TAXONOMIC STUDY OF THE GENUS NAVICULA FROM GIRNA RIVER NEAR JALGAON REGION MAHARASHTRA, INDIA

R. B. Borse
Research Centre, Dept. of Botany,
Nagnath Art's, Commerce and Science College, Aundha (Nag.)
rajeshborse25@gmail.com

Abstract

Diatoms represent an important class of aquatic phototrophs, it is also important tool for monitoring environmental condition. In this study, we aimed to revolutionized our knowledge and understanding of conventional taxonomy of genus Navicula (Bacillariophyceae) from Girna river near Jalgaon regions of Maharashtra, India. Sample were taken from three locations at Girna river near Jalgaon region. Thirteen species of Navicula were observed under Light microscopic (LM), and identified till forms level. All *Navicula* species were taxonomically determined and are described for the first time from these areas. They were listed and presented with morphological descriptions, dimensional information and photographic information.

Key words: Morphographic, Girna, *Navicula*, taxonomically, Jalgaon, investigation.

Introduction

The diatoms are biological index, used to access water quality, have shown their limits to detect toxic pollution effects. The diatoms are well known bioindicators of tropic pollution. Diatoms are essential members of the phytoplankton communities in the fresh water as well as marine environment and very often from a dominant component of macro and micro planktons Fogg, G. E. (1982).

Girna river water is perhaps the most vulnerable habitants and are most likely to be changed by the activities of man. This essential resource is becoming increasingly scarce in many parts of the river due to the severe impairment of water quality. This river originates in the western hills of Kalwan subdivision of Nasik district. Total length of Girna river in Jalgaon district is approximately around 174 km. Now-a-days this river has also got polluted. Diatoms are a large and diverse group of single-celled algae. They are distributed throughout the world in nearly all types of aquatic systems and are one of the most important food resources in marine and freshwater ecosystems. There are many thousands of taxa with diverse ecological requirements, their siliceous remains are used extensively as environmental indicators in studies of climate change, acidic precipitation and water quality (Stoermer & Smol, 1999).

Diatoms not only the most important primary producers on the Earth, but also important tools for monitoring environmental conditions of the past and present. Especially the benthic diatoms are very useful tools in the interpretation of past environmental conditions as well as the understanding of the present ecosystem in river area.

Taxonomy is the science of classifying, naming, describing organisms and it also shows the status of population, conservation of specific species. In advance biological researchers can't find better result without classification, as the taxa of their organism are not specified for nomenclature. The oncoming student or researchers are confused instead of getting benefit of the research work. In this paper we given morphological description, scatches and photographs of total 13 taxa, in which there are 6 species, 4 variety and 3 forma of genus *Navicula*.

Navicula cells generally solitary and free floating. *They are* raphed, pinnate diatom with boat-shaped cells that may exist singly or in ribbons. The valves are symmetrical both apically and transapically, and may have rounded, acute, or capitate ends. The central area is often distinctly expanded. The lineate striae are composed of elongated areolae arranged parallel to the apical axis. However, the areolae may be difficult to see in many taxa, particularly in live, uncleaned samples. *Navicula* is the largest diatom genus, with over 10,000 species, varieties, and forms. *Navicula*, like many other raphe-bearing diatoms, secretes mucilage from the raphe to enable the cells to glide along the substrate.

Materials and Methods

Algal materials were collected in specimen bottles at the beginning of the experiment. Filamentous form were collected with the forceps or by hand, while for phytoplankton forms surface water were collected between 8 to 9 am., epiphytic form were collected by scraping or squeezing the hydrophytes.

Algal sample were collected at monthly interval, during January 2007 to December 2008. The attached epiphytic and floating form of algae were collected in acid washed container bottles, and transferred to the laboratory for the immediate preservation in the 4% formalin for further taxonomic investigation.

The permanent slides of the diatoms were prepared by treatment method (Sarode and Kamat, 1984). Diatom frustules were prepared by boiling the sample in the mixture of concentrated sulphuric acid (20.25 ml preserved sample+20.25 ml conc. H_2SO_4). The diatomaceous remain were then washed in distilled water until acid free and centrifuged samples were preserved in 70% alcohol. Frustules were eventually mounted in Canada balsam for microscopic examination. Photographs taken by Nikon camera and sketches were made by using camera lucida. Identification of diatoms was mostly based on the key given by Hustedt (1930), Venkataraman (1939), Cleve-Euler (1955). Krishnamurthy (1954), Ganghi (1958, 1960, 1998) and Sarode and Kamat (1984).

Systematic account

Genus- *Navicula* Bory, 1822

Navicula cocconeiformis Gregory Pl. 1, fig. 7; Pl. 2, fig. 1

Hustedt 1930. P. 290, f. 493.

Valves 20-27 µ long, 8-9µ broad, rhombic elliptical with narrowed acutely rounded ends; raphe thin with central pores distantly placed; axial area narrow; central area very small, elliptical; striae 24-26 in 10µ, radial throughout, finely punctate, short and long striae alternate each other in the centre.

Bombay (Gonzalves and Gandhi 1954). Nagpur, Alibag.

Navicula cuspidata Kuetz. Pl. 1, fig. 13; Pl. 2, fig. 7

Hustedt 1930, p. 268, f. 433.

Valves 65-107µ long, 14.6-20 µ, broad, rhombic lanceolate with acutely rounded ends; raphe thin and straight with hooked unilaterally bent central pores and large terminal fissures; axial area narrow, linear, slightly widened in the middle, central area very small; striae transverse, 14-16 in 10µ, parallel, slightly convergent at the ends, longitudinal striae about 25 in 10µ.

Bombay (Gonzalves and Gandhi 1954). Kolhapur (Ganhi 1956b, 1958b; Panhalgad (Ganghi 1959c). Lonvla (Ganghi 1962b). Sav, Rajapur (Thomas and Gonzalves 1965). Aurangabad, Bihar, Osmanabad, pali (Sarode and Kamat 1980b). gangapur (Sarode and kamat 1983a). Bhusava, Jalgaon, Dhule.

Navicula cuspidata Kuetz. v. **ambigua** (Ehr.) Cleve Pl. 1, fig. 11; Pl. 2, fig. 6

Hustedt 1930, p. 268, f. 434.

Valves 56.7-126µ long, 15.5-28µ broad, narrowly rhombic lanceolate with constricted produced, capitate ends; craticular plates sometimes present; raphe thin and straight with central pores hook like; axial area very narrow, linear; central area very small; transverse striae 18-20 in 10µ, longitudinal striae 20-22 in 10µ, fine.

Bombay (Gonzalves and Gandhi 1954; Gandhi 1955). Kolhapur (Gandhi 1955, 1958b; Panhalgad (Gandhi 1959c). Lonavla (Gandhi 1962b). Aurangabad Sarode and Kamat 1980b). Wardha, Chandrapur, Katta (Sarode and Kamat 1983a). Pali, Nashik, Jalgaon, Dhule, Mahad, Panvel, Thane Barshi, Sangli, Satara, Karad.

Navicula cuspidata Kuetz. v**. ambigua** (Ehr.) Cleve f. **diminuta** A. Cl. Pl. 1, fig. 5; Pl. 2, fig. 8

Cleve-Euler 1952, p. 18, f. 1353 f.

Valves 60-85µ, long, 16.1-20.5µ, broad, broadly lanceolate with constricted, rounded ends; raphe thin and straight with unilaterally bent central pores; axial area narrow; central area slightly widened; transverse striae 14-16 in 10 µ, longitudinal striae 20-22 in 10µ, fine.

Aurangabad (Sarode and Kamat 1980b). Wardha Sarode and Kamat 1983a). Kolhapur.

Navicula cuspidata Kuetz. v. **conspicua** Venkat. Pl. 1, fig. 6; Pl. 2, fig. 9

Venkataraman 1939, p. 325, f. 83, 88.

Valves 138-141µ long, 35.5-35.8µ broad, rhombic to elliptical lanceolate with slightly constricted and rounded ends; raphe thin and straight, central pores bent unilaterally, axial area narrow; central area slightly widened; transverse striae 14 in 10µ, parallel, slightly convergent at the ends; longitudinal striae 8-10 in 10µ, coarse, clear and prominent, closer towards the margins and wider near the middle.

Bombay (Gonzalves and Gandhi 1954). Kolhapur (Gandhi 1958b). Osmanabad, Pali (Sarode and Kamat 1980b).

Navicula cuspidata Kuetz. v. **major** Meister f. **robusta** Gonzalves et Gandhi

Gonzalves and Gandhi 1954, p. 340, f. 109. Pl. 1, fig. 1; Pl. 2, fig. 11

Valves 201-230µ long, 48-50µ broad, rhombic lanceolate with attenuated, constricted, capitate ends; raphe thin and straight, with hooked, unilaterally bent central pores and broadly curved terminal fissures; axial area very narrow; central area slightly widened; transverse striae about 15 in 10µ, longitudinal striae about 18 in 10µ.

Bombay (Gonzalves and Gandhi 1954). Alibag, Dhule.

Navicula halophila (Grun.) Cleve **f. subcapitata** Ostrup Pl. 1, fig. 9; Pl. 2, fig. 4

Venkataraman 1939, p. 327, f. 91.

Valves 33-40µ long, 6.7-7.5µ broad, lanceolate with slightly produced and capitate ends; axial area narrow, linear; central area slightly widened in the middle; striae 15-16 in 10µ, perpendicular to the middle line.

Satnavari (Sarode and Kamat 1983a).

Navicula minuta (Cleve) A. Cl. Pl. 1, fig. 3; Pl. 2, fig. 2

Cleve-Euler 1953, p. 142, f. 791a (= **Navicula minuta** v. **genuine** A. Cl.).

Valves 18.5-21µ long, 6.2-7µ broad, broadly lanceolate with constricted, shortly capitate ends; raphe thin and straight; axial area very narrow; central area very small, roundish; striae about 24 in 10µ, strongly radial and fine.

Kolhapu (Gandhi 1958b; Pali (Sarode and Kamat 1980b).

Navicula pupula Kuetz. v. **capitata** Hustedt Pl. 1, fig. 12; Pl. 2, fig. 13

Hustedt 1930, p. 281, f. 467c.

Valves 29-35µ long, 8.1-9µ broad, linear with slightly convex margins and constricted, broadly capitate, rounded ends; raphe thin and straight; axial area narrow, linear; central area transversely rectangular and large; terminal nodules distinct; striae 16-18 in 10µ, radial and curved, long and short striae alternating in the middle.

Bombay (Gonzalves and Gandhi 1954; Gndhi 1955). Kolhapur (Gandhi 1958b). Lonavla (Gandhi 1962b). Amravati, Wardha, Chandrapur, Gangapur (Sarode and Kamat 1983a). Jalna, Osmanabad, Parbhani, Pali, Aurangabad, Nanded, Bhusaval, Nashik, Pune, Satara, Karad, Alibag, Mahad, Pen.

Navicula sahyadrensis Sarode et Kamat Pl. 1, fig. 4; Pl. 2, fig. 12

Valves 62.2-70 µ long, 1.2-14 µ broad, linear lanceolate with produced and acute rounded ends; raphe thin enclosed in siliceous ribs, central pores unilaterally bent, terminal fissures distinct; axial area narrow; central area small; striae 7-8 in 10 µ, in the middle and up to 10 in 10µ, at the ends, thick, redial in the middle and convergent at the ends.

Navicula vitabunda Hust. Pl. 1, fig. 2; Pl. 2, fig. 10

Cleve-Euler 1952, p.18, f. 797.

Frustules large and robust; valves 70-134 µ long, 27.4-4 µ broad, rhombic lanceolate with somewhat produced, large, unilaterally bent, terminal fissures broadly curved and clear; axial area large, moderately lanceolate; central area large, circular and somewhat unilateral; striae canal like 13-14 in 10 µ, radial in the middle and convergent at the ends, crossed by two longitudinal lines slightly away from the margin.

Navicula viridula Kuetz. Pl. 1, fig. 8; Pl. 2, fig. 5

Hustedt 1930, p. 297, f. 503.

Valves 62.2-70µ long, 1.2-14µ broad, linear lanceolate with produced and rostrate rounded ends; raphe thin enclosed in siliceous ribs, central pores unilaterally bent, terminal fissures distinct; axial area narrow; central area wide and suborbicular; striae 7-8 in 10µ, in the middle and up to 10 in 10µ, at the ends, thick, redial in the middle and convergent at the ends.

Bombay (Gonzalves and Gandhi 1954). Satnavari (Sarode and Kamat 1983a). Kolhapur, Nagpur Dhule.

Navicula viridula Kuetz**.** v. **rostellata** (Cleve) Meister Pl. 1, fig. 10; Pl. 2, fig. 3

Gonzalves and Gandhi 1954, p. 348, f. 123.

Valves 49-54µ long, 11.5-13µ broad, broadly linear, somewhat lanceolate with suddenly narrowed and produced subrostrate ends; raphe thin, enclosed in siliceous ribs with central pore bent unilaterally; axial area narrow and indistinct; central area rounded; striae 8-10 in 10µ, thick, strongly radial in the middle and slightly convergent at the ends.

Bombay (Gonzalves and Gandhi 1954). Jana, Osmanabad, Aurangabad, Pali, Bhir (Sarode and kamat 1980b). Wardha, Katta, Gangapur (Sarode and Kamat 1983a, Kolhapur Sangli. Satara, Karad, Pune, Nashik, Thane.

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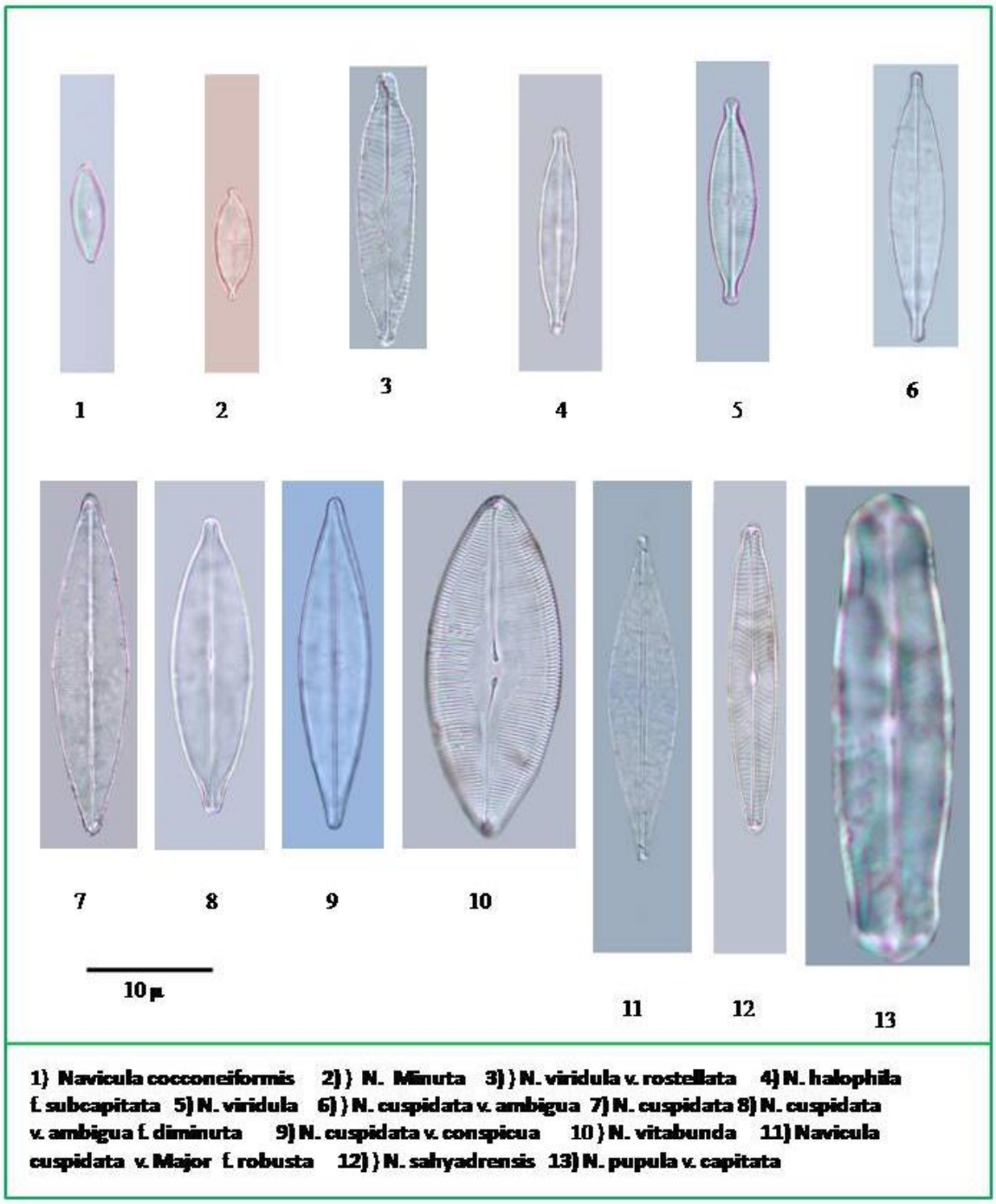
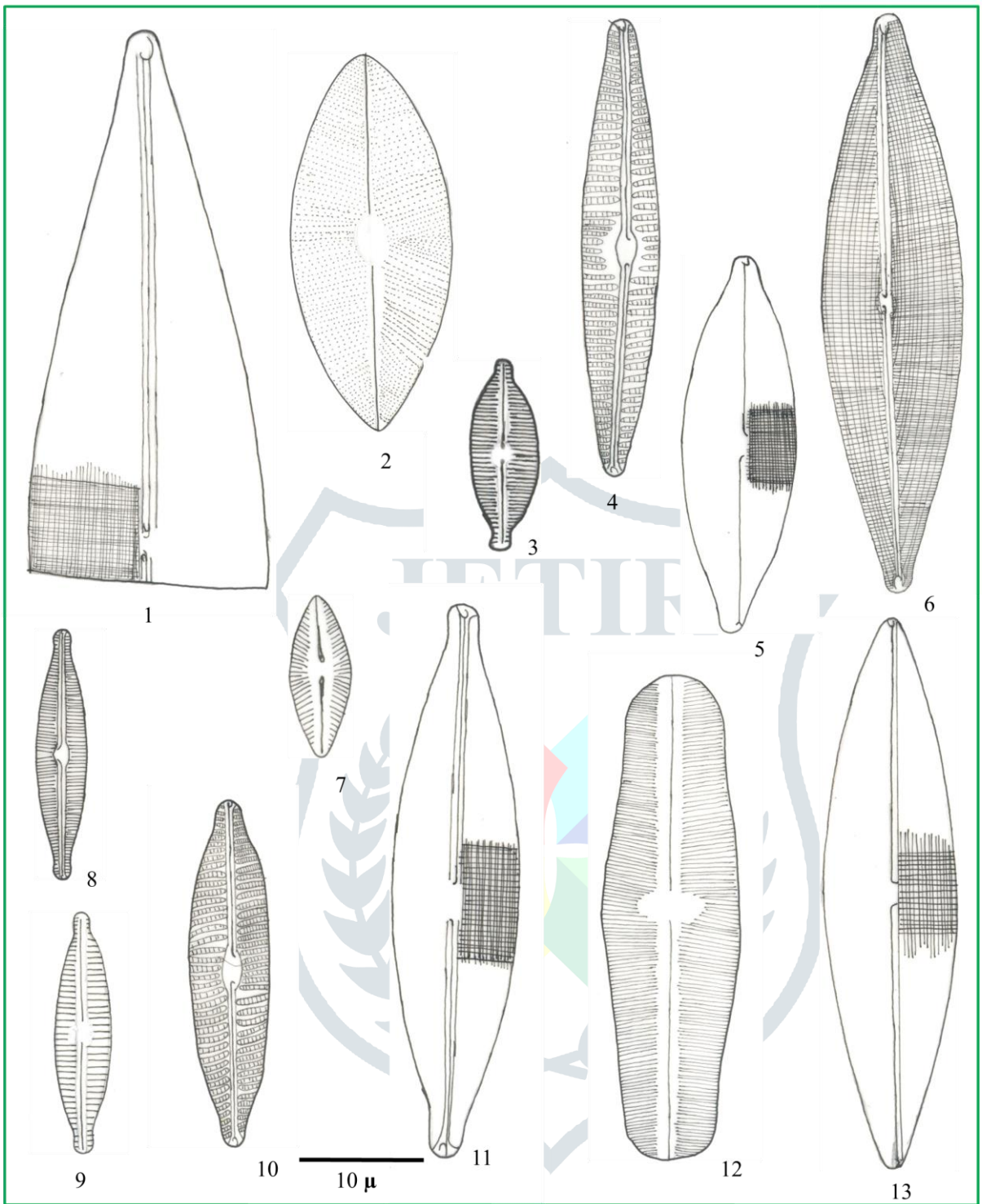
Plate-2: Navicula Photographs under Light microscope



1) Navicula cocconeiformis 2)) N. Minuta 3)) N. viridula v. rostellata 4) N. halophila f. subcapitata 5) N. viridula 6)) N. cuspidata v. ambigua 7) N. cuspidata 8) N. cuspidata v. ambigua f. diminuta 9) N. cuspidata v. conspicua 10) N. vitabunda 11) Navicula cuspidata v. Major f. robusta 12)) N. salyadrensis 13) N. pupula v. capitata

Plate-1: Navicula Scatches



1) **Navicula cuspidata** v. **Major** f. **robusta** 2) **N. vitabunda** 3) **N. minuta** 4) **N. sahyadrensis** 5) **N. cuspidata** v. **ambigua** f. **diminuta** 6) **N. cuspidata** v. **conspicua** 7) **Navicula cocconeiformis** 8) **N. viridula** 9) **N. halophila** f. **subcapitata** 10) **N. viridula** Kuetz. v. **rostellata** 11) **N. cuspidata** v. **ambigua** 12) **N. pupula** v. **capitata** 13) **N. cuspidata**