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 C A R A S



Community Structure of Diatoms about the Physicochemical Parameter of River Darna in Igatpuri Tehsil of Nashik District

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ABSTRACT

Diatoms are a good indicator of the ecological condition of rivers and important for water quality assessment. The diatoms are diverse in freshwater bodies & one of the richest algal groups in river habitats. The extensive diversity of diatoms in freshwater is controlled by the physicochemical condition of the water. Sequences of studies were carried out to determine the diversity of diatoms in the Darna River of Igatpuri tehsil of Nashik district. The investigation was conducted at monthly intervals for a period of two years July 2019 to Jun 2021. The current study aims to evaluate the biodiversity of Diatoms (Bacillariophyceae) and the impact of seasonal variation on diatoms diversity in the Darna River. Four sampling stations were selected from the river through the Igatpuri tehsil. Different physicochemical parameters were analyzed from water samples such as pH, temperature, turbidity, conductivity, BOD, etc. The diversity of diatoms was maximum during winter and summer seasons and minimum during rainy seasons. Among the all diatoms the species *Synendra*, *Navicula*, *Cymbella*, *Pinnularia*, *Gomphonema*, etc, showed vast diversity.

Key words: Diversity, Diatoms, Darna River, Seasonal variation, Physicochemical parameter

Different water reservoirs and rivers are the main sources of freshwater for the human population. Algae play a very crucial role in the freshwater ecosystem as the producers and manage the aquatic web in the habitats [1]. Diversity of the river is based on different physicochemical and biological properties. The quality of water in the river ecosystem gives information about the available resources for supporting life in the freshwater ecosystem [2]. The diatoms represent an important component of the river ecosystem and have been used for water quality assessment. The Study of diatom diversity provides important information regarding the environment of the freshwater systems. Diatoms are the only algae in an aquatic ecosystem with cell walls composed of transparent opaline silica. Diatoms provide long-chain fatty acids which are an important energy source in entire zooplankton aquatic insects to different fishes [3].

The different studies carried out in freshwater ecosystems identify the effect of physicochemical parameters on the growth of diatoms. This study indicates that the influence of human activity and variation in different environmental and climatic factors affect diatoms' community composition [4]. Present study deals with the relative diversity of diatoms with

different Physicochemical parameters of river Darna in Igatpuri tehsil of Nashik district.

MATERIALS AND METHODS

The study was conducted on river Darna start north of the Kalsubai range, it drains Igatpuri, Nashik and Niphad tehsil of Nashik district. Five different sites were selected on the river from Igatpuri tehsil (Fig 1).

Water sampling and analysis

Water samples were collected for physicochemical analysis from each sampling station. Dissolved oxygen, pH, and electric conductivity were measured on-site at a different site. The samples from all stations were preserved in a separate container for measurement of the remaining parameter in laboratories by following the standard procedures [5].

Diatom sampling and identification

Diatom samples were collected seasonally and study for a period of two years (July 2019 to June 2021). The collection was made using by planktonic net from open water from all five stations. All the collected water samples were preserved in 4% formalin. Some diatom samples were collected from the available substrate mainly small stones by scrubbing the upper surface using a clean toothbrush.

Diatoms were observed under the binocular stereoscopic microscope. Different diatoms were identified by using standard identification keys [6-7].

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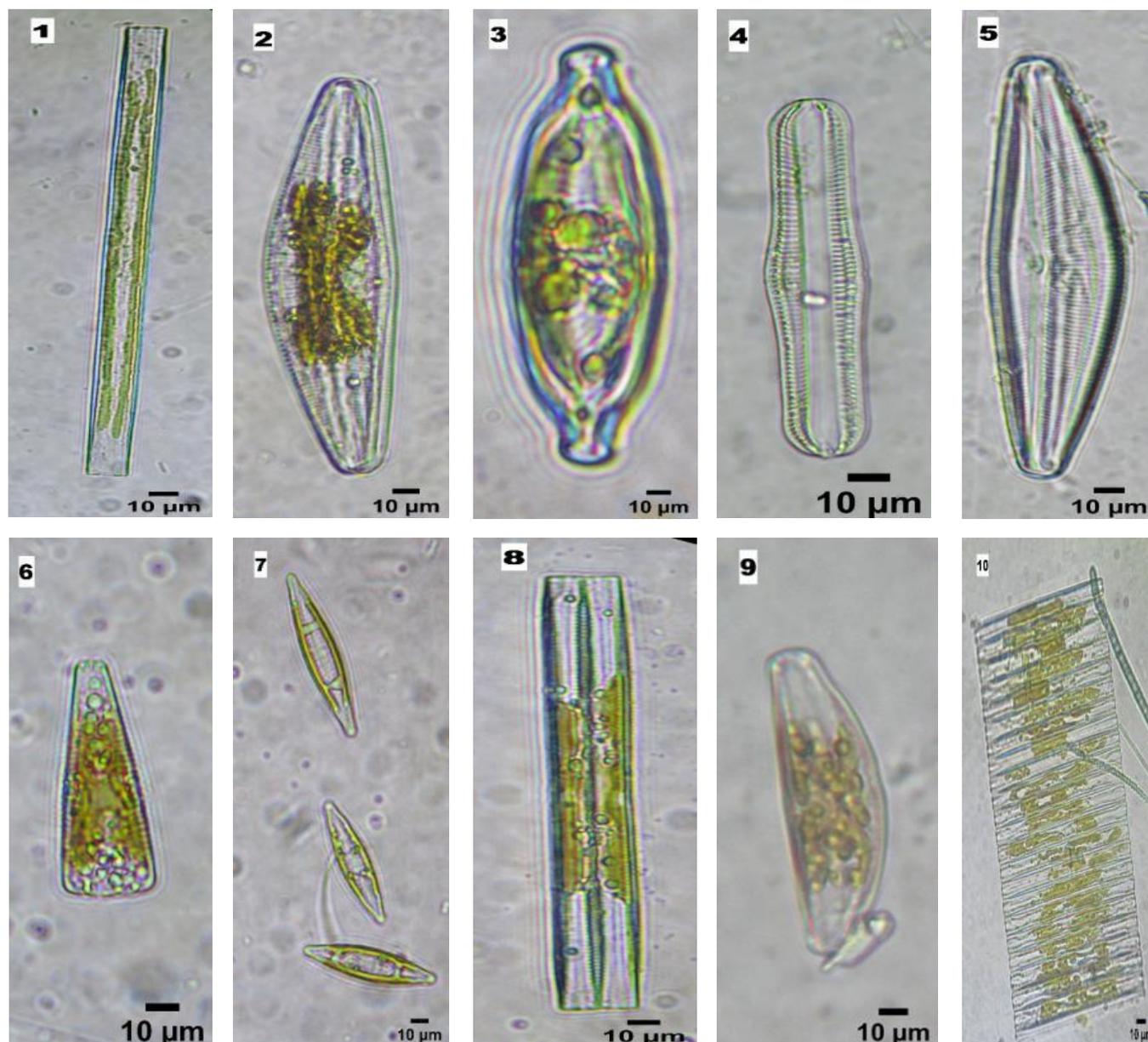


Plate 1 (1). *Synedra ulna*, (2). *Cymbella aspera*, (3). *Navicula menisculus*, (4). *Pinnularia dolosa*, (5). *Cymbella cistula*, (6). *Gomphonema spp* -1, (7). *Navicula spp.*, (8). *Synedra spp.* -1, (9). *Encyonema spp*, (10). *Fragilaria spp*

Table 1 Two-year average value of physicochemical parameters. All the parameters are expressed in mg/L except pH and temperature

S. No.	Parameters	Darna River			
		Station-A	Station-B	Station-C	Station-D
1	pH	8.1	7.5	7.8	7.4
2	Temperature	33	31	35	30
3	Dissolved oxygen	7.6	7.2	6.1	6.8
4	BOD	1.3	1.9	1.5	1.6
5	COD	3.6	4.2	2.9	3.8
6	TDS	181	172	168	179
7	Total suspended solids	10	8.5	10.5	9.5
8	Total alkalinity	89	83	75	94
9	Total hardness	74	81	68	85
10	Calcium	26.4	27.2	26.8	28.1
11	Nitrate	3.4	3.6	2.8	2.2
12	Sulphate	7.1	5.9	6.3	4.9
13	Chloride	7	6.5	6.8	7.4
14	Magnesium	17.7	18.2	16.8	15.9
15	Silica	6.3	6.9	7.7	7.5
16	Potassium	10.4	11.2	10.8	11.5
17	Total Phosphate	0.021	0.018	0.016	0.012

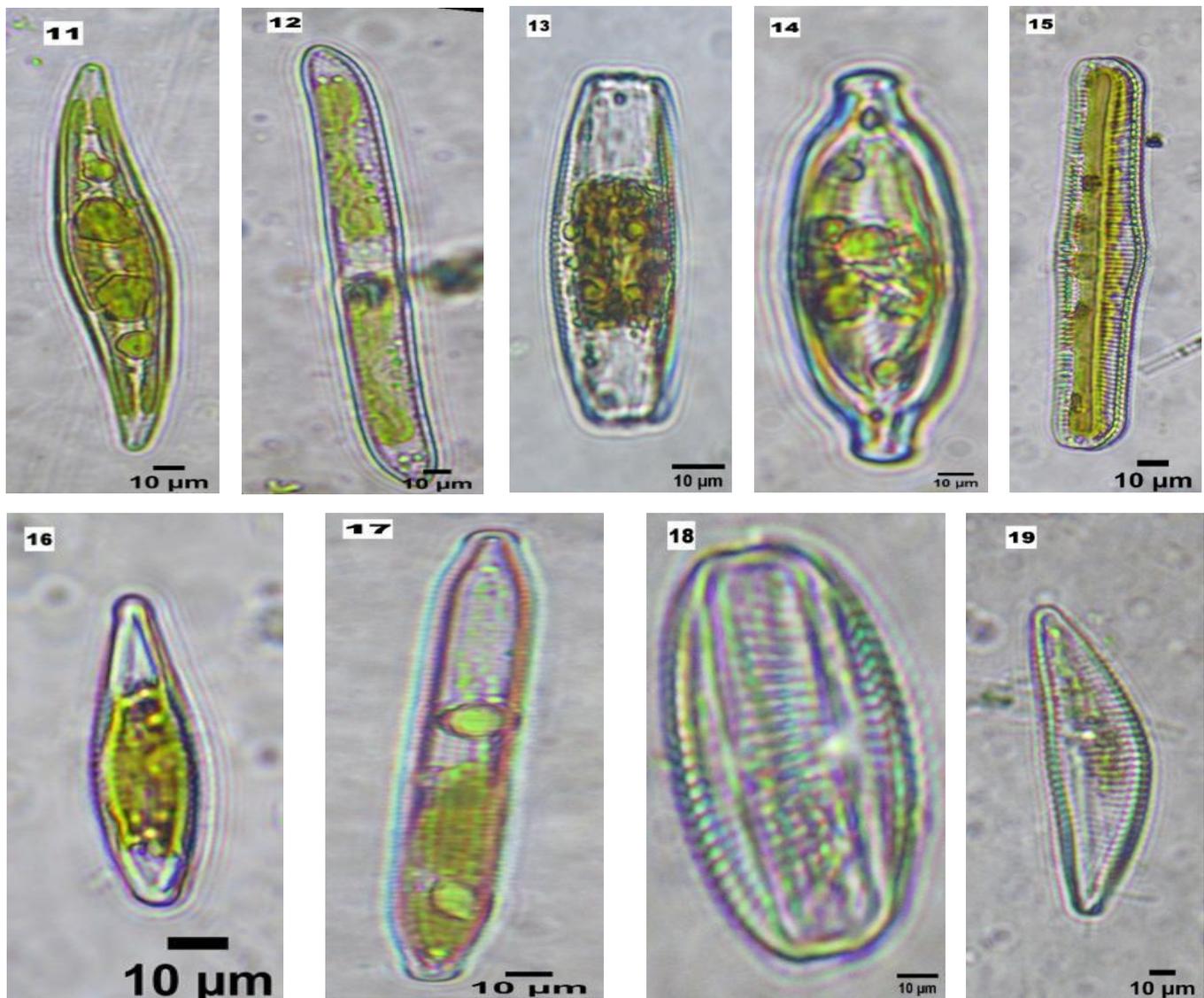


Plate 2 (11) *Gyrosigma* spp – 1, (12) *Nitzschia sigma*, (13) *Amphora* spp- 1, (14) *Caloneis* spp, (15) *Rhopalodia* spp (16) *Gomphonema* spp - 2, (17) *Nitzschia* spp -1, (18) *Amphora ovalis*, (19) *Cymbopleura* spp

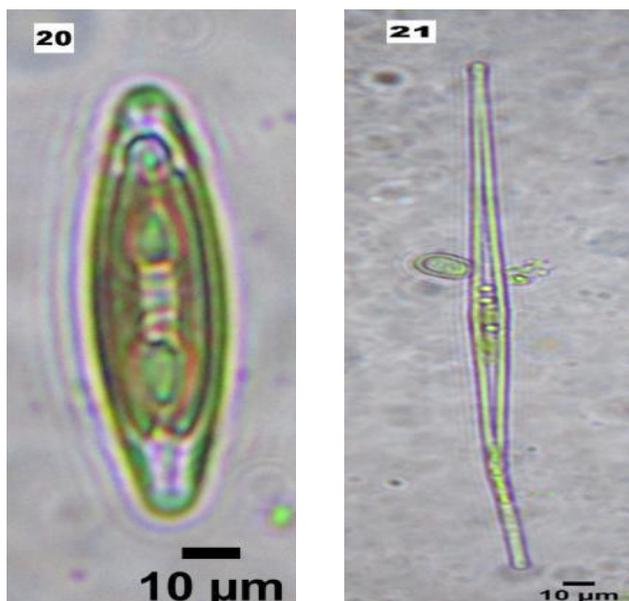


Plate 3 (20) *Stauroneis anceps*, (21) *Cylindrothica* spp.

RESULTS AND DISCUSSION

Physicochemical parameters from the sampling sites

The different values of physicochemical parameters were presented in the (Table 1).

The river water was alkaline pH above 8.2. The range of carbonate at all stations is 20-25 mg/L. Bicarbonate varies between 165-200 mg/L at all the stations. At the different sites, river chloride was present in 20-30 mg/L. Dissolved oxygen is always more than 6 mg/L. It is an important indicator of water quality and governs the diversity and distribution of the diatom population. Total hardness ranged from 105-125 mg/L. Silica varies in a range of 6-9 mg/L. Phosphate ranged between 0.01-0.04 mg/L throughout the investigation.

Diatom composition

In the river, Darna different filamentous algae, phytoplanktons, and benthic algae have been studied from all the stations of the river at the time of the investigation. In all the sites the diatoms were dominated followed by green algae and blue-green algae. Maximum growth of diatoms was observed during summer and winter seasons from the sites and maximum during rainy seasons. In the investigation period of two years (July 2019 to June 2021) total of 21 species of diatoms are found which is listed in the (Table 2).

Alkaline pH and higher level D.O. has favored the growth and multiplication of Diatoms. Important parameters like Dissolved oxygen, phosphate, nitrate, and silica affect the growth of different diatoms. An increase in silica content in the water causes an increase in diatom population [8]. In the river

Darna the dominant diatom population was belonging to species *Synedra ulna*, *Cymbella aspera* *Navicula menisculus*,

Pinnularia dolosa, *Cymbella cistula* *Gomphonema* spp. etc. mainly formed in the bulk of the population [9-11].

Table 2 Diatoms flora of Darna River

S. No.	Name of species	Occurrence of diatoms			
		A	B	C	D
1	<i>Synedra ulna</i>	+	+	+	+
2	<i>Cymbella aspera</i>	+	+	+	+
3	<i>Navicula menisculus</i>	+	+	-	+
4	<i>Pinnularia dolosa</i>	+	+	+	+
5	<i>Cymbella cistula</i>	-	+	+	+
6	<i>Gomphonema</i> spp 1	+	-	+	+
7	<i>Navicula</i> spp.	+	+	+	-
8	<i>Synedra</i> spp. 1	+	-	+	+
9	<i>Encyonema</i> spp	-	-	+	+
10	<i>Fragilaria</i> spp	+	+	-	-
11	<i>Gyrosigma</i> spp.	+	+	-	+
12	<i>Nitzschia sigma</i>	-	+	-	+
13	<i>Amphora</i> spp 1	-	-	+	+
14	<i>Caloneis</i> spp	+	+	-	-
15	<i>Rhopalodia</i> spp	-	+	+	-
16	<i>Gomphonema</i> spp 2	-	+	-	+
17	<i>Nitzschia</i> spp 1	+	-	-	-
18	<i>Amphora ovalis</i>	-	-	+	+
19	<i>Cymbopleura</i> spp	-	+	-	-
20	<i>Stauroneis anceps</i>	+	-	-	-
21	<i>Cylinrothica</i> spp	-	+	-	-

CONCLUSION

The study indicate that physicochemical parameter affects the growth as well as diversity of different diatoms. Different parameters of the river shows that the water is unpolluted as the dissolved oxygen content was high and nitrate and phosphate were present in minimum concentration. Carbonate and bicarbonate were present in considerable quantities and river water always alkaline. Silica was significantly present which indicate that dominance of diatoms in the water. The distribution of seasonal changes plays an important role to determining the variation in diatom diversity. In the investigation total 21 species of diatoms were recorded which dominated in all the three seasons. The study of Darna

River indicates that diatom was found abundantly when temperature of water fluctuate between winter and summer. It is general observation that *Cymbella*, *Gomphonema*, *Fragilaria*, *Pinnularia* species are commonly found in clean water This indicate that river water not yet polluted. So, the river water can be safely used for drinking and irrigation purposes.

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