *L. luna*, *L. lunaris*, *Lepadella patella*, *Notholca squamula*, *Polyarthra vulgaris*, *Synchaeta pectinata* and *Trichotria pocillum* [9, 10, 34] Our study supported these findings by also identifying these species.

In conclusion, in this study, the diversity of rotifer species in the Cappadocia region was presented for the first time. All species that were found in this study were new records for each water source as well as for the Cappadocia (Nevşehir) region.

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