

Epilithic diatoms of settlement of Sivrice district (Hazar Lake/Elazig-Turkey)

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Abstract

In this study, the epilithic diatoms in the samples taken from two stations in Hazar Lake (Elazig-Turkey) between June 2015 and November 2015 were analyzed. In total, 28 taxa belonging to the diatoms were recorded during the study. The diatom taxa *Cymbella* (6 taxa), *Navicula* (4 taxa) and *Nitzschia* (4 taxa) were represented by the most taxa.

Keywords: Epilithic, Diatom, Sivrice district, Elazig-Turkey

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Introduction

When the subject is aquatic food, fish and other aquaculture come to mind. In this regard, detection and awareness of the importance of algae in waters are essential for the growth and preservation of aquaculture populations in our inland waters (Ahıska and Atıcı, 2005).

Algae, which are the primary producers in aquatic environments, constitute the essential nutrients of the organisms feeding on them, and they live in benthic and planktonic forms. Knowledge of the change the algae show in time is of high importance in terms of both human benefit and preservation of water quality. Because the number and diversity of algae and other organisms may constantly change depending on environmental conditions (Palmer, 1980). Diatoms, which are one of the most appropriate biological components for determining environmental destructions in aquatic habitats, are used as biomonitors in water quality assessment (Charles *et al.*, 1994). So, their feeding capacity is to be determined in order to make more efficient use of streams, lakes and seas in our country which has a high inland water potential. Therefore, studies (Şahin, 2000; Şen *et al.*, 2001; Çetin *et al.*, 2003; Akköz and Güler, 2004; Atıcı *et al.*, 2005; Soylu *et al.*, 2011; Fakioğlu *et al.*, 2012; Pala *et al.*, 2016; Çağlar and Pala, 2016) on the analysis of benthic and planktonic algae in our inland waters have been increasing in number day by day.

In parallel with these studies in our country, studies (Şen, 1988; Şen *et al.*, 1995; Yıldırım, 1995; Sönmez and Şen, 2011; Pala, 2014) in Hazar Lake in our region also have been growing more intense each day. The aim of this study carried out in the coastal region where Hazar Lake Sivrice district settlement is located, is to determine the epilithic diatoms of the lake and thus contribute to the identification of the algal flora of our inland waters.

Materials and methods

In this study, two different stations were chosen with the aim of identifying the epilithic algae of the coastal region of Hazar Lake where Sivrice district settlement is located. The distance between the stations is approximately 1 km. The epilithic samples at both stations were taken from mucilage-covered big stones by scraping them with the help of a brush, and the epilithic diatoms clung to the brush were washed with pure water and put into sterilized sampling jars.

Nikon branded microscope was used for species identification and counting of the diatoms permanent preparates of which were prepared. The counting was based on relative density and the results were given as “organism %”.

Relative Density (RD) = $N_A/N \times 100$

N_A = Total individual number of species A

N = Individual number of all species (Kocataş, 1999).

For the identification of the species, the related sources (Germain, 1981;

Hustedt, 1932; Bourelly, 1972; Bourelly, 1968) were made use of.

Results and discussion

Table 1 shows the epilithic diatoms identified throughout this study of six months carried out in the coastal region of Hazar Lake where Sivrice district settlement is located, and the stations at which they were found. In total, 28 taxa belonging to the epilithic diatoms were recorded. 2 of these taxa belong to Centrales group, and 26 of them belong to Pennales group. While Centrales members known as planktonic forms

among epilithic diatoms were also identified, in small numbers, though, especially the taxa belonging to Pennales group were regarded to be significant in the epilithic flora in terms of their diversity, frequency of occurrence, and number of individuals. In this flora, particularly *Cymbella* spp., *Navicula* spp., *Nitzschia* spp. and *Gomphonema* spp were remarkable among the epilithic diatoms in terms of both their number of species and number of individuals belonging to these species.

Table 1: Availability of epilithic diatoms at the stations.

Taxa	Station I	Station II
Centrales		
<i>Cyclotella kützingiana</i> Chauvin, nom.illeg.	+	+
<i>Pantocsekiella ocellata</i> (Pantocsek) K.T. Kiss and E. Acs	+	+
Pennales		
<i>Amphora ovalis</i> (Kützing) Kützing	+	+
<i>Cocconeis placentula</i> Ehrenberg	+	-
<i>Cymatopleura solea</i> (Brebisson) W. Smith	+	-
<i>Cymbella affinis</i> Kützing	+	+
<i>Cymbella cymbiformis</i> C.Agardh	-	+
<i>Cymbella neoleptoceros</i> Krammer	+	+
<i>Cymbella helvetica</i> Kützing	+	+
<i>Cymbella cistula</i> (Ehrenberg) Kirchner	+	-
<i>Cymbella laevis</i> Nageli	+	+
<i>Epithemia argus</i> (Ehrenberg) Kützing	+	+
<i>Fragilaria acus</i> (Kützing) Lange-Bertalot	+	+
<i>Fragilaria capucina</i> Desmazieres	-	+
<i>Gomphonema acuminatum</i> Ehrenberg	+	+
<i>Gomphonema gracile</i> Ehrenberg	+	+
<i>Gomphonema parvulum</i> (Kützing) Kützing	+	+
<i>Sellaphora pupula</i> (Kützing) Mereschkovsky	+	+
<i>Navicula cryptocephala</i> Kützing	+	+
<i>Navicula phyllepta</i> Kützing	+	+
<i>Navicula salinarum</i> Grunow	+	-
<i>Navicula radiosa</i> Kützing	-	+
<i>Nitzschia palea</i> (Kützing) W. Smith	+	+
<i>Nitzschia linearis</i> W. Smith	+	+
<i>Nitzschia sigmoidea</i> (Nitzsche) W. Smith	+	+
<i>Nitzschia sigma</i> (Kützing) W. Smith	+	+
<i>Rhoicosphenia abbreviata</i> (C.Agardh) Lange-Bertalot	+	+
<i>Ulnaria acus</i> (Kützing) M. Aboal	+	+

The diatom taxa *Cymbella affinis*, *Cymbella helvetica*, *Cymbella laevis*, *Gomphonema gracile*, *Gomphonema acuminatum*, *Navicula cryptocephala*, *Navicula phyllepta*, *Nitzschia linearis*, *Nitzschia palea* and *Ulnaria acus* were regularly recorded at both of the stations throughout the study.

While among the species at the station I, *Gomphonema acuminatum*, *Cymbella laevis* and *Navicula phyllepta* were recorded to be more significant than the others in terms of relative density (Fig. 1), *Gomphonema gracile*, *Cymbella helvetica* and *Nitzschia linearis* were recorded to have the highest relative density at the station II (Fig. 2).

In terms of frequency of occurrence and population size, the most significant diatoms among the epilithic diatoms of the coastal region of Hazar Lake where Sivrice district settlement is located were *Navicula*, *Gomphonema* and *Cymbella*. These species were followed by *Nitzschia*. While the *Cymbella* was represented by the species *Cymbella cymbiformis*, *C. affinis*, *C. neoleptoceros*, *C. helvetica*, *C. cistula* and *C. laevis*, *Navicula* was represented by the species *N. salinarum*, *N. phyllepta*, *N. radiosa* and *N. cryptocephala*, and *Gomphonema* was represented by the species *G. acuminatum*, *G. gracile* and *G. parvulum*.

The taxa identified in the lake showed considerable similarity to the diatoms identified in different lakes of our country (Altuner and Gürbüz, 1996; Şahin, 2001; Şen *et al.*, 2001; Çetin *et*

al., 2003). The epilithic diatoms in the coastal region of Hazar Lake Sivrice settlement were represented by 28 taxa belonging to 14 species. Also in the study on benthic diatom flora of Orduzu Dam Lake (Malatya/Turkey) by Çetin *et al.* (2013), the taxa belonging to the species *Cymbella*, *Navicula* and *Nitzschia* were found to be more significant than the other diatoms in terms of diversity. This finding is similar to the findings of our study. While in their study on the seasonal changes in epilithic diatoms in an alkaline lake (Hazar Lake/Elazig), Sönmez and Şen (2011) recorded *Cymbella* (7 taxa), *Epithemia* (7 taxa) and *Gomphonema* (6 taxa) as the diatoms represented by the highest number of species, in our study, *Cymbella* (6 taxa), *Navicula* (4 taxa) and *Nitzschia* (4 taxa) were recorded to have the highest number of species. *Epithemia* and *Gomphonema* were represented by 1 taxon and 3 taxa, respectively.

The composition and seasonal changes of benthic diatoms were analyzed in various studies carried out in lakes, ponds, and dam lakes as a result of which similarities and differences were found out. While reproduction and distribution of benthic diatoms are affected by many factors, it has often been emphasized that light intensity and water temperature have an important role (Round, 1984). In our study, epilithic diatoms were recorded to have the highest number of individuals in July and August.

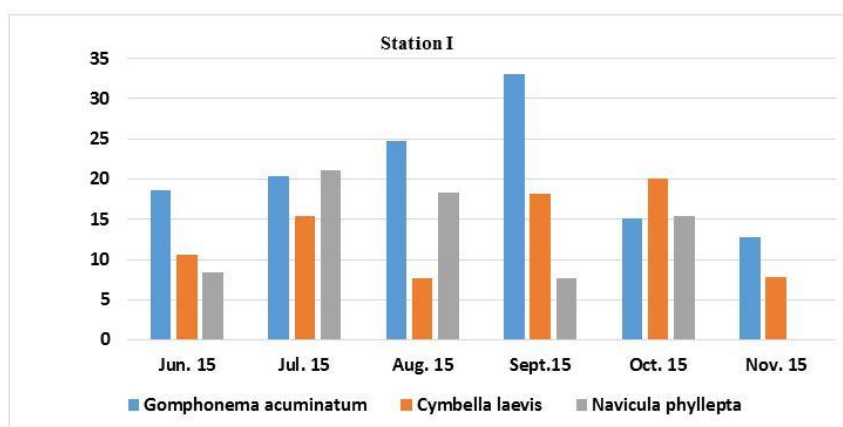


Figure 1: Monthly changes in relative density of *Gomphonema acuminatum*, *Cymbella laevis* and *Navicula phyllepta* recorded at the station I.

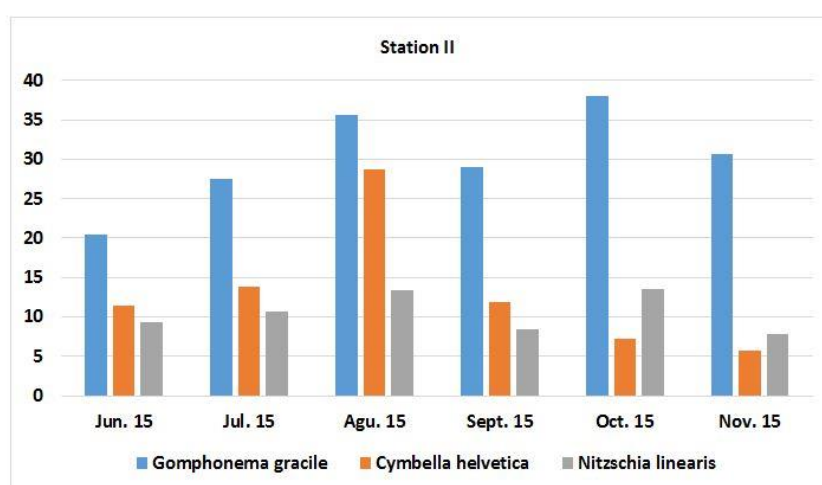


Figure 2: Monthly changes in relative density of *Gomphonema gracile*, *Cymbella helvetica* and *Nitzschia linearis* recorded at the station II.

Round (1984) stated that *Amphora ovalis*, *Navicula cryptocephala*, *Navicula pupula*, and *Cymatopleura solea* were found in alkaline waters. Since Hazar Lake is an alkaline soda lake, the same species were also detected in our study. The epilithic diatoms showed some differences according to the stations. While *Cocconeis placentula*, *Cymatopleura solea*, *Cymbella cistula* and *Navicula salinarum* were recorded only at station I, *Cymbella cymbiformis*, *Fragilaria capucina* and *Navicula radiosa* were recorded only at station II. In studies on

identification of benthic algae in lakes, ponds and dam lakes in different regions of our country (Gönülol, 1987; Şahin, 2000; Çetin *et al.*, 2013), Centrales members known as planktonic forms were detected on sediments, in negligible quantities, though. Although *Cyclotella kützingiana* and *Pantocsekiella ocellata* were detected in the epilithic diatoms of Hazar Lake, they were not much significant considering their availability and abundance.

The fact that diatoms are always present in benthic algal community

shows that this algal group is cosmopolitan and easily adapts to any kind of substrat.

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