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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

Investigations on the zooplankton distribution and composition of Işıklı Lake (Çivril-Denizli/Türkiye), with a trophic status assessment

Işıklı Gölü (Çivril-Denizli/Türkiye) zooplankton dağılımı ve kompozisyonunun trofik durum değerlendirmesi ile araştırılması

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Abstract: In this study, the zooplankton distribution and composition of Işıklı Lake, located in the Inner West Anatolia region of Türkiye, were examined monthly between 2003-2005. Zooplankton samples were collected with Hydro-Bios plankton net (55 µm) at the surface and fixed in formaldehyde (4 %). Physiological parameters such as surface water temperature, pH, dissolved oxygen, and conductivity were also measured. Also, the frequency index (F %) and the *Brachionus* / *Trichocerca* ($Q_{B/T}$) were determined to assess the trophic composition of Lake Işıklı. A total of 49 species have been identified. Rotifera (55 %), Cladocera (27 %) and Copepoda (18%) were represented by the species. The maximum species was found in May 2004 (21 species), while the minimum was found in October 2003 (5 species). *Asplanchna priodonta, Keratella cochlearis, Keratella tecta, Polyarthra dolichoptera, Synchaeta pectinata, Bosmina longirostris* and *Chydorus sphaericus* are common species in the lake. The water temperature varied between 3.9-24.6 °C; pH ranged from 8.1 to 8.8; the electrical conductivity ranged from 341 µS/cm to 434 µS/cm; the dissolved oxygen values changed from 5.8 mg/L to 11.1 mg/L. According to the frequency index (F %), the most dominant species are *B. longirostris* (74 %), *K. cochlearis* (62 %), *A. priodonta* (54 %), and *C. sphaericus* (51 %). A total of 20 species are reported for the first time from the region. Newly reported species from the lake were: the rotifers, *A. priodonta, Brachionus angularis, Brachionus calyciflorus, Colurella colurus, Keratella quadrata, Lecane clostrocerca, Lecane ludwigi, Lecane luna, Lecane lunaris, Lecane ohioensis, Lecane quadridentata, Lecane* sp., *Mytilina mucronata, Notholca acuminata, Notholca squamula, Trichotria tetractis,* the cladocerans *Acroperus harpae, Daphnia cucullata,* and the copepods *Eucyclops macrurus* and *Megacyclops gigas*. Considering the *Brachionus* / *Trichocerca* ($Q_{B/T}$) ratio according to the Sládeček (1983) index, the lake showed mesotrophic features.

Keywords: Mesotrophic level, Işıklı Lake, Rotifera, Cladocera, Copepoda

Öz: Bu çalışmada Türkiye'nin İç Batı Anadolu bölgesinde yer alan Işıklı Gölü'nün zooplankton dağılımı ve kompozisyonu 2003-2005 yılları arasında aylık olarak incelenmiştir. Zooplankton örnekleri yüzeyden Hydro-Bios plankton ağı (55 µm) ile toplanmıştır ve formaldehit (% 4) içerisine sabitlenmiştir. Yüzey suyu sıcaklığı, pH, çözünmüş oksijen ve elektriksel iletkenlik gibi bazı fizikokimyasal parametreler de ölçülmüştür. Ayrıca Işıklı Gölü'nün trofik kompozisyonunu değerlendirmek amacıyla frekans indeksi (% F) ve *Brachionus / Trichocerca* ($Q_{B/T}$) belirlenmiştir. Toplam 49 tür tespit edilmiştir. Rotifera (%55), Cladocera (%27) ve Copepoda (%18) türleri tarafından temsil edilmiştir. Maksimum tür Mayıs 2004'te (21 tür), minimum tür ise Ekim 2003'te (5 tür) bulunmuştur. *Asplanchna priodonta, Keratella cochlearis, Keratella tecta, Polyarthra dolichoptera, Synchaeta pectinata, Bosmina longirostris* ve *Chydorus sphaericus* gölde yaygın olarak görülen türlerdir. Su sıcaklığı 3,9-24,6 °C arasında; pH 8,1 ila 8,8 arasında; elektriksel iletkenlik 341 µS/cm ile 434 µS/cm arasında; çözünmüş oksijen değerleri 5,8 mg/L'den 11,1 mg/L'ye kadar değişmiştir. Sıklık indeksine (% F) göre en baskın türler *B.longirostris* (%74), *K. cochlearis* (%62), *A. priodonta* (%54) ve *C. sphaericus* (%51)'dur. Bölgeden ilk kez toplam 20 tür rapor edilmiştir. Gölde yeni bildirilen türler: rotifera, *A. priodonta, Brachionus angularis, Brachionus calyciflorus, Colurella colurus, Keratella quadrata, Lecane clostrocerca, Lecane ludwigi, Lecane luna, Lecane lunaris, Lecane ohioensis, Lecane quadridentata, Lecane* sp., *Mytilina mucronata, Notholca acuminata, Notholca squamula, Trichotria tetractis*, cladocera *Acroperus harpae, Daphnia cucullata* ve copepoda *Eucyclops macrurus* ve *Megacyclops gigas*. Sládeček (1983) indeksine göre *Brachionus* / *Trichocerca* ($Q_{B/T}$) oranı dikkate alındığında; göl mezotrofik özellik göstermiştir.

Anahtar kelimeler: Mesotrofik seviye, Işıklı Gölü, Rotifera, Cladocera, Copepoda

INTRODUCTION

In freshwater and aquatic ecosystems, zooplankton is an essential component in the food web, carbon transfer, suppressing phytoplankton abundance (Bozkurt and Genç, 2018; Çolak and Alper, 2020; Karpowicz and Ejsmont-Karabin, 2021; Özdemir et al., 2021). Cladocera, Copepoda and Rotifera are the main representatives of zooplankton. While zooplankton is an essential indicator of the health of the ecosystem (Ateş and Kırkağaç, 2020), the Rotifera group is also an important indicator of the water quality, pollution and eutrophication process (Altındağ, 2000). They are also highly suitable for biological monitoring of water quality, as environmental changes strongly influence them and because of their rapid response to changes in water quality (Chalkia and Kehayias, 2013; Saler and Selamoğlu, 2020). Indeed, although zooplankton is still not included, according to the implementation of the EU Water Framework Working Directive

as a biological quality indicator for aquatic ecosystems, several studies have shown its usefulness as an indicator of changes in the trophic dynamics and ecological status of lakes related to nutrient loading and climate changes (Jeppesen et al., 2011). Zooplanktonic organisms constitute the primary food source of fish in freshwater sources and they constitute the leading food of many pelagic-feeding fish species and young periods of demersal-feeding fish (Gürleyen and Ustaoğlu, 2017). Zooplanktonic organisms, which form the second food pyramid ring in fresh waters, are essential in ensuring the continuity of the material and energy cycle (Bulut et al., 2021). Rotifera group is an indicator for determining water quality and trophic status (Muñoz-Colmenares et al., 2021). Long-term limnological studies, especially research on water chemistry and zooplankton, are effective in the management of water bodies (Nandini et al., 2008). It has been stated that the rotifer community structure, which changes from lake to lake, can indicate the lake's real-time environmental health (Umi et al., 2017).

Işıklı (Çivril) Lake is within the scope of Class A wetland according to the International Ramsar Convention. It is at an altitude of about 800 m and its area is around 3500 ha. It is fed by Işıklı Springs, Büyük Menderes River, Karanlık Creek and Kufi Stream (Anonymous, 2022). When the studies carried out in Işıklı Lake are examined chronologically, the Çivril Lake limnological research project was carried out by Anonymous (1992). In addition, there are limited number of zooplankton studies that have been done before in Çivril Lake (Gündüz, 1997; Aygen and Balık, 2005; Barinova et al., 2014). This research aims to study the zooplankton species comprehensively, to present them in detail with their monthly distributions, and to compare the results with the previous state of the lake. It is thought that the studies in which Rotifera, Cladocera and Copepoda groups are presented as a whole will form an important infrastructure for future studies in ecological terms.

MATERIALS AND METHODS

Zooplankton sampling was carried out monthly from 2 stations in Işıklı Lake between 2003 (only January, September, October, November, December),2004 (all months from January to December) and 2005 (January, February, March) (Figure 1). Located in the Çivril district of Denizli province, the lake's average water level area is 64.53 km^2, and its depth is 7 m. (Uysal et al., 2006). 1st station is close to the residential area and there is no water inlet or outlet at this station. The ground is loamy and the vegetation is sparse and shallow. 2nd station is the area where irrigation gates are located. There is a partial water exchange. Gökgöl incoming water exits from the area close to the steam station. There are aquatic plants and reeds, and it is deeper than the 1st station. Zooplankton samples were taken horizontally with a plankton net (mesh size of 55 µm, diameter = 57 cm), and samples were fixed with formaldehyde (4%) immediately after collection in 250 ml bottles. Species were examined under a binocular microscope (Olympus model) and the species were determined to the species level using the keys of Kiefer (1952, 1955), Dussart (1967, 1969), Koste (1978), Negrea (1983), Smirnov (1996), Nogrady and Segers (2002). Also, a zooplankton species checklist was prepared according to Ustaoğlu (2004) and Ustaoğlu et al. (2012). Soyer's (1970) frequency index (F %) was used to define the frequency of species in the study area. Results were determined as constant (F ≥ 50%), common (50% > F ≥ 25%), or rare (F < 25%). Regardless of the Soyers index; few, abundant and most abundant indicators expressed in Table 1. The values are observed qualitatively at the stations every month. *Brachionus*/*Trichocerca* coefficient ($Q_{B/T}$) was calculated to evaluate the trophic structure of Işıklı Lake. In this formula, Sládeček (1983) stated that a quotient of 1 indicates oligotrophic conditions, while a quotient between 1 and 2 corresponds to mesotrophic conditions, and a ratio of >2 is encountered in eutrophic lakes. In the simultaneous study where fishing research was carried out in Lake Işıklı; Some measurements of water quality were taken in July-December 2004 and January-March 2005. Water quality values are presented additionally for data recording in the study. Temperature and pH were recorded with a WTW electrode sentix 41 pH meter, dissolved oxygen was measured with a WTW CellOx-325 type oxygen meter, and electrical conductivity was measured using a WTW tetracon 325 type conductivity meter.

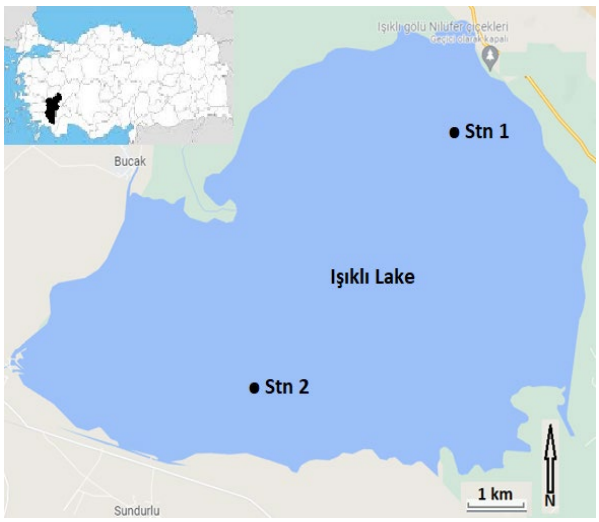

Figure 1. The study area and stations (**Stn 1:** 38°14'44.6"N, 29°55'55.1"E; **Stn 2:** 38°12'40.9"N, 29°52'15.6"E)

RESULTS

A total of 49 species, 27 from Rotifera, 13 from Cladocera and 9 from Copepoda, were identified in Lake Işıklı (Table 1). The most common group is Rotifera. The distribution of zooplankton groups by stations is shown in Figure 2.

When evaluated according to the frequency index, 4 species (F ≥ 50%) were classified as constant, 8 species (50% > F ≥ 25%) were classified as common, and 37 species (F < 25%) were classified as rare. Among these dense species, *B. longirostris* was determined with the highest frequency (74%) in almost all months.

Table 1. Zooplankton species list of Lake Işıklı (2003-2005) (+: Few; ▲: Abundant; *: Most Abundant)

	2003									2004																								2005						
	Jan	Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		
	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	F%
ROTIFERA																																								
Asplanhna priodonta	+	+	+			+	+	▲		+				+		*	*	▲	▲	▲	▲				+	+						+	+	+		+	+			54
Brachionus calyciflorus						+				+									+	+																				10
Brachionus angularis																			+						+															5
Brachionus quadridentatus																										+														3
Colurella colurus																					+					+		+	+											10
Euchlanis dilatata										+						+				+	+					+							+			+		+	+	23
Keratella cochlearis	+					+	+	+		+		+		+		▲	+	+	+	*	+					+				+	+	+	+	+	*	*	*	*	*	62
Keratella tecta	+					+	+			+				+				+	+		+							+	+		+							+		31
Keratella quadrata	+							+		+		+		+		+	+		+	+									+		+	+	+	+	+	▲	*	+	+	49
Polyarthra dolichoptera						+	+	+		+				+					+		+					+		+	+		+		+	+	+	+	+	+	+	46
Synchaeta pectinata	+					+	+			+																		+		+		+	+	+	▲	+	+	+		33
Testudinella patina					+											▲			+	*				+						▲	+	+	+			+				26
Lecane bulla																				+				+	+	+				+						+				15
Lecane clostrocerca																									+	+		+		+	+					+	+			18
Lecane ludwigi																									+	+									+					8
Lecane luna																		+						+		+					+	+								10
Lecane lunaris																		+			+			+	+	+		+								+	+			21
Lecane ohiensis																										+				+	+							+		10
Lecane quadridentata																				+				+	+	+														10
Lecane sp.																													+											3
Lepadella sp.														+																										3
Mytilina mucronata	+																			+					+											+				8
Notholca acuminata														+																						+	+			8
Notholca squamula														+																				+		+	+		+	13
Trichocerca similis																		+	▲	+	+				+			+	+											18
Trichotria pocillum														+					+							+							+	+						13
Trichotria tetractis																														+					+		+			8
CLADOCERA																																								
Acroperus harpae														+					+																					5
Alona guttata																	+						+															+		8
Alona rectangula	▲					*	▲	+		+						+				+			+			+				▲	+	+	+			+		+		38
Bosmina longirostris	*	+	*		*	*	*	*		+		*				+	▲	+	▲	*	▲		*	*	*	+		▲	▲	*	▲	+	+	+	+	+	*	▲		74
Ceriodaphnia pulchella		▲	+			+	+												+		+			▲						+	+									23
Chydorus sphaericus	*									+		+		+		+	▲		*	+					+	+				+	+	+	+	+	+	*	*	*	▲	51
Daphnia cucullata		+			+		+	+								+	+		+					+									+				+			26
Daphnia longispina																						+																		3
Diaphanasoma brachyurum		+	▲			+	+												+				+	▲	▲							+								23
Disparalona rostrata					+																		*																	5
Graptoleberis testudinaria	+																																+							5
Pleuroxus aduncus	▲									+				+		+	+		+												+	+	+		+	+	+	+	+	36
Simocephalus vetulus										+																														3
COPEPODA																																								
Eucyclops macruroides										+									+																				+	8
Cyclops abyssorum						▲																														+	+			8
Cyclops strenuus	+						▲	▲		+																														10
Cyclops vicinus	+							▲		+		+										*										+								15
Eucyclops serrulatus			+																																					3
Eucyclops speratus	+																																+							5
Eucyclops macrurus			+																																					3
Megacyclops gigas										+																														3
Canthocamptus staphylinus	+				+							+		+					+					+						+			+							21
Total species in months	**15**	**7**		**5**		**13**		**9**		**17**		**6**		**13**		**11**		**21**		**18**		**7**		**17**		**17**		**10**		**17**		**19**		**12**		**20**		**14**		

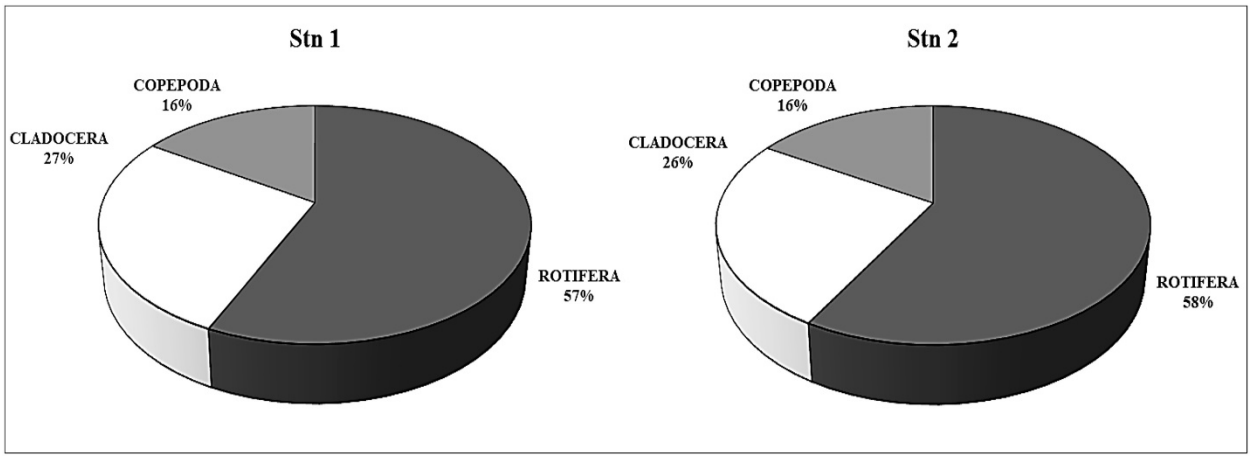

Figure 2. Distribution of zooplanktonic groups in Lake Işıklı

K. cochlearis (62%), *A. priodonta* (54 %), *C. sphaericus* (51%), *K. quadrata* (49%), *P. dolichoptera* (46%), *P. aduncus* (36%) and *S. pectinata* (33%) are other zooplanktonic organisms that are frequently seen (Table 1). The most representative Rotifera were Brachionidae (8 species) and Lecanidae (8 species). *Brachionus quadridentatus* from Rotifera was only seen at Station 1 in September 2004, *Lecane* sp. at station 2 in October 2004, and *Lepadella* sp. at station 1 in March 2004.

The rotiferans recorded only during the autumn and winter were *B. quadridentatus, Lecane* sp., *Notholca acuminata, N. squamula* and *Lecane ohiensis*. The Cyclopoidae (8 species) and Harpacticoidae (1 species) were observed between the Copepoda. Copepoda species were most abundant, mainly in the autumn and winter seasons. *Eucyclos macrurus* from Copepoda was only seen at station 2 in September 2003, and *Megacyclops gigas* was only at station 1 in January 2004. Among the Cladocera, Chydoridae (7 species) and Daphniidae (4 species) were the richest families. In addition, *Daphnia longispina* from Cladocera was found only at station 1 in July 2004, and *Simocephalus vetulus* was found only at station 1 in January 2004 (Table 1). When some physicochemical measurements between July 2004 and March 2005 were evaluated, it was determined that the conductivity was maximum in December 2004, the water temperature was maximum (24.6 °C) in August 2004, and the dissolved oxygen was low (5.8 mg/L). Monthly average values of the stations in water quality measurements are given in Table 2.

Table 2. Some physicochemical parameters of Işıklı Lake (average values of the first and second stations)

Months	Temperature (°C)	Dissolved oxygen (mg/L)	Conductivity (µS/cm)	pH
July-2004	22.5	7.6	341	8.7
August-2004	24.6	5.8	356	8.5
September-2004	19.3	9.3	356	8.7
October-2004	15.8	9.0	348	8.8
November-2004	5.0	11.1	357	8.6
December-2004	3.9	9.0	434	8.3
January-2005	5.7	12.2	414	8.3
February-2005	8.4	9.6	413	8.1
March-2005	10.5	10.4	389	8.2

DISCUSSION

In the previous study in Işıklı Lake, some Cladocera species (4 species) (Gündüz, 1997) were reported. In addition, there are studies published on Cladocera and Copepoda fauna (28 species) in 2005 (Aygen and Balık, 2005), and on some zooplankton groups (25 species) in 2014 (Barinova et al., 2014). 49 species were identified in this study, the Rotifera group being the dominant group of 55%. Compared to the study of Barinova et al. (2014), 10 Rotifera species were similar to the research results, while 5 Rotifera species were not found in this study. However, 17 Rotifera species were identified for the first time in this study. While 7 species from Cladocera were similar to those of Barinova et al. (2014), and 6 Cladocera species were identified for the first time in this study. *C. quadrangula* and *D. lacustris* species were reported only in Gündüz (1997). While *M. gigas* from Copepoda was detected only in this study, *M. albidus, M. viridis*, and *A. robustus* species were found only in Gündüz (1997) (Table 3).

Sládecek, (1983) Rotifera index (QB/T) was studied in different lakes. For example, Çaygören Reservoir (Balıkesir/ Türkiye) QB/T=1.5 (Çelik et al., 2019); Kemer Dam Lake (Aydın- Türkiye QB/T=1 (Tuna and Ustaoğlu, 2016); River Haraz (Northeast Iran) QB/T=1.5 (Jafari et al., 2011); Paraná River (Brazil) QB/T=1.3 (Golec-Fialek et al., 2021); Egirdir Lake (Isparta, Türkiye) QB/T=1.3 (Apaydın Yağcı et al., 2014) studies showed mesotrophic status in terms of zooplankton. This research showed a uniform situation with the examples given above QB/T=2.

Some zooplankton species identified in this study (*A. priodonta, K. quadrata, K. cochlearis, D. cucullata, C. abyssorum*) were determined in the study conducted in Kemer Dam Lake (Tuna and Ustaoğlu, 2016) with pH values of 7.97-8.83, dissolved oxygen values varied between 7.5-10.5 mg/L, water temperature values varied between 9.8-27.7 °C, and conductivity values varied between 206-601 $\mu S_{25°C}$. In addition, in the study conducted in Çaygören reservoir (Çelik et al., 2019), *A. priodonta, K. cochlearis, B. longirostris, E. speratus, C. vicinus, C. pulchella, D. longispina* species; It has been determined that they live in the pH range of 8.2-11.1 and

temperature range of 4-26.6°C. In this study, the mentioned species had pH 8.1-8.8, dissolved oxygen values 5.8-12.2 mg/L, temperature 3.9-24.6 °C, and electrical conductivity values between 341-434 µS/cm. As seen in the Işıklı Dam lake, most lakes and dam lake ecosystems are dominated by Rotifera, followed by the Cladocera and Copepoda groups (Tuna and Ustaoğlu, 2016; Tugyan and Bozkurt, 2019; Golec-Fialek et al., 2021; Bulut et al., 2021). Calanoid and cyclopoid copepod species are important criteria in defining water resources' quality and trophic status (Muñoz-Colmenares et al., 2021). It has been reported that Cyclopoid copepod predation may be effective in hypertrophic waterbodies (Sarma et al., 2019). Among determined species *P. dolichoptera, K. cochlearis, B. quadridentatus, B. angularis, B. calyciflorus, B. longirostris, C. sphaericus, G. testudinaria* are the most well-known indicators of mesotrophic-eutrophic waters (Frutos et al., 2009; Apaydın Yağcı et al., 2014; Tuna and Ustaoğlu, 2016; Macêdo et al., 2019).

Table 3. Chronological change of zooplankton in Işıklı Lake (●: present in the related study)

Species	Gündüz (1997)	Aygen and Balık (2005)	Barinova et al. (2014)	This study
ROTIFERA				
Asplanchna priodonta Gosse, 1850				●
Brachionus angularis Gosse, 1851				●
Brachionus calyciflorus Pallas, 1776				●
Brachionus quadridentatus Hermann, 1783			●	●
Colurella adriatica Ehrenberg, 1831			●	●
Colurella colurus(Ehrenberg, 1830)				●
Euchlanis dilatata Ehrenberg 1832			●	●
Hexarthra mira Hudson, 1871			●	
Keratella cochlearis Gosse, 1851			●	●
Keratella tecta Gosse, 1851			●	●
Keratella quadrata (Müller, 1786)				●
Lecane bulla Gosse, 1886			●	●
Lecane closterocerca (Schmarda, 1859)				●
Lecane ludwigi (Eckstein, 1883)				●
Lecane luna (Müller, 1776)				●
Lecane lunaris (Ehrenberg, 1832)				●
Lecane ohioensis (Herrick, 1885)				●
Lecane quadridentata (Ehrenberg, 1830)				●
Lecane sp.				●
Lepadella sp.				●
Mytilina mucronata (Müller, 1773)				●
Notholca acuminata (Ehrenberg, 1832)				●
Notholca squamula (Müller, 1786)				●
Polyarthra dolichoptera Idelson, 1925				●
Polyarthra vulgaris Carlin, 1943			●	
Synchaeta oblonga Ehrenberg, 1831			●	
Synchaeta pectinata Ehrenberg, 1832			●	●
Testudinella patina Herman, 1783			●	●
Trichocerca longiseta Schrank, 1802			●	
Trichocerca similis Wierzejski, 1893			●	●
Trichocerca pusilla Harring, 1913			●	
Trichotria pocillum Müller, 1773			●	●
Trichotria tetractis (Ehrenberg, 1830)				●
CLADOCERA				
Acroperus harpae (Baird, 1834)				●
Alona guttata Sars, 1862		●	●	●
Coronatella rectangula Sars, 1862		●	●	●
Alona (*Biapertura*) *affinis* (Leydig, 1860)		●	●	
Bosmina longirostris (O.F. Müller, 1785)	●	●	●	●
Ceriodaphnia pulchella Sars, 1862		●	●	●
Ceriodaphnia quadrangula (O.F. Müller, 1785)	●			
Chydorus sphaericus (O.F. Müller, 1785)		●	●	●
Daphnia cucullata (GO Sars, 1862)				●
Daphnia longispina O.F. Müller, 1785	●	●	●	●
Diaphanosoma brachyurum (Lievin, 1848)		●	●	●
Diaphanasoma lacustris (Korinek, 1981)	●			
Diaphanosoma mongolianum Ueno, 1938		●		
Disparalona rostrata (Koch, 1841)		●		●
Groptoleberis testudinaria(Fischer, 1851)		●		●
Leydigia leydigi (Schoedler, 1863)		●		
Macrothrix laticornis (Jurine, 1820)		●		
Moina micrura Kurz, 1874		●		
Pleuroxus aduncus Baird, 1850		●		●
Simocephalus vetulus (O.F. Müller, 1776)		●		●
COPEPODA				
Macrocyclops albidus (Jurine, 1820)		●		
Eucyclops serrulatus (Fischer, 1851)		●		●
Eucyclops speratus (Lilljeborg, 1901)		●		●
Eucyclops macrurus (GO Sars, 1863)				●
Eucyclops macruroides Lilljeborg, 1901		●		●
Metacyclops gracilis (Lilljeborg, 1853)		●	●	
Mesocyclops leuckarti (Claus, 1857)		●	●	
Cyclops vicinus Uljanin, 1875		●		●
Cyclops abyssorum Sars, 1863		●		●
Cyclops strenuus Fischer, 1851		●		●
Megacyclops gigas (Claus, 1857)				●
Megacyclops viridis Jurine, 1820		●		
Acanthocyclops robustus (Sars, 1863)		●		
Canthocamptus staphylinus (Jurine, 1820)		●		●

CONCLUSION

According to the results of this study, Işıklı Lake showed mesotrophic characteristics in terms of zooplankton. Compared to the previous studies in the lake, the zooplankton fauna was comprehensively studied in this study and contributed to the biodiversity fauna of Türkiye. The fact that the number of species of the Rotifera group was dominant compared to Cladocera and Copepoda and, when evaluated in terms of species, showed that the trophic structure of the lake was mesotrophic. The dominance of the *Cyclops* group, which is one of the eutrophic species, shows that the lake may progress from the mesotrophic feature to the eutrophic state.

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AUTHORSHIP CONTRIBUTIONS

All authors contributed equally to the planning, execution, and field and laboratory work of this study.

CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

ETHICS APPROVAL

Ethics Committee approval certificate is not required for invertebrates. For this reason, Ethics Committee Certificate was not obtained in this study.

DATA AVAILABILITY

All relevant data is in the article.

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