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Assessment of Zooplankton Community Structure and Trophic State in Boraboy Lake (Amasya, Türkiye)

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A B S T R A C T

This study is the first investigation to evaluate the zooplankton community structure of Boraboy Lake, a landslide-dammed freshwater ecosystem located in Amasya Province, Türkiye. Seasonal sampling was conducted in spring, summer, autumn, and winter at four stations. Physicochemical parameters, such as temperature, pH, dissolved oxygen, electrical conductivity (EC), Secchi depth (SD), total phosphorus (TP), total nitrogen (TN), and chlorophyll a (Chl-a), were measured and evaluated using Carlson's Trophic State Index (TSI), OECD classification, and Turkish Surface Water Quality Regulation. Results showed that Boraboy Lake generally exhibits oligotrophic to mesotrophic characteristics, with an average TSI value of 31.6. A total of 36 zooplankton species were identified: 26 Rotifera, eight Cladocera, and two Copepoda. Dominant taxa included *Eudiaptomus gracilis*, *Keratella cochlearis*, and *Bosmina longirostris*, while *Polyarthra vulgaris* and *Asplanchna priodonta* showed seasonal peaks. These findings highlight the ecological significance of Boraboy Lake and underscore the importance of regular monitoring to ensure the long-term sustainability of its biodiversity and ecosystem services.

A R T I C L E I N F O

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Öz: Boraboy Gölü (Amasya, Türkiye)'nde Zooplankton Topluluk Yapısının ve Trofik Durumunun Değerlendirilmesi

Bu çalışma Amasya ilinde yer alan heyelan set gölü olan Boraboy Gölü'nün, zooplankton komünite yapısının değerlendirildiği ilk çalışmadır. İlkbahar, yaz, sonbahar ve kış olmak üzere mevsimsel örneklemeler toplamda dört istasyonda gerçekleştirilmiştir. Sıcaklık, pH, çözünmüş oksijen, elektriksel iletkenlik (EC), Secchi diski derinliği (SD), toplam fosfor (TP), toplam azot (TN) ve klorofil-a (Chl-a) gibi fiziko-kimyasal parametreler ölçülmüş; Carlson Trofik Seviye İndeksi (TSI), OECD sınıflandırması ve Türkiye Yüzeysel Su Kalitesi Yönetmeliği çerçevesinde değerlendirilmiştir. Sonuçlar, gölün genel olarak oligotrofik ile mezotrofik özellikler gösterdiğini ve ortalama TSI değerinin 31,6 olduğunu ortaya koymuştur. Zooplankton topluluk yapısı incelendiğinde toplam 36 tür belirlenmiştir: 26 Rotifera, 8 Cladocera ve 2 Copepoda. Baskın taksonlar arasında *Eudiaptomus gracilis, Keratella cochlearis* ve *Bosmina longirostris* yer alırken, *Polyarthra vulgaris* ve *Asplanchna priodonta* mevsimsel pikler göstermiştir. Bulgular, Boraboy Gölü'nün ekolojik önemini vurgulamakta ve biyolojik çeşitliliğin sürdürülebilirliği için düzenli izleme gerekliliğini ortaya koymaktadır.

Anahtar kelimeler: Türkiye, göl, trofik durum, zooplankton, komünite

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Introduction

Lakes, which constitute a component of freshwater ecosystems, occupy a relatively small area on a global scale. Nevertheless, they exhibit elevated biodiversity levels and contribute significantly to ecosystem services (Heino et al. 2021).

A significant portion of the structural changes observed in lakes arises from fluctuations in the lake water's physicochemical properties that directly shape the composition of aquatic communities. Anthropogenic activities play a critical role in the degradation of lake ecosystems, leading to rapid depletion of biological resources and disrupting the balance among plankton, benthos, and nekton (e.g., fishes) (Jeppesen et al. 2011). In particular, increasing eutrophication alters organisms' tolerance thresholds to environmental conditions, drives local extinctions or shifts in species dominance, and ultimately poses a serious

threat to freshwater biodiversity (Alexander et al. 2017).

As one of the fundamental biotic groups in lakes, zooplankton connect interactions between upper trophic levels (top-down fish predation) and lower trophic levels (bottom-up phytoplankton supply), thereby providing direct information on water quality (Jeppesen et al. 2011; Zhao et al. 2022). Due to their rapid and sensitive responses to environmental changes, zooplankton communities are widely recognized as powerful bioindicators (Hemraj et al. 2017; García-Chicote et al. 2019; Rocha et al. 2024). Numerous studies over the years have examined zooplankton responses to environmental variability and eutrophication (Aka et al. 2000; Virro et al. 2009; Špoljar et al. 2011; Arenas-Sánchez et al. 2019; Li et al. 2022; Chaguaceda et al. 2024; Caroni et al. 2025; Altındağ and Berdi 2025). Understanding the structure of zooplankton communities and their ecological interactions directly informs the prediction, monitoring, and mitigation of biotic and abiotic stressors in freshwater ecosystems (Dhanasekaran et al. 2017; Pinto et al. 2023; Qi et al. 2025).

Türkiye is located on the Alpine orogenic belt, and its highly rugged topography, which took its present form during the Quaternary period, is the result of tectonic activity (Göncüoğlu 2010). Landslide-dammed lakes are also formed in these rugged terrains, which are characterized by mountainous, hilly, and steeply sloped landscapes (Costa and Schuster 1988). Classified as natural lakes, they form when a river's flow is obstructed by landslide masses (Hermans et al. 2011). Most of Türkiye's landslide-dammed lakes are located in the Black Sea region, including a total of seven: Tortum, Sera, Abant, Yedigöller, Zinav, Sülük, and Boraboy (Duman 2009; Avşar et al. 2015; Ocakoğlu et al. 2023). Information regarding the biological components of Boraboy Lake is limited; however, Çetin et al. (2023) assessed the lake's phytoplankton and trophic state alongside other high-altitude lakes in the region. In addition to water quality studies, the environmental impact of recreational activities on Boraboy Lake has also been documented. Şenol (2018) investigated the problems arising from intensive human use and reported that the lake faces several anthropogenic pressures, including solid waste accumulation, noise and visual pollution, and local erosion caused by visitors.

This study represents the first investigation of the seasonal species abundance of the zooplankton fauna in Boraboy Lake and its relationship with seasonal physicochemical parameters. In addition, the trophic state of the lake was re-evaluated in this study. Boraboy Lake is a landslide-origin freshwater ecosystem located within the Amasya province of northeastern Türkiye. It has been granted protected status due to its ecological attributes, which support a diverse assemblage of aquatic organisms. The monitoring and assessment conducted herein compile essential information on the lake's water quality and environmental conditions, providing a basis for developing adaptive management strategies to conserve the lake and its resources.

Materials and Methods

Boraboy Lake has an average depth of 11 meters and a surface area of approximately 0.11 square kilometers, making it a critical freshwater resource for the region. Seasonal sampling was carried out at four different locations in the lake during each of the four seasons: summer (27 June 2022), autumn (12 October 2022), and winter (1 February 2023), spring (26 May 2023) The coordinates of the sampling sites are listed in Table 4, while Figure 1 illustrates the location of the lake and the sampling stations. The coordinates were recorded using a Garmin Global Positioning System (GPS) device (GARMIN Etrex 30).

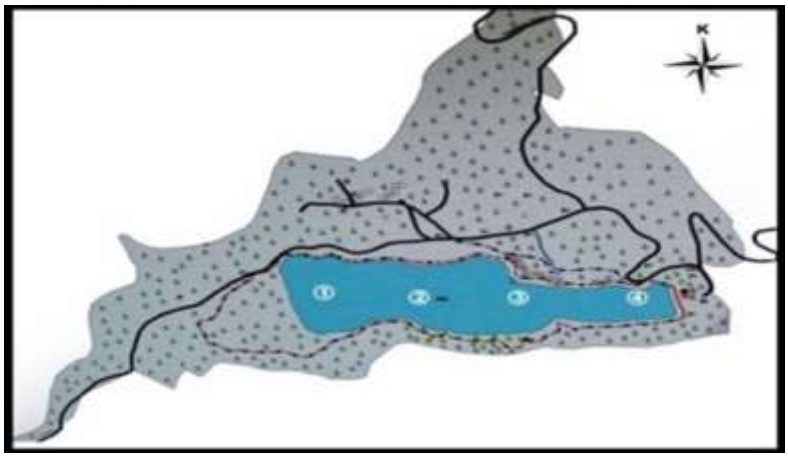

Figure 1. Boraboy Lake sample stations

Data processing and formulae

Zooplankton samples were collected using a Hensen-type plankton net with a mesh size of 55 µm. Sampling occurred both horizontally at the surface and vertically from an average depth of 11 meters within the lake. Each sample was labeled and thoroughly documented, including details such as the type of sampling, date, coordinates, and physicochemical parameters. The plankton samples were preserved in a 4% formaldehyde solution before being transported to the laboratory. Zooplankton species were identified by using an inverted microscope Leica DMSL according to the keys of Edmonson (1959), Flößner (1972), Ruttner-Kolisko (1974), Koste (1978), Nogrady et al. (1995), and Benzie (2005).

Additionally, four 1.5-liter water samples were taken from each station and sent directly to Çınar Engineering Environmental Laboratory for analysis. All zooplankton samples were preserved and stored in the Hydrobiology Laboratory at Ankara University. Water temperature (WT), pH, electrical conductivity (EC), and dissolved oxygen (DO) were measured in the field with a portable multimeter (Hanna HI 9812-5), which was previously calibrated, and an Ohaus Starter 300D Oxygen Meter, which were previously calibrated. Additionally, a Plastimo Echotest II Handheld Depth Gauge and Secchi disk (200 mm diameter Hydro-Bios) were used to measure depth and water transparency, respectively. Secchi disk depth was used to evaluate water transparency. However, due to unfavorable climatic conditions, Secchi disk depth was not measured during the February sampling. All physicochemical measurements are presented in Table 4.

The trophic state indices used to determine the trophic state of Boraboy Lake are presented in Table 1, Table 2, and Table 3. The trophic state of Boraboy Lake was determined using the Trophic State Index (TSI) proposed by Carlson (1977). This index provides a quantitative classification of lake water quality by integrating key limnological parameters. For the present study, Secchi disk depth (SD, m), chlorophyll-a concentration (Chl-a, µg/L), total phosphorus concentration (TP, µg/L), and dissolved oxygen (DO) were used as input variables. TSI values were calculated using the following equations:

$TSI\ (SD) = 60 - 14.41 \times ln(SD)$

$TSI\ (Chl\text{-}a) = 9.81 \times ln(Chl\text{-}a) + 30.6$

$TSI\ (TP) = 14.42 \times ln(TP) + 4.15$ where *ln* represents the natural logarithm.

The mean TSI value was then obtained by averaging the three parameter-based indices (SD, Chl-a, and TP). Based on the Carlson classification, trophic levels were defined as follows in Table 1.

Table 1. Carlson's trophic state index (TSI) and its associated parameters

Trophic State	TSI	Chl-a (µg/L)	SD (m)	TP (µg/L)
Oligotrophic	< 30	< 0.95	> 8	< 6
Mesotrophic	40 – 50	2.6 – 7.3	4 – 2	12 – 24
Eutrophic	50 – 60	7.3 – 20	2 – 1	24 – 48
Hypereutrophic	70 – 80	56 – 155	0.25 – 0.5	96 – 192

The trophic state of the lake was also evaluated according to the OECD trophic state classification index (OECD 1982; Table 2) and the Trophic State Classification Index of the Turkish Surface Water Quality Management Regulations (Official Gazette 2016; Table 3).

Table 2. Lake trophic state classifications (OECD 1982)

Trophic State	Chl-a (µg/L)	SD (m)	TP (µg/L)
Oligotrophic	< 2.5	> 6	< 10
Mesotrophic	2.5 – 8	6 – 3	10 – 35
Eutrophic	8 – 25	3– 1.5	35 – 100
Hypereutrophic	>25	<1.5	>100

Table 3. Trophic state index of the Turkish Surface Water Quality Regulation (Official Gazette 2016)

Trophic State	TP (µg/L)	TN (µg/L)	Chl-a (µg/L)	SD(m)	DO (mg/L)
Oligotrophic	< 10	< 350	< 3.5	> 4	> 7
Mesotrophic	10 – 30	0.35 – 0.65	3.5 – 9.0	4 – 2	6 – 4
Eutrophic	31 – 100	0.651 – 1.20	9.1 – 25.0	1.9 – 1.0	3
Hypereutrophic	> 100	> 1.2	> 25.0	< 1	< 3

Results

In Türkiye, the water quality of Boraboy Lake was evaluated through the analysis of seasonal zooplankton distribution, physicochemical parameters, and its trophic state. Measurements indicated that the average water depth was 11 m, with a maximum depth of 25.7 meters (m) recorded in the summer of 2022 and a minimum depth of 3.1 m noted in spring 2023. The highest water temperature was observed in spring at 19 ℃, while the lowest occurred in winter at 2 ℃. pH values were generally alkaline, with a peak value of 9.7 recorded in spring. The electrical conductivity (EC) reached its highest point in winter at 270 µS/cm. Moreover, the highest oxygen concentration was measured in spring, registering at 11.5 mg/L. Water transparency, as indicated by Secchi disk depth, was maximized in autumn, reaching a depth of 3.25 m.

As a result of water analyses conducted only during the spring season, total phosphorus was measured as 0.006 µg/L, total nitrogen as 1.54 µg/L, the average Secchi disk depth as 2.69 m, and chlorophyll-a concentration as 0.001 µg/L. Based on these findings, the calculated Trophic State Index (TSI) value was 31.60. Similarly, Çetin et al. (2023) recorded average values of 2.00 m for Secchi disk depth, 3.18 µg/L for chlorophyll-a, 2.50 µg/L for total phosphorus, 170.33 µg/L for total nitrogen, 8.00 mg/L for dissolved oxygen, 281.67 µS/cm for electrical conductivity, and 7.75 for pH in Boraboy Lake.

Table 4. Geographic coordinates and seasonal water quality parameters of Boraboy Lake

Station	Coordinates	Season	SD(m)	pH	DO (mg/L)	T (°C)	EC (µS/cm)
1	40º48'23.80" N, 36º09'48.61" E	Spring	2.80	9.7	11.5	17	230
		Summer	2.47	9.6	9.7	18	250
		Autumn	2.75	9.0	7.4	16	230
		Winter	-	7.5	7.0	6	250
2	40º48'23.48" N, 36º09'39.50" E	Spring	2.60	9.2	10.3	19	230
		Summer	2.25	9.2	10.9	18	240
		Autumn	3.0	8.9	7.4	16	220
		Winter	-	7.5	8.5	2	260
3	40º48'21.98" N, 36º09'39.50" E	Spring	2.50	8.9	7.6	17	230
		Summer	3.05	8.9	11.2	18	240
		Autumn	3.0	8.9	6.7	15	230
		Winter	-	7.5	8.2	3	270
4	40º48'22.78" N, 36º09'16.57" E	Spring	1.75	8.8	9.9	17	240
		Summer	3.00	8.8	11.3	18	250
		Autumn	3.25	8.9	7.2	15.3	230
		Winter	-	7.6	7.9	2.1	270

SD: Secchi disk depth, DO: Dissolved Oxygen, T: Temperature, EC: Electrical Conductivity

Table 5. Zooplankton species identified in Boraboy Lake

Species	Spring	Summer	Autumn	Winter
ROTIFERA				
Ascomorpha ecuadis (Petry, 1850)		+	+	
Asplanchna priodonta (Gosse, 1850)	+		+	
A. sieboldii (Leydig, *1854)*	+			
Brachionus angularis (Gosse, 1851)	+	+	+	+
B. quadridentatus (Hermann, 1783)			+	
Cephalodella gibba (Ehrenberg, 1830)		+		+
Colurella adriatica (Ehrenberg, 1831)	+	+		+
Conochilus unicornis (Rousselet, 1892)	+	+	+	
Euchlanis dilatata (Ehrenberg, 1832)	+	+		
Filinia longiseta (Ehrenberg, 1834)		+	+	+
Gastropus stylifer (Imhof, 1891)			+	
Kellicottia longispina (Kellicott, 1879)	+	+	+	+
Keratella cochlearis (Gosse, 1851)	+	+	+	+
K. quadrata (Müller, 1786)	+		+	+
Lecane lunaris (Ehrenberg, 1832)	+			
L. closterocerca (Schmarda, 1859)	+			
Lophocharis salpina (Ehrenberg, 1834)	+			
Polyarthra vulgaris (Carlin, 1943)	+	+	+	
Pompholyx sulcata (Hudson, 1885)	+	+		
Philodina megalotrocha (Ehrenberg, 1832)	+	+		
Synchaeta pectinata (Ehrenberg, 1832)	+	+	+	+
Testudinella patina (Hermann, 1783*)*		+		
Trichotria pocillum (Müller, 1776)	+			
T. tetractis (Ehrenberg, 1830)	+	+		
Trichocerca capucina (Wierzejski & Zacharias, 1893)			+	
T. similis (Wierzejski,1893)		+	+	
CLADOCERA				
Alona guttata Sars, 1862	+	+	+	+
Bosmina longirostris (O.F. Müller, 1785)	+	+	+	+
Ceriodaphnia quadrangula (O.F. Müller, 1785)		+	+	
Chydorus ovalis (Kurz, 1875)		+		
C. sphaericus (O.F. Müller, 1776)	+	+		+
Daphnia longispina (O.F. Müller, 1875)	+	+	+	+
D. cucullata (Sars, 1862)		+		
Diaphanosoma brachyurum (Lievin, 1848)		+	+	
COPEPODA				
Cyclops strenuus (Fischer, 1851)	+	+	+	
Eudiaptomus gracilis (G.O., Sars, 1863)	+	+	+	+

A total of 36 zooplankton species were identified in Boraboy Lake (Table 5). Among them, 26 species belonged to Rotifera, including *Ascomorpha ecaudis, Asplanchna priodonta, Asplanchna sieboldii, Brachionus angularis, Brachionus quadridentatus, Cephalodella gibba, Colurella adriatica, Conochilus unicornis, Euchlanis dilatata, Filinia longiseta, Gastropus stylifer, Kellicottia longispina, Keratella cochlearis, Keratella quadrata, Lecane lunaris, Lecane closterocerca, Lophocharis salpina, Philodina megalotrocha, Polyarthra vulgaris, Pompholyx sulcata, Synchaeta pectinata, Testudinella patina, Trichotria tetractis, Trichotria pocillum, Trichocerca capucina,* and *Trichocerca. similis*. Cladocera were represented by eight species: *Alona guttata, Bosmina longirostris, Chydorus ovalis, Chydorus sphaericus, Ceriodaphnia quadrangula, Daphnia longispina, Daphnia cucullata,* and *Diaphanosoma brachyurum*. Copepoda were represented by two species: *Cyclops strenuus* and *Eudiaptomus gracilis*.

The highest number of species within Rotifera was recorded in the Brachionidae family, including *B. angularis*, *B. quadridentatus*, *K. cochlearis*, *K. longispina,* and *K. quadrata*. Among Cladocera, the family Daphniidae was the most diverse, represented by three species: *C. quadrangula*, *D. longispina,* and *D. cucullata.* In terms of seasonal distribution, the most common species during summer were *K. cochlearis*, *C. strenuus,* and *E. gracilis*. *P. vulgaris* and *K. cochlearis* were frequently observed in spring, while *A. priodonta* and *K. cochlearis* were dominant in autumn. Notably, *K. longispina, K. cochlearis and S. pectinata* were recorded in every season. Boraboy Lake's annual zooplankton diversity exhibited seasonal variation, with 26 species observed in summer, 24 in spring, 21 in autumn, and 13 in winter.

Discussion

In Boraboy Lake, the water parameters measured at four stations during autumn indicated that both water temperature and dissolved oxygen levels were suitable for sustaining aquatic life. However, pH values were found to be strongly alkaline (min 7.5 - max 9.7), approaching the upper tolerance limit considered restrictive for fish survival (pH 6.0-9.0) (McCormick et al. 2020). Bozkurt and Sagat (2008) reported that the acceptable water conductivity value for aquatic organisms is between 250 and 500 µmhos/cm. Electrical conductivity (EC), an indicator of the total concentration of ionized substances in aquatic environments, averaged 245 µS/cm in Boraboy Lake. Electrical conductivity values can affect the structure of zooplankton communities, particularly in terms of species diversity and richness (Altındağ and Berdi 2025). Secchi-disk depth revealed an average value of 3 m across the four stations. Transparency depends on zooplankton abundance and other organic particles (Shil et al. 2013). According to the Carlson Index, the Turkish Surface Water Quality Regulation, and the OECD indices (Table 1, Table 2 and Table 3), Secchi disk depths of 0-1 m indicate eutrophic conditions, 1-2 m indicate mesotrophic conditions, and depths greater than 2 m indicate oligotrophic conditions. Based on this classification, Boraboy Lake exhibited oligotrophic characteristics (low nutrient levels) during autumn. In winter, the average water temperature measured at the four stations was 3.2 ℃, indicating conditions suitable for organisms adapted to cold environments. The pH ranged between 7.5 and 7.6, which is considered favorable for aquatic species. Total phosphorus was measured as 5 µg/L, while chlorophyll a concentration was ≤ 1 µg/L, confirming the oligotrophic state of the lake in winter. In spring, the average water temperature across the four stations was 17.5 ℃, and pH values ranged from 8.8 to 9.7, reflecting strongly alkaline conditions. The total phosphorus concentration was less than 5 µg/L, and the chlorophyll a concentration was measured at 1 µg/L. These values indicated that Boraboy Lake displayed eutrophic characteristics in spring. In summer, the average water temperature at the four stations was 18.0 ℃. A pH level of around 9.12 can have a negative impact on fish health (Haktanır and Arcak 1998) and is also a critical water quality indicator, particularly in lakes, as it influences the proportion of ammonium–ammonia equilibrium (Sönmez et al. 2008). Seasonal pH variations may result from factors such as sampling time, point-source contamination, or sudden changes in water volume. In this study, a considerable increase in the water level was also observed.

One of the most critical aspects of evaluating a body of water in terms of eutrophication is accurately determining its trophic state. At Boraboy Lake, the total phosphorus concentration was measured at 9 µg/L, indicating oligotrophic conditions according to both the Carlson and OECD indices (Table 1 and Table 2). A chlorophyll-a concentration of ≤1 µg/L further confirms the lake's oligotrophic state. According to these indices, Boraboy Lake can be classified as oligotrophic (a deep, nutrient-poor lake with low, unproductive phytoplankton abundance in the limnetic zone, clear water, and high oxygen

levels). The Secchi disk depth averaged 2.69 meters across the four stations. According to the Carlson and OECD indices, Secchi depths of 0-2 m indicate eutrophic conditions, 2-4 m indicate mesotrophic conditions, and depths greater than 4 m indicate oligotrophic conditions (Table 1 and Table 2). Thus, Boraboy Lake exhibited mesotrophic characteristics with respect to light penetration. The total nitrogen concentration was measured at 1.54 mg/L. According to the Water Pollution Control Regulation (Official Gazette 2004), the recommended value for Natural Protection Areas and Recreational Waters is 0.1 mg/L. This indicates that nitrogen loading into the lake is relatively high. Similarly, the total phosphorus concentration of 0.009 mg/L exceeded the recommended threshold of 0.005 mg/L for protected and recreational waters (Official Gazette 2016). Therefore, total phosphorus levels in Boraboy Lake are also slightly elevated.

This study on Boraboy Lake is a complex scientific investigation summarising the seasonal variations and trophic state. According to the trophic classification system threshold values for lakes, ponds, and reservoirs, Boraboy Lake was classified as: oligotrophic based on its total phosphorus concentration, hypereutrophic based on its total nitrogen concentration, oligotrophic based on its chlorophyll-a concentration, and mesotrophic based on its Secchi disk depth.

Evaluation of zooplankton community structure in Boraboy Lake

In the annual zooplankton survey of Boraboy Lake, the Copepoda were found to be the dominant group in terms of both species diversity and abundance. The lake's dominant species were identified as *E. gracilis*, *K. cochlearis,* and *B. longirostris*. *P. vulgaris* exhibits a wide tolerance range to temperature (Herzig 1987), which accounts for its presence throughout the year, particularly in spring when it is most abundant. *B. longirostris* is typically found in eutrophic lakes and ponds where nutrient salts and organic matter are abundant (Brooks 1969), and it was observed almost every season. These species also serve as an essential food source in aquatic ecosystems. Similarly, *Cyclops* species are frequently associated with eutrophic lakes (Yağcı 2010). *C. strenuus* is generally observed between 6 ℃ and 21 ℃, being absent at temperatures higher or lower than this range (Maier 1990). In Boraboy Lake, *C. strenuus* was observed in all seasons except winter.

Oligotrophic lakes are typically dominated by rotifer species such as *K. cochlearis, K. longispina*, *S. pectinata*, *P. vulgaris,* and *Asplanchna priodonta* (Ruttner-Kolisko 1974). In Boraboy Lake, *P. vulgaris* was the most dominant rotifer in spring (31.97 %), while *A. priodonta* was the most dominant in autumn (16.92 %), supporting the oligotrophic state of the lake. *E. gracilis* was dominant annually, with an occurrence rate of 26.93 %. Copepod and cladoceran species are generally considered to be indicators of oligotrophic conditions (Herzig 1987). In Boraboy Lake, copepods were proportionally more abundant than rotifers and cladocerans. Based on total phosphorus, chlorophyll a, and TSI values, the lake exhibited oligotrophic characteristics; however, Secchi depth and total nitrogen values indicated mesotrophic features. Similarly, a study in the eutrophic Lake Mogan demonstrated that pH strongly influenced zooplankton distribution, with species tolerant of alkaline waters such as *Keratella* sp., *B. angularis*, *B. calyciflorus*, and *Trichocerca* sp. being frequently observed (Velioğlu and Kırkağaç 2017). In Lake Abant, various rotifer species have been reported, including *Asplanchna brightwelli*, *C. unicornis*, *Filinia terminalis*, *K. longispina*, *K. cochlearis*, *K. quadrata*, *Lecane* sp., *Euchlanis* sp. (Margaritora and Cottarelli 1970), *A. ecaudis*, *A. priodonta*, *A. girodi*, *C. unicornis*, *Collotheca hippocrepis*, *Collotheca ornata*, *C. pelagica*, *E. dilatata*, *F. longiseta*, *G. stylifer*, *L. lunaris*, *L. hamata*, *L. salpina*, *Polyarthra dolichoptera*, *P. vulgaris*, *Synchaeta litoralis*, *S. pectinata*, and *T. pocillum* (Altındağ 1999; Altındağ and Yiğit 1999). In Boraboy Lake, the occurrence of species such as *C. unicornis*, *K. longispina*, *K. cochlearis*, *K. quadrata*, *Lecane* sp., *A. ecaudis*, *A. priodonta*, *E. dilatata*, *F. longiseta*, *G. stylifer*, *P. vulgaris*, *S. pectinata*, and *T. pocillum* exhibits similarity to those found in Lake Abant. However, physicochemical analyses revealed that Lake Abant is undergoing eutrophication (Özdemir Mis et al. 2017). Numerous studies on Lake Abant, including those on seasonal phytoplankton dynamics and chlorophyll a concentration (Atıcı and Obalı 2002), as well as the rotifer fauna (Altındağ 1999), have indicated its designation as a sensitive area in terms of eutrophication.

The seasonal qualitative and quantitative distribution of the zooplankton fauna has also been studied in Yedigöller. A total of 39 species were identified: five Cladocera, three Copepoda, and 31 Rotifera (Altındağ and Yiğit 1999). Rotifers constituted the dominant zooplankton group in most lakes, particularly in Büyük, Nazlı, Serin, and Sazlı lakes, whereas cladocerans dominated Derin Lake and copepods were more abundant in İnce Lake. *Eucyclops* sp. was reported as the dominant taxon in Büyük, Nazlı, Serin, and Sazlı lakes. Among rotifers, *P. vulgaris* was dominant in Büyük and Nazlı lakes, *B. longirostris* in Sazlı and İnce lakes, and *Cyclops* sp. in Nazlı and Sazlı lakes. The presence of *Cyclops* sp. and *P. vulgaris* in Boraboy Lake during all seasons except winter indicates a notable similarity

between Boraboy Lake and the Yedigöller Lake system. Physicochemical analyses revealed that İnce, Sazlı, Nazlı, and Serin lakes were undergoing eutrophication, while Büyük and Derin lakes exhibited mesotrophic characteristics. In Sünnet Lake, another landslide-dammed freshwater ecosystem, species such as *D. longispina*, *B. longirostris*, and *C. sphaericus* were reported, along with numerous rotifer taxa (Deveci et al. 2011). Many of these species, including *D. longispina*, *B. longirostris*, *C. sphaericus*, *A. priodonta*, *B. angularis*, *K. cochlearis*, and *K. quadrata*, were also recorded in Boraboy Lake, indicating a high degree of faunistic similarity among landslide-dammed lakes. Notably, rotifer species such as *K. cochlearis* and *A. priodonta* are widely recognized as characteristic taxa of oligotrophic freshwater ecosystems. Consistent with this pattern, physicochemical assessments classified Sünnet Lake as oligotrophic to mesotrophic (Sarı et al. 2004). Similarly, the trophic state of Boraboy Lake was determined as oligotrophic based on the Trophic State Index (TSI), as reported by Çetin et al. (2023), further supporting the ecological comparability of these landslide-dammed lake systems. In conclusion, Boraboy Lake can be characterised as a lake transitioning from oligotrophic to mesotrophic state based on physico-chemical parameters, trophic state indices, and indicator species. Given its designation as a nature park and its importance for both recreation and ecology, there is a need for regular monitoring, periodic environmental assessments, and remediation measures when necessary. This study provides valuable baseline information for future research. Protecting freshwater ecosystems, particularly those affected by landslide-dammed lakes such as Boraboy Lake, is crucial for ensuring long-term sustainability

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