A STUDY ON DIATOMS OF THE ARTIFICIAL PONDS AND LAKES OF THE NATIONAL BOTANICAL GARDEN, IRAN

T. Nejadsattari, Z. Shariatmadari, & Z. Jamzad


Five aquatic sites of National Botanical Garden of Iran monthly were sampled from December 2003 to November 2004. Total number of 68 genera in 18 families and 11 orders of the planktonic Diatoms were identified. Among the families Bacillariaceae with 19 genera and species showed the highest species richness. Cymbellaceae (11 species), Naviculaceae (7 species), Surirellaceae (6 species), Pleurosigmataceae (4 species), Fragilariaceae and Achnanthaceae each with 4 species, Pinnulariaceae and Gomphonemaceae each with 2 species and Rhopalodiaceae, Cosmioneidaceae, Diadesmidiaceae, Amphipleuraceae, Catenulaceae, Melosiraceae, Mastogloiaceae, Stephanodiscaceae, Anomoeoneidaceae each with 1 species respectively presented in the studied sites.

High population densities of species were observed in the cold seasons.

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Key words. Phytoplankton, Diatom, Population, Botanical Garden, Iran.

INTRODUCTION

Algae are major constituents of aquatic ecosystems (Zimba & Hopson 1997). Due to their minute size they are often overlooked in limnological studies. Their importance in terms of productivity and as a food source in higher trophic levels is well known (Burkholder & Wetzel 1990). Studies on algal flora have received little attention in Iran and there are few published surveys of algal floras (Hirono 1973, Wasylik 1975, Compere 1981). Moghaddam (1976) has reported diatoms from small portion of Zayandeh Rood river. Löffler (1961) reported different algal groups from several geographical areas of Iran. Depth distribution of epipelic algae, seasonal distribution of epiphytic algae in Anzali Lagoon and vertical distribution of epiphytic diatoms on Typha latifolia L. and Phragmites australis Trim. in Amir Kalayeh Lagoon, were reported by Nejadsattari & al. (2002a and b, 2003). Diatom flora of Neure lake was reported by Nejadsattari (2005) and Epi phytic algal flora of Anzali lagoon were studied by Nejadsattari, & al. (2005). Also, algal flora of lotic waters of Zayandehrood river were investigated by Afsharzadeh & al. (2003). Several lakes, ponds, wetlands and rivers in different areas were studied from 1997. In this work Diatoms flora of five artificial ponds and lakes in National Botanical Garden of Iran were studied. The present study is an attempt to contribute to the knowledge about Diatoms and their distribution in these aquatic ecosystems.

MATERIALS AND METHODS

Five aquatic sites were selected for sampling. Approximate area and depth of sites and their substratum were given in table 1.
Table 1. Approximate area and depth of study sites.

<table>
<thead>
<tr>
<th></th>
<th>Ponds &amp; Lakes</th>
<th>Area (m²)</th>
<th>Depth (m)</th>
<th>Substratum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rock garden</td>
<td>2500</td>
<td>2.5</td>
<td>Plastic (Keltan)</td>
</tr>
<tr>
<td>2</td>
<td>Systematic garden</td>
<td>110</td>
<td>1</td>
<td>Cement</td>
</tr>
<tr>
<td>3</td>
<td>Trial area</td>
<td>102</td>
<td>1.2</td>
<td>Plastic (isogam)</td>
</tr>
<tr>
<td>4</td>
<td>Japanese garden</td>
<td>3000</td>
<td>2.5</td>
<td>Cement</td>
</tr>
<tr>
<td>5</td>
<td>Salt lake</td>
<td>1975</td>
<td>1.5</td>
<td>Plastic (Keltan)</td>
</tr>
</tbody>
</table>

Monthly Samples were obtained from each site from December 2003 through November 2004. All samples were collected between 10 AM-13 PM.

Sampling procedure. At each site three samples were collected in a 1 liter bottle from 0.5m depth of shore line. Water temperature and pH were measured immediately after collection. All samples were fixed in 3% formalin, labeled, and were carried to the laboratory in cool containers. Algal samples were allowed to settle for at least 7 days and the super liquid section moved, the final volume of concentrated sample was 130 ml. Diatoms was cleaned using the method described by Patrick & Reimer (1975). Oxidation by hydrogen peroxide and potassium dichromate was done. Slides of diatoms for microscopic analysis were prepared. Identification of algae was done using a Sairan model (BM-22h) microscope at 400-1000X. Identification was based on Whittford and Schumacher (1973), Prescott (1970), Eileen J. Cox (1996), Krammer and Lange-Bertalot (1985) and Patrick & Reimer (1966, 1975). Enumeration of algae was done using Sedgwick-Rafter cell. At least 300 cells were counted and population density was reported as cell/ml. All statistical analysis was done using Excel ver. 2000.

RESULTS AND DISCUSSION
In this study 68 taxa of Bacillariophyta were identified. These belong to 11 orders and 18 families which 53 were identified at species level and other in generic level (Figs 1, 2).

Fig. 1. Number of species among families of diatoms.

Fig. 2. Number of species, families and orders.
Results showed in sites 3 and 4 diatoms have high density in spring and in site 2 the highest density of diatoms occurred in autumn and winter (Figs. 4, 5, 6). In sites 1 and 5 there were distinct population change.

List of Diatom species
Bacillariophyta

Coscinodiscophyceae
Thalassiosirales
Stephanodiscaceae
Cyclotella meneghiniana Kützing
Melosirales
Melosiraceae
Melosira varians C. Agardh
Fragilariophyceae
Fragilariales
Fragilariaceae
Fragilaria sp.
Ulnaria acus (Kützing) M. Aboal
Synedra rampens Kützing.
Synedrella parasitica (W. Smith) Round & Maidana

Bacillariophyceae
Mastogloiales
Mastogloaceae
Aneumastus sp.
Cymbellales
Cymbellaceae
Cymbella lanceolata (Ehrenberg) Kirchner
Cymbella grecilis (Rabenhorst) Cleve
Cymbella turgida W. Gregory
Cymbella naviculiformis (Auerswald) Cleve
Cymbella affinis Kützing
Cymbella cistula (Hemprich & Ehrenberg) O. Kirchner
Cymbella tumida (Brébisson.) von Heurck
Cymbella sp.1
Cymbella sp.2
Cymbella sp.3
Placoneis clementioides (Hustedt) E. J. Cox

Gomphonemataceae
Gomphonema sp.1
Gomphonema sp.2

Anomooneidaceae
Anomooneis sphaerophora (Kützing) Pfütz.

Achnanthales
Achnanthaceae
Achnanthes delicatula Kützing
Achnanthes exigua Grunow
Achnanthes pseudoswazi J. A. Carter
Achnanthidium minutissima (Kützing) Czarnecki

Naviculales
Cosmioeidaceae
Cosmioneis pusilla (W. Smith) D. G. Mann & A. J. Stickle
Diadesmiaceae
Diadesmis spp.

Amphipleuraceae
Frustulia rhomboids var. saxonica (Rabenhorst) Detoni

Pinnulariaceae
Caloneis amphisbaena (Bory) Cleve.
Pinnularia sp.
Naviculaceae
Navicula accommoda Hustedt
Navicula cincta (Ehrenberg) Kützing
Navicula cryptoecephala Kützing
Navicula gregaria Donkin
Navicula lanceolata var. phyllepta (Kützing) Cleve
Navicula subrhyhoocephala Hustedt
Navicula veneta Kützing

Pleurosigmataceae
Gyrosigma acuminatum (Kützing) Rabenhorst
Gyrosigma sp.1
Gyrosigma sp.2
Gyrosigma spencerii (W. Smith) Griffith & Henfrey

Thalassiophysales
Catnenulaceae
Amphora ovalis (Kützing) Kützing

Bacillariaceae

Denticula elegans Kützing
Denticula kuertzingii Grunow
Denticula sp.
Denticula tenuis Kützing
Nitzschia frustulum (Kützing) Grunow
Nitzschia fonticola (Grunow) Grunow
Nitzschia fossilis (Grun) Grun
Nitzschia baciliformis Hustedt
Nitzschia comminuis Grunow
Nitzschia hantzschiana Rabenhorst
Nitzschia intermedia Hantzsch
Nitzschia lacuum Lange-Bertalot
Nitzschia ovalis H. J. Arnott
Nitzschia palea (Kutzing) W. Smith
Nitzschia paleacea Grunow
Nitzschia radicula Hustedt
Nitzschia recta Hantzsch
Nitzschia solita Hustedt
Nitzschia subaccularis Hustedt

Rhopalodiaceae

Epithemia sp.

Surirellales

Surirellaceae
Campyldiscus sp.
Cymatopleura solea (Breb.) W. Smith
Stenopterobia signatella (W. Gregory) R. Ross
Surirella capronii Brebisson
Surirella robusta Ehrenberg
Surirella sp.
Figure 3. Monthly Variation graph of Bacillariophyceae in station 1 \( n = 3, \overline{X} \pm SD \)

Figure 4. Monthly Variation graph of Bacillariophyceae in station 2 \( n = 3, \overline{X} \pm SD \)

Figure 5. Monthly Variation graph of Bacillariophyceae in station 3 \( n = 3, \overline{X} \pm SD \)
The existing differences between different sites can impute to none similar sites condition. Studies show that light and temperature are important factors in growth of algae (Thebault & Rabouille 2003). In addition to light and temperature, nutrient sources are important factors affecting seasonal changes of phytoplanktons (Olsen & al. 1989, Grover 1991). During winter month, temperature and dissolved oxygen are the main factors affecting diversity of algae (Alam & al. 2001). Grazing activity of zooplanktons is also important factor which affects algal population changes through affecting competitive (Evans & Pablow 1985). The current study contributes to the knowledge of algal ecology and flora in Iran.

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REFERENCES