Diversity of *Navicula* (Diatom) from Sulwade Barrage of river Tapti, Dhule (M.S., India)

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Abstract

Sulwade barrage located 21.30^0 N and 74.80^0 E on river Tapti of Dhule District. River Tapti shows variety of diatoms. Biodiversity of diatoms was studied for one year. Present article deals with twenty-five species of *Navicula* (Diatom- Bacillariophyceae) occur abundantly in winter season. Brief notes and illustration are given for each species.

Key Words: Diatom, *Navicula*, Sulwade barrage.

Introduction

Beginning of work on diatoms in India by Venkatraman (1939, 1956). He contributes on systematic account of South Indian diatoms. Later on, a major contribution in the field of diatoms by Gonzalves and Gandhi (1952-1954), Sarode and Kamat (1984). In North Maharashtra Mahajan et al. (2004), Nandan et al. (2009) Patil (2016) recorded diatoms. There is meager information on diversity of diatoms from river Tapti.

Materials and Methods

The collections were made in winter season in the year 2016. Diatoms were collected by using plankton nets, water samples and mud were collected in plastic bottles and fixed with 4% Formalin.

Diatoms were cleaned by following Brun's method, then observed under microscope with 40X and 100X power for taxonomic study. Camera lucida drawings were made. Identifications were made by Gonzalves and Gandhi, 1953; Gandhi 1956, 1960; Sarode and Kamat 1984.

Taxonomic Account

Genus: *Navicula* was discovered by Bory de Saint- Vincent in 1822 with *Navicula tripunctata* as type species. It is boat shaped diatom, very large genus comprising over 1200 species (Guiry, 2015). True *Navicula* species have lanceolate valves with narrow axial area flanked by fine striae which are slightly radiate at the center but parallel towards the cell apices. The raphe is hooked at the apices with the ends both pointing the same way. Cells are often very motile (naviculoid movement). Cell apices may be narrowly rounded or sub capitate.

Navicula barodensis Gandhi (Fig. 1)

Gandhi (1998)

Valves 14-14.2 µ long, 4-4.8 µ broad, linear, lanceolate, ends constricted, broadly rounded, raphe thin and straight, axial area narrow, central area broad, striae 13-15 in 10 µ, radial throughout.

Navicula chauhanii Gandhi (Fig. 2)

Gandhi (1964)

Valves 7.8-13 µ long and 4.5-4.7 µ broad, striae about 19-22 in 10 µ, fine but distinctly punctate.

Navicula cincta (Ehr.) Kuetz. (Fig. 3)

Hustedt (1930)

Valves 26.1- 29 µ broad, linear, lanceolate with broadly rounded ends, raphe thin and straight, axial area narrow, central area small, striae 18-20 in 10 µ, middle striae widely set.

Navicula citrus Krasske (Fig. 4)

Kresske (1923)

Valves 18-21 µ long and 6-6.8 µ broad, elliptical lanceolate, ends constricted, shortly or weakly capitate rounded. Raphe thin and straight with central pores somewhat closely set and terminal fissures shortly curved. Axial areas very narrow, linear, central area small transversely rectangular, hazy. Striae 18-20nin 10 µ punctate, indistinctly radial or perpendicular to the middle line.

Navicula cryptocephala Kuetz. (Fig. 5)

Hustedt (1930)

Valves 22.7-35.7 µ long, 8.5-9.2 µ broad, lanceolate with produced, rounded ends, raphe thin and straight, axial area narrow, central area slightly extended transversely, small, striae 10-12 in 10 µ.

Navicula dicephala (Ehr.) W. Smith (Fig. 6)

Cleve-Euler (1953)

Valves 20-25 µ long, 7-8 µ broad, linear or linear elliptical with constricted, capitate, rounded ends, raphe thin and straight, axial area narrow, linear area fairly large, somewhat roundish, striae 14-15 in in 10 µ, radial throughout and curved closely set at the ends.

Navicula densestriata Hustedt (Fig. 7)

Hustedt (1930)

Valves 24-30 µ long and 5.6-6 µ broad, linear elliptic, rounded ends. Raphe thin straight with central pores set at a moderate distance and terminal fissures very shortly curved. Axial area very narrow, linear, central area not

developed. Striae about 12-15 in 10 µ, delicate, slightly radial in the middle and weakly convergent towards end.

Navicula gastrum Ehr. (Fig. 8)

Hustedt (1930)

Valves 48-55 µ long, 18.5-20 µ broad, elliptic lanceolate with short, rostrate and broad rounded ends, raphe thin and straight, axial area narrow, linear, central area widened, irregular, striae 8-10 in 10 µ, radial throughout, long and short striae alternate each other in middle.

Navicula grimii Krasske (Fig. 9)

Hustedt (1930)

Valves 19-25 µ long 7.1-8.2 µ broad, elliptic lanceolate with constricted capitate ends, raphe thin and straight, axial area narrow, central area large, rectangular, striae 14-15 in 10 µ, radial.

Navicula halophila Grun. (Fig. 10)

Foged (1976)

Valves 52-56 µ long 12.2-13.4 µ broad, elliptical lanceolate with produced, slightly capitate ends, raphe somewhat thick and straight, axial area narrow, central area slightly wide end, striae 17-19 in 10 µ, perpendicular to the middle line.

Navicula laterostrata Hustedt (Fig. 11)

Hustedt (1930)

Valves 18.5-28.5 µ long, 6.6-9.5 µ broad, elliptic lanceolate with broadly rounded and more or less capitate ends, raphe thin and straight, axial areas narrow, central area large, rhombic to rounded, striae 14-16 in 10 µ in the middle and up to 20 in 10 µ at the end, delicate and radial.

Navicula lucidula Grun. (Fig. 12)

Cleve-Euler (1953)

Valves 14-20 µ long,8-10 µ broad, elliptical with broadly rounded ends, raphe thin and straight, axial areas very narrow, central area very small, striae transverse and longitudinal, 16-18 in 10 µ.

Navicula maharashtrensis Sarode and Kamat (Fig. 13)

Sarode and Kamat (1983)

Valves 15-17 µ long, 4.8-5.2 µ broad, very small, rhombic lanceolate with somewhat acutely rounded ends, raphe thin and straight, axial area very narrow, central area small, rounded, striae 28 in 10 µ.

Navicula mutica Kuetz. ***f. goeppertiana*** (Bleisch) Grun. (Fig. 14)

Cleve-Euler (1953)

Valves 18-29 µ long, 7-7.5 µ broad, lanceolate to linear lanceolate with somewhat acutely rounded ends, raphe thin and straight, axial area narrow, central area large, rectangular with an isolated punctum on one side, striae 18-20 in 10.

Navicula mutica Kuetz. *var*. ***producta*** Grun. (Fig. 15)

Cleve-Euler (1953)

Valves 20-29 µ long, 8-9.5 µ broad, elliptic lanceolate, produced, broadly rounded ends, raphe thin and straight, axial area narrow, central area large, rectangular widening towards the margin with an isolated punctum, striae 15-16 in 10 µ in the middle and up to 19 in 10 µ at the ends, radial, punctate dash like.

Navicula pupula Kuetz. *var*. ***rostrata*** Hustedt. (Fig. 16)

Cleve-Euler (1953)

Valves 30 µ long, 7.2-7.8 µ broad, elliptic with narrowed constricted rostrate ends, raphe thin and straight, polar areas distinct, axial areas very narrow, central large, rectangular, striae 20-22 in 10 µ, radial and fine.

Navicula radiosa Kuetz. (Fig. 17)

Cleve Euler (1953)

Valves 27.5-34 µ long, 5.6-6 µ broad, narrowly lanceolate and gradually tapering to somewhat acutely rounded ends, raphe thin and straight, axial area narrow, central area large, rounded striae 14-16 in 10 µ in the middle and convergent at the ends.

Navicula rhynchocephala Kuetz. (Fig. 18)

Cleve-Euler (1953)

Valves 35-41 µ long, 7-8.5 µ broad, lanceolate with rounded capitate ends, raphe thin and straight, axial area narrow, linear, central area large, rounded, striae14-16 in 10 µ, punctate, radial but slightly convergent at the ends.

Navicula salinarum Grun. *var*. ***intermedia*** (Grun.) (Fig. 19)

Cleve Euler (1953)

Valves 29-35 µ long, 7.8-8.2 µ broad, lanceolate with produced capitate ends, raphe thin and straight, axial area narrow, linear, central area moderate, striae 18-19 in 10 µ, radial and curved in the middle and convergent at the ends, short and long striae alternate in the middle.

Navicula subdapaliformis Gandhi (Fig. 20)

Gandhi (1970)

Valves 44.8-52 µ long, 9.2-10.5 µ broad, narrowly elliptical lanceolate with broad, truncately rounded ends, raphe thin and straight, terminal fissures large, semicircular and curved, axial area narrow, linear, central area large, striae 15-16 in 10 µ, radial and curved.

Navicula subhamulata Grun. (Fig. 21)

Hustedt (1930)

Valves 14-20 µ long and 6.2 µ broad, elliptic lanceolate, ends constricted. Raphe thin and straight, central area expanded. Striae about 18-20 in 10 µ, fine.

Navicula subminuscula Mangun (Fig. 22)

Hustedt (1927)

Valves 20-22 µ long and 6.4-6.6 µ broad, lanceolate to lanceolate elliptical, ends constricted, narrowly rostrate rounded. Raphe thin straight. Axial area very narrow, linear central area scarcely wider than the axial area. Striae about 16-22 in the middle and 24-30 in 10 µ towards ends, parallel and perpendicular to the middle line all throughout.

Navicula subrhynchocephala Hustedt (Fig. 23)

Foged (1976)

Valves 32-37 µ long, 8.1-9.5 µ broad, lanceolate with produced capitate ends, raphe thin and straight, axial area narrow, linear, central area large, rounded, striae 12-14 in 10 µ, slightly radial in the middle and slightly convergent at the ends.

Navicula subtenelloids Cholnoky (Fig. 24)

Cholnoky (1958)

Valves 20.5-22 µ long, 3.5-3.8 µ broad, very narrowly lanceolate with slightly constricted, produced, rounded ends, raphe thin and straight, axial area narrow, linear, central area small, striae21-23 in 10 µ, almost parallel.

Navicula tenelloides Hustedt (Fig. 25)

Hustedt (1938)

Valves 20.4-22 µ long and 3.3-8 µ broad, narrow, linear, lanceolate, ends acutely rounded, raphe thin and straight, axial area very narrow, central area small roundish, striae 16-17 in 10 µ in the middle, radial in the middle and convergent towards the end.

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Figure Legends

1) *Navicula barodensis* Gandhi
2) *Navicula chauhanii* Gandhi
3) *Navicula cincta* (Her.) Kuetz.
4) *Navicula citrus* Krasske
5) *Navicula cryptocephala* Kuetz.
6) *Navicula dicephala* (Ehr.) W. Smith
7) *Navicula densestriata* Hustedt
8) *Navicula gastrum* Ehr.
9) *Navicula grimii* Krasske
10) *Navicula halophila* Grun.
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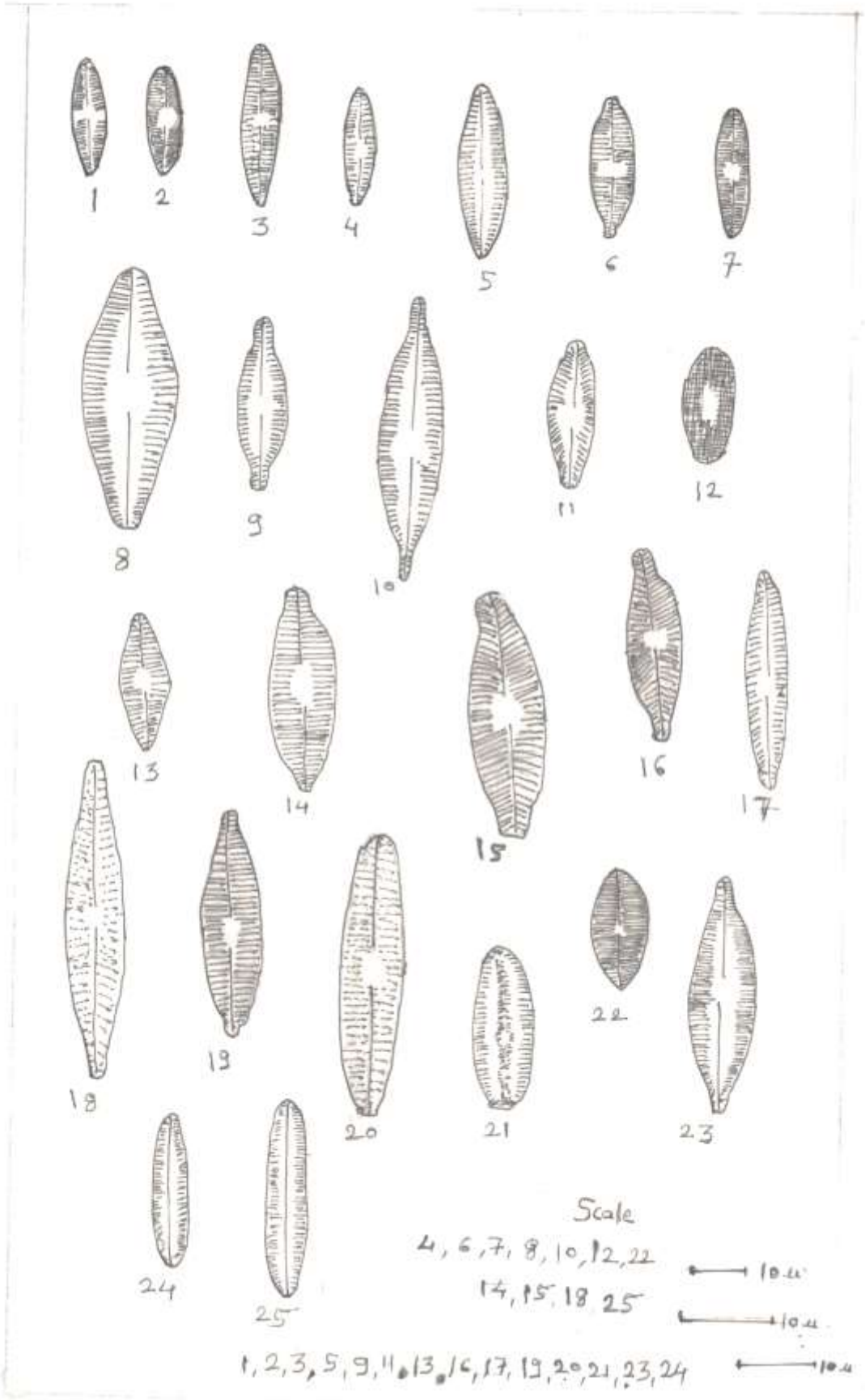
13) *Navicula maharashtrensis* Sarode and Kamat
14) *Navicula mutica* Kuetz. *f. goeppertiana* (Bleisch) Grun.
15) *Navicula mutica* Kuetz. var *producta* Grun.
16) *Navicula pupula* Kuetz. var *rostrata* Hustedt
17) *Navicula radiosa* Kuetz.
18) *Navicula rhynchocephala* Kuetz.
19) *Navicula salinarum* Grun. var. *intermedia* (Grun.)
20) *Navicula subdapaliformis* Gandhi
21) *Navicula submulata* Grun.
22) *Navicula subminuscula* Mangum
23) *Navicula subrhynchocephala* Hustedt
24) *Navicula subtenelloids* Cholnoky
25) *Navicula tenelloides* Hustedt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