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PHYTOPLANKTON COMMUNITY OF TERKOS LAKE AND ITS INFLUENT STREAMS, ISTANBUL, TURKEY

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Abstract

Phytoplankton composition and density as well as some selected physical and chemical parameters were investigated between April 2008 and January 2009 in Lake Terkos and its inflowing streams. In total, 69 taxa were recorded belonging to 6 divisions: Bacillariophyta, Chlorophyta, Cyanophyta, Euglenophyta, Dinophyta and Cryptophyta. Bacillariophyta showed the highest species richness in all the studied stations. The higher flow of Istranca Stream as well as its high contaminant load has a strong impact on the water quality of the lake. In addition, Karacaköy, Çiftlikköy and Başakköy streams, which receive untreated domestic wastewaters and animal wastes, were found to be rich in nitrate and phosphate. Therefore, in order to control water pollution in the catchment area of Lake Terkos, it is of utmost importance to provide the settlements surrounding the lake of adequate treatment plants and to rationalize the use of fertilizers, especially in the catchment area of the Istranca Stream.

Introduction

The limnological characteristics of water bodies must be determined in order to use existing potable water resources more effectively throughout the world and also in Turkey. Watercourses are systems that convey water, and also pollutants, to lakes and seas. Waste materials and their derivates carried by watercourses may adversely affect the chemical, physical and biological composition of water bodies. Phytoplankters are the primary producers within the food chain in running water systems, as in other aquatic environments. Phytoplankton is one of the top living group which react quickly to pollution in aquatic systems. The composition of phytoplankton can be utilized to identify the trophic state, productivity rate, nutrient level, water quality and pollution in aquatic systems (Reynolds, 1998). In Turkey, fewer studies have been conducted on algae in watercourses as compared to those for lakes. However, it is important that ecologic and taxonomic studies are carried out on the phytoplankton of watercourses, which have significant impacts on lakes. For Lake Terkos, which is one of the major water bodies that supply drinking water to the Istanbul metropolitan area, a study was conducted on phytoplankton by Temel (2005). The phytoplankton composition of the inflowing streams has not been previously studied. The aim of this study was to establish the impact of the inflowing streams on Lake Terkos Basin; and the water quality in the lake and inflowing streams, by determining the phytoplankton composition and some physicochemical parameters in Lake Terkos and the inflowing streams: Başakköy, Kürk, Belgrat, Karacaköy, Istranca, Kanlıayazma and Tayakadın.

Study Area: Lake Terkos is located in the Marmara Region of Turkey, 50 km northwest of Istanbul at a latitude of 40º 19' north and 28º 32' east. The lake has a length of 12 km and a width of 5 km. Its surface area is 2 km^2 and average depth is 3.4 m. Terkos is the location of a dam, between the Marmara Sea and the Black Sea. The lake is used as a fishery and a hunting area, where many game birds live. Although the lake is 2.75m above sea level, today there is no flow from the lake to the Black Sea. The connection between the lake and the sea was terminated in 1881; the connection was permanently closed by the construction of a regulator at the junction with the Black Sea, with the aim of supplying potable water to Istanbul. The catchment area of Lake Terkos is rather small; however, it has many inflowing streams. The stream with the highest flow is Istranca Creek in the west. The average annual flow to Lake Terkos is 196 million m^3. Due to drought in recent years, and in order to meet the potable water demand of Istanbul's increasing population, the water from wells drilled closer to the sea is pumped to Lake Terkos (Oğuz, 1995).

Material and Methods

In the present study, 9 sampling stations were chosen including the Lake Terkos and the inflowing streams (Fig. 1). Samples were collected on a monthly basis between April 2008 and January 2009. No sampling could be possible at Kanlıayazma and Tayakadın streams except April 2008 and January 2009 as this streams got dried up. The water temperatures of the lake and its streams were measured with a thermometer and the pH was measured using an Onion make pH-meter at the study area. The dissolved oxygen (DO), nitrate (NO_3), total phosphorus (TP), ammoniac (NH_3) content and chemical oxygen demand (COD) were determined at a laboratory, according to standard methods (Anon., 1995). Water samples were taken in Nansen bottles and were fixed with Lugol's iodine. Phytoplanktonic organisms were counted with an inverted microscope according to Lund *et al.,* (1958). Phytoplankton species were identified by with the help of literature, including several comprehensive reviews on the subject (Hustedt, 1930; Desikachary, 1959; Prescott, 1961; Prescott, 1964; Patrick & Reimer, 1966; Patrick & Reimer, 1975; Huber-Pestalozzi, 1975; Hustedt, 1985; Krammer & Lange-Bertalot, 1986; John *et al.*, 2003).

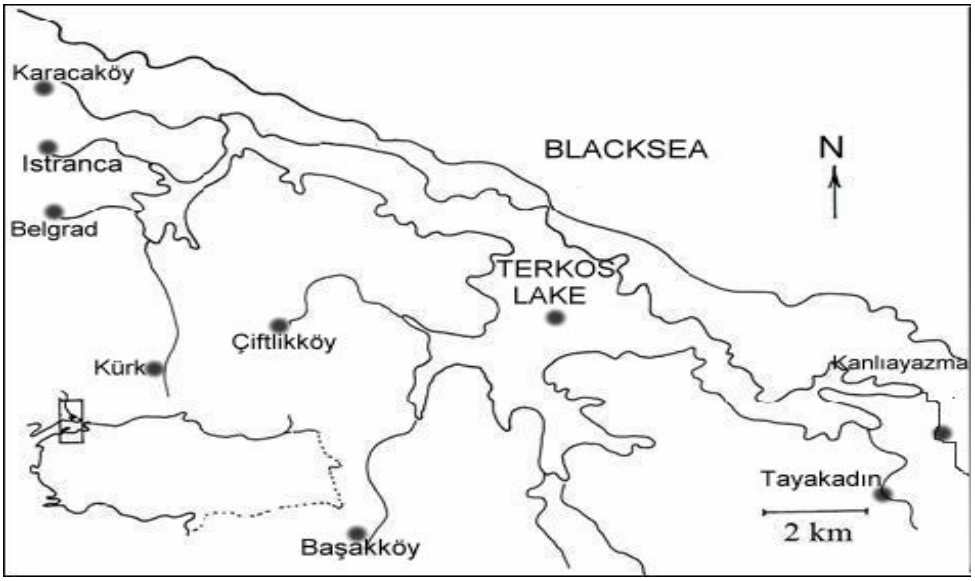

Fig. 1. The map of Lake Terkos and sampling stations.

Results

Physical and chemical variables of Lake Terkos and its streams: Temperature varied from 7.8 to 28.0°C, maximum values were measured in Terkos Lake and Karacaköy Stream. The pH ranged from 7.0 to 8.5; dissolved oxygen varied from 6.1 to 12.7mg L^{-1} and the highest value was measured in Karacaköy Stream. Ammonium values varied from <0.1 to 2.0mgL^{-1} and the maximum value was recorded in Çiftlikköy Stream. Nitrate and total phosphorus values were between <0.1-1.4mgL^{-1} and <0.03-0.60mgL^{-1}, respectively. The highest nitrate content was found in Başakköy Stream and the highest total phosphorus content was found in Çiftlikköy Stream. Chemical oxygen demand (COD) was less than 30mgL^{-1} at all stations (Table 1).

Table 1. Physicochemical parameter ranges and water quality classes (Anon., 2005) of lake Terkos and its inflowing streams.

Physico-chemical parameteres		Terkos Lake	Karacaköy	Çiftlikköy	Istranca	Başakköy	Kürk	Belgrat	Kanlıayazma	Tayakadın
Temp. (°C)	Min.	8.75	8.15	9.13	10.10	7.90	7.95	8.40	8.15	7.80
	Class	I	I	I	I	I	I	I	I	I
	Max.	28.0	28.0	27.0	27.8	13.8	17.2	19.0	12.3	12.0
	Class	I-II	I-II	I-II	I-II	I	I	I	I	I
pH	Min.	7.3	7.3	7.0	7.3	7.2	7.4	7.2	7.1	7.3
	Class	I-II	I-II	I-II	I-II	I-II	I-II	I-II	I-II	I-II
	Max.	8.5	8.5	8.2	8.4	7.9	8.0	7.7	7.5	8.0
	Class	I-II	I-II	I-II	I-II	I-II	I-II	I-II	I-II	I-II
$D.O_2$ (mg L^{-1})	Min.	6.20	8.00	6.10	7.70	7.62	7.40	8.64	6.60	7.50
	Class	I	I	I	I	I	I	I	I	I
	Max.	10.50	12.70	11.90	11.94	11.45	11.89	11.36	9.53	9.46
	Class	I	I	I	I	I	I	I	I	I
NO_3 (mg L^{-1})	Min.	<0.10	<0.10	0.10	<0.10	0.20	<0.10	0.30	0.14	0.30
	Class	I	I	I	I	I	I	I	I	I
	Max.	1.0	0.7	0.6	0.4	1.4	0.4	0.5	0.5	1.3
	Class	I	I	I	I	I	I	I	I	I
TP (mg L^{-1})	Min.	<0.03	0.05	0.10	<0.03	<0.03	<0.03	<0.03	0.05	0.03
	Class	I	I	I	I	I	I	I	I	I
	Max.	0.15	0.22	0.6	0.14	0.11	0.10	0.06	0.05	0.20
	Class	I	II	III	I	I	I	I	I	II
NH_4 (mg L^{-1})	Min.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Class	I	I	I	I	I	I	I	I	I
	Max.	<0.1	0.9	2.0	<0.1	1.80	<0.1	<0.1	<0.1	<0.1
	Class	I	II	III	I	II	I	I	I	I
COD (mg L^{-1})		<30	<30	<30	<30	<30	<30	<30	<30	<30
		I	I	I	I	I	I	I	I	I

Phytoplankton composition of Terkos Lake and its streams: In the present study, a total of 69 taxa of phytoplankton, belonging to Bacillariophyta, Chlorophyta, Cyanophyta, Euglenophyta, Dinophyta and Cryptophyta divisions, were identified. Bacillariophyta was the dominant group in terms of species diversity and density. During the study, the highest phytoplankton species richness was recorded at Karacaköy Stream (31 taxon), followed by Terkos Lake (30 taxon) and Çiftlikköy Stream (30 taxon), Istranca (27 taxon) and Başakköy streams (27 taxon), Kürk (20 taxon), Belgrat (19 taxon), Kanlıayazma (13 taxon) and Tayakadın (9 taxon) streams (Table 2). The dominant phytoplankton species were *Aulocoseira italica* from the Bacillariophyta division in Lake Terkos; *Ulnaria acus* from the Bacillariophyta division in Istranca and Kürk streams; *Microcystis aeruginosa* from the Cyanophyta division in Karacaköy and Belgrat streams; *Scenedesmus quadricauda* from the Chlorophyta division in Çiftlikköy Stream; and *Pandorina morum* from the Chlorophyta division in Başakköy Stream.

Table 2. List of taxa numbers and presence of phytoplankton taxa of Lake Terkos and its streams (+: present, -: absent).

Taxa	Stations								
	Terkos Lake	Karacaköy	Çiftlikköy	Istranca	Başakköy	Kürk	Belgrat	Kanlıayazma	Tayakadın
Dıvısıo: Bacıllarıophyta									
Order: Centrales									
Aulocoseira italica (Ehrenberg) Simonsen	+	-	-	+	+	-	-	-	-
Coscinodiscus sp.	-	-	-	-	-	-	+	-	-
Cyclotella kützingiana Thwaites	+	+	-	+	-	-	-	+	-
Cyclotella ocellata Pantocsek	+	+	+	+	+	+	+	+	+
Melosira granulata (Ehrenberg) Ralfs	-	+	-	-	-	+	+	-	-
Melosira varians Agardh	+	+	-	+	-	+	-	-	+
Stephanodiscus astrea (Ehrenberg) Kützing	-	-	+	-	-	-	-	-	-
Order: Pennales									
Achnanthes lanceolata (Brebisson) Grunow	-	+	-	-	-	-	-	-	-
Amphora ovalis Kützing	-	+	-	+	-	-	-	-	-
Asterionella formosa Hassall	+	-	-	-	-	-	-	-	-
Caloneis amphisbaena (Bory) Cleve	-	+	-	+	-	+	-	-	-
Cocconeis placentula Ehrenberg	+	+	+	+	+	+	-	+	-
Cymatopleura solea (Brebisson) W.Smith	-	+	-	-	-	-	-	-	-
Cymbella affinis Kützing	-	-	+	-	-	-	-	-	-
Cymbella lanceolata Ehrenberg	-	-	-	-	-	+	+	-	-
Cymbella linearis Ost.	-	-	+	-	+	-	-	-	-
Cymbella ventricosa Kützing	+	+	+	+	+	+	-	-	+
Diatoma elongatum (Lyngbye) Agardh	-	-	+	-	+	-	-	-	-
Diatoma vulgaris Bory	-	+	-	-	-	-	-	-	-
Fragilaria crotonensis Kitton	-	-	+	-	+	-	-	-	-
Gomphonema introcotum (Ehrenberg) Cleve	-	-	-	-	-	+	-	-	-
Gomphonema olivaceum (Hornemann) Brebisson	-	+	-	+	-	-	+	-	-
Gyrosigma acuminiatum (Kützing) Rabenhorst	-	+	-	+	-	-	-	-	-
Meridion circulare (Greville) Agardh	-	+	+	+	+	+	+	+	+
Navicula cryptocephala Kützing	-	+	+	-	+	-	+	-	-
Navicula gracilis Ehrenberg	+	+	+	+	+	+	+	+	+
Navicula sp.	+	-	+	+	+	+	+	-	-
Nitzschia acicularis (Kützing) Wm. Smith	-	+	+	-	-	+	+	-	-
Nitzschia linearis (Agardh) Wm. Smith	-	-	+	+	+	-	-	-	-
Nitzschia palea (Kützing) Wm. Smith	-	+	+	+	+	+	+	+	+
Pinnularia brebissoni (Kützing) Rabenhorst	-	-	-	+	-	-	-	-	-
Pinnularia sp.	-	+	+	-	+	-	-	-	-
Rhaphalodia gibba (Ehrenberg) O. Müll.	-	-	-	+	-	-	-	-	-
Rhoicosphenia curvata (Kützing) Grunow	-	-	-	-	+	-	-	+	-
Surirella ovata Kützing	+	-	-	-	+	-	-	+	-
Surirella robusto var. obtusa Playfair	-	-	-	+	-	-	-	-	-
Ulnaria acus (Kützing) M. Aboal	+	+	+	+	+	+	+	+	+
Ulnaria ulna (Nitzsch) P. Compere	+	+	+	+	+	+	+	+	+
Ulnaria ulna capitata (Ehrenberg) P. Compere	-	-	+	-	-	-	+	-	-
Divisio: Chlorophyta									
Order: Chlorococcales									
Actinastrum sp.	+	-	-	-	-	-	-	-	-
Coelastrum sp.	+	-	-	-	-	-	-	-	-
Kirchneriella sp.	-	+	-	-	-	-	-	-	-

Table 2. (Cont'd.).

Taxa	Statıons								
	Terkos Lake	Karacaköy	Çiftlikköy	Istranca	Başakköy	Kürk	Belgrat	Kanlıayazma	Tayakadın
Monaraphidium falcatus (Corda) Ralfs	+	-	-	-	+	-	-	+	-
Oocystis natans (Lemm.) Wille	-	-	-	+	-	-	-	-	-
Pediastrum dublex Meyen	+	-	-	+	-	-	-	-	-
Pediastrum simplex	-	-	+	-	-	-	-	-	-
Scenedesmus bijuga (Turpin) Lagerheim	-	-	+	+	-	-	-	-	-
Scenedesmus quadricauda (Turpin) Brebisson	+	+	+	+	+	-	-	-	-
Order: Desmidiales									
Closterium acutum Brèb. in Ralfs	-	+	-	-	-	+	-	-	-
Cosmarium formosulum Hofmann	+	+	-	-	-	-	-	-	-
Order: Volvocales									
Pandorina morum (Müller) Bory	+	+	-	-	+	-	-	-	-
Spirogyra sp.	-	-	-	-	+	-	-	-	-
Dıvısıo: Cryptophyta									
Order: Cryptomonodales									
Cryptomonas erosa Ehrenberg	+	-	-	-	-	-	-	-	-
Cryptomonas ovata Ehrenberg	+	+	+	+	+	+	+	+	-
Dıvısıo: Cyanophyta (Cyanobacteria)									
Order: Chroococcales									
Microcystis aeruginosa (Kützing) Kützing	+	+	+	-	-	-	+	-	-
Order: Oscillatoriales									
Oscillatoria tenuis Agarth	+	-	-	-	-	-	+	-	-
Planktothrix rubescens De Condelle Ex Gomont	-	-	+	-	+	-	-	-	-
Order: Nostocales									
Anabaena catenula (Kütz.) Bornet & Flahault *var. affinis* (Lemm.) Geitler	+	+	-	-	-	-	-	-	-
Anabaena spiroides Klebahn	+	-	-	-	-	+	-	-	-
Phormidium sp.	+	-	-	-	-	-	-	-	-
Dıvısıo: Dınophyta									
Order: Peridiniales									
Ceratium furca (Ehrenberg) Claparede Lachmann	+	-	-	-	-	-	-	-	-
Peridinium bipes F. Stein	+	-	+	-	-	-	-	-	-
Dıvısıo: Euglenophyta									
Order: Euglenales									
Euglena acus Ehrenberg	+	-	+	-	-	+	-	-	-
Euglena ehrenbergii Klebs	-	-	+	-	-	-	-	-	-
Euglena gracilis Klebs	-	+	-	-	+	-	+	-	-
Euglena pascheri Swirenko	-	-	+	-	-	-	-	-	-
Euglena viridis Ehrenberg	-	-	-	-	-	+	-	-	-
Phacus orbicularis Hübner	+	-	-	+	+	-	-	-	-
*Trachelomonas hispid*a (Perty) Stein	-	+	+	+	+	-	+	+	+

Discussion and Conclusion

The water quality of Terkos Lake and its inflowing streams was determined according to the regulation on water quality of surface waters supplying or planned to supply potable water (Anon., 2005). In terms of temperature, Terkos Lake, Karacaköy, Çiftlikköy, Istranca streams are of class I and II; Başakköy, Kürk, Belgrat, Kanlıayazma and Tayakadın streams are of class I water quality. The results of previous research stated that, the oxygen concentrations are usually 10mgL^{-1} and the pH varied from 6 to 9 in clear waters (Cirik & Cirik, 1991). According to pH levels, all stations are of class I and II; according to dissolved oxygen and nitrate concentrations, all stations are of class I water quality (Anon., 2005).

In terms of measured maximum total phosphorus, Karacaköy and Tayakadın streams are of class I, Çiftlikköy Stream is of class III and other streams are of class I water quality. However Terkos Lake is of class I, it was determined that the lake had an enrichment in respect to phosphorus concentrations. In terms of ammonia**,** Terkos Lake, Istranca, Kürk, Belgrat, Kanlıayazma and Tayakadın streams are of class I; Karacaköy and Başakköy streams are of class I and II; Çiftlikköy Stream is of class I and III water quality (Anon., 2005).

COD, which is an indicator of pollution, especially at coastal and inland discharge points, is the amount of oxygen consumed to degrade the natural and organic load using strong chemical oxidants. The measured concentration of COD, is close to, but does not exceed, the guide limit set for surface waters supplying or planned to supply potable water (Anon., 2005).

High nutrient concentrations were measured in Çiftlikköy, Karacaköy and Başakköy streams during the present study. Therefore, in order to control water pollution in the catchment area of Terkos Lake, it is of utmost importance that wastes from the settlements surrounding the lake, and animal wastes and nitrogen and phosphorus from agricultural activities are treated at the source, starting especially with Istranca Stream. Istranca Stream is a determining factor in the water quality of the lake, due to its higher flow and contaminant load. It was stated that, the main source of pollution is determined as sewage inputs in river systems in many investigations (EL-Sheekh *et al*., 2010; Chughtai *et al.,* 2011).

In the present study of phytoplankton, a total of 69 taxa of Bacillariophyta, Chlorophyta, Cyanophyta, Euglenophyta, Dinophyta and Cryptophyta divisions were identified. These results are in agreement with the phytoplankton groups recorded by Temel (2005) in a study in Terkos Lake. In terms of species diversity, the Bacillariophyta division was found to be dominant in all stations as, in agreement with findings previously reported by Temel (2005).

The stations that have highest total algae density are listed, in descending order, as Lake Terkos (10323 ind./cm^3), Çiftlikköy Stream (2106 ind./cm^3), Karacaköy Stream (1394 ind./cm^3), Başakköy Stream (1378 ind./cm^3) Kürk Stream (1240 ind./cm^3), Belgrat Stream (1140 ind./cm^3), Istranca Stream (979 ind./cm^3), Kanlıayazma Stream (206 ind./cm^3) and Tayakadın Stream (79 ind./cm^3). In terms of algae density, members of Chlorophyta were observed to be dominant in Başakköy Stream and members of Bacillariophyta were dominant in other streams and the lake.

At the present time the phytoplankton functional groups approach comprises more than 45 assemblages that are identified by alphanumerical codes according to their sensitivities and tolerances (Reynolds *et al.*, 2002; Padisak *et al*., 2009). The functional groups represented by the phytoplankton encountered in Terkos Lake and its streams were B,C, D, N, P,T_C, X1, Y, F, J, H1, L_O, L_M, R, W1 and W2.

In previous algal studies carried out in Turkey's watercourses, Bacillariophyta was usually found to be the dominant division. The centric diatom *Cyclotella ocellata* was recorded at all stations, whereas *Cyclotella kützingiana* was recorded at Istranca, Karacaköy and Kanlıayazma streams and Terkos Lake. *C. ocellata* was recorded in low numbers in a previous study by Temel (2005). *Cyclotella* species were accepted by many investigators as one of the typical components of both oligotrophic lakes and reservoirs (Hutchinson, 1967; Trifonova, 1998). *Ulnaria ulna*, a pennate diatom, which was present and abundant at all stations, is known to be characteristic of eutrophic lakes (Hutchinson, 1967; Cirik & Cirik, 1991). Codon D, one of the phytoplankton functional goups, was formed by the diatoms *Cyclotella ocellata*, *Ulnaria acus* and *Ulnaria ulna,* which usually occur in shallow, enriched turbid waters including rivers. This group have a tolerance for flushing and they are sensitive to nutrient depletion (Reynolds *et al.*, 2002; Padisak *et al*., 2009).

In the present study, *Asterionella formosa* was observed only at Lake Terkos station; this species was not recorded in any of the streams. According to Temel (2005), *A. formosa* was abundant in the pelagic region of the lake, and was present in low numbers in the littoral region, from winter to spring. Hutchinson (1967) noted that, *A. formosa* is a characteristic diatom of nutrient- rich waters and is usually found in non-turbulent waters. *A. formosa* takes place in codon C assembladge, which are known to be represented in the plankton of eutrophic small and medium sized lakes with having tolerance to light and C deficiences (Reynolds *et al.*, 2002; Padisak *et al*., 2009).

Scenedesmus quadricauda of the Chlorophyta division, which is reported as an indicator of pollution (Hutchinson, 1967), was recorded as being dominant in Çiftlikköy Stream (July 2008) and subdominant in Istranca Stream (June 2008). According to Round (1984), members of the order Chlorococcales were found more in waters which are change from oligotrophic character to eutrophic character. *S. quadricauda* appears in J assemblage, which is a typical species for shallow enriched lakes, ponds and rivers. The codon assemblage F was formed by the colonial chlorophytes *Oocystis natans* (recorded only in Istranca Stream) and *Pandorina morum* (dominant species in Başakköy Stream) which are known to be represented in the plankton of a wide spectrum of lakes (mainly mesotrophic). They are sensitive to carbon deficiency and tolerant to low nutrients (Reynolds *et al.*, 2002; Padisak *et al*., 2009).

The species *Microcystis aeruginosa* of the Cyanophyta division was observed to become dominant at Belgrat Stream. *M. aeruginosa* takes place in codon L_M which usually inhabits eutrophic waters (Reynolds *et al*., 2002; Padisak *et al*., 2009).

Members of Euglenophyta were usually observed in low numbers. *Euglena pascheri* was recorded in high numbers only at Çiftlikköy Creek. According to Temel (2005), *Euglena acus* and *Phacus orbicularis* were observed occasionally and in low numbers at Lake Terkos. Members of Euglenophyta are reported to be more abundant in contaminated waters and to develop well in environments with high organic matter input (Round, 1984). Codon W1 assemblage was formed by the euglenoids *Euglena acus, Euglena ehrenbergii, Euglena gracilis, Euglena pascheri, Euglena viridis and Phacus orbicularis,* which are characteristic species for small organic ponds. W2 assemblage was formed by *Trachelomonas hispida*, which is found typical in shallow mesotrophic lakes (Reynolds *et al*., 2002; Padisak *et al*., 2009*).* During the study *T. hispida* was recorded at all stations, except Terkos Lake and Kürk Stream.

The species *Cryptomonas erosa* of the Cryptophyta division was recorded only at Lake Terkos, whereas the species *Cryptomonas ovata* was recorded in all stations except Tayakadın Stream. *C. ovata* was determined as the dominant species at Istranca Stream (November, 2008) and at Çiftlikköy Stream (October, 2008). In the previous study by Temel (2005), species of *Cryptomonas* were recorded continually and frequently in high numbers. Y assemblage formed by the cryptomonads *C. erosa* and *C. ovata* which are found usually in small enriched lakes with low light tolerance (Reynolds *et al.*, 2002; Padisak *et al*., 2009).

A high rate of flow in running waters causes phytoplankton biomass to be low (Güner, 2004). Accordingly, the streams investigated in this study were found to be poor in terms of the number of phytoplankton

species and density. It is known that, in general, there are no fixed species that are specific to rivers, and most algal communities found in riverine environments drift there by chance (Güner, 2004).The taxa observed in the present study are not truly planktonic species; it was found that they are species which drifted to the plankton due to water movements and other factors.

During the study, the species *Cyclotella ocellata, Ulnaria acus*, *Ulnaria ulna* and *Navicula gracilis* of the Bacillariophyta division were recorded at all of the stations, whereas the species *Navicula palea* and *Meridion circulare* were found in the streams but not in Lake Terkos. The species *Asterionella formosa,* from the Bacillariophyta division; *Actinastrum* sp. and *Coelastrum* sp. from the Chlorophyta division; *Cryptomonas erosa* from the Cryptophyta division; the *Phormidium* sp. from the Cyanophyta division and *Ceratium furca* from the Dinophyta division were recorded only at the Lake Terkos station. According to water quality classes, there was an enrichment of nutrients at the lake and streams. Maximum individual numbers of phytoplankton were found at Çiftlikköy, Karacaköy and Başakköy streams, depending on nutrient enrichment. The presence of oligotrophic, mesotrophic and eutrophic species of phytoplankton indicated that, the trophic structure of the lake and streams will change from oligotrophic character to mesotrophic character in the near future.

Turkey has a large number of watercourses; however, it is considered among the water-poor countries, in terms of available water per capita and based on a comparison with other water-rich countries and the global average. In order to ensure that sufficient clean water will be available for future generations, policies should be implemented to conserve water resources and use them rationally. In conclusion, continuing detailed ecological studies of Terkos Lake and its inflowing streams that supply potable water to the Istanbul metropolitan area will allow ongoing reevaluation of the uses of the lake, and preservation, improvement and control of the water quality. The data gathered will be useful in determining the trophic status of Terkos Lake and its inflowing streams and will provide input for future research.

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