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## Biodiversity of Charophytes from Satara District (Maharashtra)

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**Abstract:** Present paper deals with observations on macrophytic algae viz. Charophytes from Satara district. Charophytes are among those algae which are being considered as probable candidates for terrestrial migration of aquatic plants. Out of seven genera of charophytes, two genera *Chara* and *Nitella* have been reported from the study area. Six species of *Chara* viz *Chara vulgaris* L em., *Chara globularis* Thuill, em., *Chara setosa* Klein ex.Willd., *Chara zeylanica* Klein ex.Willd., em., *Chara braunii* Gm., *Chara socotrensensis* Nordst., em.Kuhn,em. and two species of *Nitella* viz *Nitella stuartii* A.Br., *Nitella gracilis f. minuta* (T.F.A.) R.D.W. are described. Ecological observations along with geographical distribution of these Charophytes are also enumerated.

**Key words:** Charophytes, *Chara*, *Nitella*, ecology.

### Introduction

Charophytes are the macroscopic algal forms drawing extensive attention of phycologist now-a-days world over. These are highly organized plants consisting of seven extant and many other extinct genera. Distribution of charophytes is worldwide (R.D.Wood and Imahori, 1965) Some of the species of charophytes have been recognized as "species par excellence" in India as well as in the world. Majority work on charophytes in India has been carried out either in the northern or southern parts of country. The middle states have been meagerly explored for these algae. In Maharashtra work on charophytes have been concentrated only in the limited area such as western ghats (N.D.Kamat 1965,1967, S.C.Dixit 1931, 1935, 1940a, 1940b, 1942, Vaidya and Gonzalves E.1963, Vaidya 1967, Patil S.R. and ChauguleB.B. 1992, Karande V.C. and ChauguleB.B. 1998, Karande C.T. and Karande V.C 2000, Desai and Karande C.T. 2009). Besides few of reports no information on the charophytes from Satara district is known to us. Hence a survey and documentation work on charophytes was felt necessary.

### Material and methods

Satara district occupies important position owing to the famous hill stations as well as "throne of king Shivaji". District lies between 17° 50' and

18° 11' North latitude and 73° 31' to 74° 75' East longitude along the Sahyadri ranges. It has an area of 10417 sq. km., with 11 administrative tahsils. The district has a compact shape with an east west stretch of about 144 km., and north south about 120 km. Plants were collected during post monsoon season from different locality. Morphological observations were made and plants were preserved in 4% formaldehyde solution. Identification was made using monographs by Wood and Imahori 1965, Zaneveld 1940, Pal and Kundu1960 and Subramanian 2002. Voucher specimens and slides have been deposited in Department of Botany, Y. C. Institute of Science, Satara.

### Observations

#### *Chara vulgaris* v. and f. *gymnophylla* (A.Br.) Nyman

Plant monoecious to 4 – 12 cm high Axes 285 – 800 µm. in diameter; Cortex 2 corticate isostichous to tylacanthous. Stipulodes in 2 – tiers, Branchlets 10 in a whorl, 0.4 – 2.5 cm long, segment 3 – 5 of which all are ecoticated, end segment single celled, Bract cells 4 – 6 unilateral 1485 – 3428 µm. long. Bractioles 2, 146 – 1285 µm. long. Gametangia conjoined or geminate at lowest 1 – 3 nodes. Oogonia 366 – 660 µm. long 263 – 352 µm. wide, convolutions 12 – 14. Coronula 73 - 132 µm. high and 146 –



180  $\mu\text{m}$ . wide. Oospore black 400 – 460  $\mu\text{m}$ . long, 300 – 352  $\mu\text{m}$ . wide striae of 10 – 11 ridges; Antheridia 220 – 337  $\mu\text{m}$ . in diameter.

Locality - Mhasvad, Rajewadi, Degaon, Rahimatpur,

*Chara globularis* v. and f. *globularis* Thuill., em.

Plants monoecious 60 – 20 cm high, Axes slender, 300 – 600  $\mu\text{m}$ . in diameter; 3.5 cm long; cortex regularly 3 – corticate, Stipulodes 74 – 103  $\mu\text{m}$ . in diameter, Branchlets 9 in a whorl end segment 1 – 2 celled, pointed or blunt. Bract cells 3 – 500 – 1200  $\mu\text{m}$ . long Gametangia conjoined at lowest 5 branchlet nodes. Oogonia 400 – 800  $\mu\text{m}$ . long (incl. coronula), 400 – 700  $\mu\text{m}$ . long (excl. coronula), 200 – 550  $\mu\text{m}$ . wide; convolutions 9; coronula 125 – 250  $\mu\text{m}$ . high, 130 – 200  $\mu\text{m}$ . wide, connivent, erect or rarely spreading. Oospores dark reddish black, 350 – 600  $\mu\text{m}$ . long, 278 – 410  $\mu\text{m}$ . wide; striae of 9 faint to prominent ridges terminating in basal claws; fossa 58 – 74  $\mu\text{m}$ . across; membrane granulate. Antheridia 219 – 325  $\mu\text{m}$ . in diameter, octoscutate.

Locality – Mhasvad, Khatav, Rahimatpur, Aundh

*Chara setosa* f. *setosa*. A. Br.

Plants monoecious 20 – 30 cm high. Axes 705 – 728  $\mu\text{m}$ . in diameter Stipulodes 2 tiers, branchlets, 8 – 9, 1 – 4 cm long; segment 7 – 8, corticate, Bract cells 6 – 8 unilateral, anterior 428 – 580  $\mu\text{m}$ , Post 197  $\mu\text{m}$  long, Bractioles 2 as long as mature oogonium, 704 – 762  $\mu\text{m}$ , Gametangia conjoined at 2 – 5 branchlet nodes, Oogonia 485 – 630  $\mu\text{m}$ . long, 439 – 485  $\mu\text{m}$  wide, convolutions 12 – 14; coronula 135 – 175  $\mu\text{m}$ . high, 199 – 227  $\mu\text{m}$ . wide, Oospores brown to black, 651 – 721  $\mu\text{m}$ . long, 424 – 485  $\mu\text{m}$ . wide; striae of 10 – 12 ridges; fossa 75  $\mu\text{m}$ , membrane opaque, Antheridia 272 – 363  $\mu\text{m}$ . in diameter.

Locality – Triputi (near Koregaon)

*Chara setosa* f. *innermis* Zanev. R.D.W.

Plants monoecious 30 cm high. Axes 454 – 330  $\mu\text{m}$ , internodes 1 – 2 times as longer than branchlets, cortex 3 – corticate, isostich, spine cells rudimentary, Stipulodes 2 tiers, shorter than basal segment, branchlets 10 – 12 in a whorl, 2 – 3 cm long; segment 6 – 8, 2 corticate except distal 1 – 2 ecorticate, basal shorter, Bract cells 6 – 8 unilateral, anterior 350 – 530  $\mu\text{m}$ , Bractioles 2 longer than mature oogonium, Gametangia conjoined at lowest 1 – 5 nodes, Oogonia 318 – 333  $\mu\text{m}$ . long, 181 – 197  $\mu\text{m}$  wide, convolutions 10 – 11; Oospores black, 439  $\mu\text{m}$ . long, 272  $\mu\text{m}$ . wide; 9 – 10 ridges; fossa 44  $\mu\text{m}$ , membrane smooth, Antheridia 272 – 303  $\mu\text{m}$ . in diameter.

Locality – Triputi (near Koregaon)

*Chara zeylanica* v. *zeylanica* f. *elegans* (A.Br.ex.T.F.A.) H & J. Gr.

Plants monocious, 15 – 25 cm. high, 400 – 630  $\mu\text{m}$ . in diameter; 0.4 – 1.5 cm. cortex 3 corticate; spine – cells variable, 39 – 117  $\mu\text{m}$ . long, verticillate. Branchlets 10 – 12 in a whorl to 1.8 cm long; segments – 8; 1 – 3 end segments. Bract – cells 5, verticillate, 500 – 900  $\mu\text{m}$ . long, posteriors 300 – 650  $\mu\text{m}$ . long. Bractioles 2, Gametangia conjoined at 4 – 5 lowest branchlet nodes. Oogonia 500 – 800  $\mu\text{m}$ . long (excl. coronula), 400 – 500  $\mu\text{m}$ . wide; convolutions 10 – 13; coronula 73 – 150  $\mu\text{m}$ . high, 146 – 250  $\mu\text{m}$ . wide at apex, spreading. Oospores black, 410 – 545  $\mu\text{m}$ . long, 293 – 380  $\mu\text{m}$ . wide; striae of 11; fossa 44 – 50  $\mu\text{m}$ . across; membrane smooth, Antheridia 175 – 370  $\mu\text{m}$ . in diameter; tetrascutate.

Locality – Pateshwar, Bhartgaon, Angapur

*Chara braunii* f. *kurzii* (Zanev.) R.D.W.

Plants monoecious, 20 – 35 cm long. Axes 758 – 780  $\mu\text{m}$ . in diameter Stipulodes 424 – 606  $\mu\text{m}$ . long, 110  $\mu\text{m}$ . wide. Branchlets 8 – 10 in a whorl about 2.5 cm long straight, ecorticate, end cell short. Bract – cells -5 Bractioles two, oogonium 556 – 615  $\mu\text{m}$ . long. Gametangia, conjoined at 2 lowest branchlet nodes, occasionally geminate. Oogonia 586 – 660  $\mu\text{m}$ .



long (excl. coronula ), 366 - 440  $\mu\text{m}$ . wide; convolutions 9 - 10; coronula 130 - 147  $\mu\text{m}$ . high, 219 - 235  $\mu\text{m}$ . wide, cells connate except the blunt tips oospores black 294 - 476  $\mu\text{m}$ . long, 249 - 380  $\mu\text{m}$ . wide; striae of 9 wide ridges, fossa 70  $\mu\text{m}$ . apart. Antheridia 219 - 260  $\mu\text{m}$ . in diameter, octoscutate.

Locality - Vairatgadh fort.

***Chara socotrensis f. pashanii* (Dixit) R. D. W.**

Plants monoecious, 4 - 15 cm. high. Stem 234 - 460  $\mu\text{m}$ . in diameter; Stipulodes present in 1 tier but rudimentary. Branchlets 10 - 12 in a whorl, terminal segment one celled conical, acute, Bract cells present only at fertile nodes 2, 115 - 180  $\mu\text{m}$ . long. Bracteoles 2, 215 - 420  $\mu\text{m}$ . long. Gametangia conjoined and aggregate at lowest 1 - 2 branchlet nodes, usually 2 antheridia below 1 - 2 oogonia. Oogonia 1 - 2 together. Oogonium 360 - 805  $\mu\text{m}$ . long, 175 - 530  $\mu\text{m}$ . broad (incl. coronula), 400 - 820  $\mu\text{m}$ . long 200 - 580  $\mu\text{m}$  wide (excl. coronula) convolutions 9; coronula 60 - 150  $\mu\text{m}$ . high, 146 - 175  $\mu\text{m}$ . wide. Oospores orange to black in colour 215 - 270  $\mu\text{m}$ . long, 210 - 270  $\mu\text{m}$ . wide; striae of 8 - 10 prominent ridges; fossa 58  $\mu\text{m}$ . across; Antheridia 205 - 265  $\mu\text{m}$ . in diameter; octosutate.

Locality - Kavathe, Ozarde, Medha, Godoli, Parali, Pateghar, Pateshwar, Jarandeshwar, Rajewadi, Degoan, Masur, Urmodi

***Chara socotrensis f. nuda* (Pal) R.D.W.**

Plants, monoecious, 3 - 12 cm. high, axes 293 - 410  $\mu\text{m}$ . in diameter, cortex haplostichous, Branchlet 7 - 9 in a whorl, ecorticate, end segment blunt, bract cells 2, bracteoles 2 small. Gametangia conjoined present at two lowest branchlet node, oogonia 366 - 659  $\mu\text{m}$ . long (excl. coronula), 245 - 513  $\mu\text{m}$ . wide, oogonia 513 - 777  $\mu\text{m}$ . long (incl. coronula) and 250 - 513  $\mu\text{m}$ . wide; convolutions 10 - 12; coronula 88 - 147  $\mu\text{m}$ . high, 175 - 250  $\mu\text{m}$ . wide. Oospores black, 513 - 586  $\mu\text{m}$ . long, 293 - 498  $\mu\text{m}$ . wide, striae - 10 with prominent ridges,

fossa 58 - 74  $\mu\text{m}$ . Antheridia 263 - 293  $\mu\text{m}$ . in diameter.

Locality - Pateghar, Urmodi Dam, Godoli.

***Nitella stuartii* A.Br.**

Plants monoecious, 7 - 12 cm high, axes moderately stout, 400 - 700  $\mu\text{m}$ . in diameter, Branchlets 6 - 7 in a whorl, Gametangia conjoined or sejoined at fertile branchlet nodes, Oogonia aggregate 2 - 5 at a node, 280 - 330  $\mu\text{m}$ . long 200 - 240  $\mu\text{m}$ . wide, convolutions 7 - 8, Coronula 3.5 - 4  $\mu\text{m}$  high, Oospores light golden to dark brown, 180 - 220  $\mu\text{m}$ . long, 160 - 170  $\mu\text{m}$ . wide, 5 - 6 prominent ridges, Antheridia are not seen.

Locality - Kas .

***Nitella gracilis f. minuta* (T.F.A.) R.D.W.-**

Plants monoecious, 1.5 - 4 cms high, axes 145 - 220  $\mu\text{m}$ . in diameter. Branchlets fertile 6 - 7 in a whorl, compacted in to heads to 0.3 cm long, 3 - furcate primary ray 7, 586 - 1099  $\mu\text{m}$ . long, secondaries 3 - 6, 293 - 880  $\mu\text{m}$ . long, tertiaries 5, 512 - 733  $\mu\text{m}$ . long, dactyls 3 - 4, 2 - celled, uniform, basal cell rounded at apex, end cell conical, acute, 29 - 74  $\mu\text{m}$ . long, 15  $\mu\text{m}$ . wide at base. Heads 2 - 5 on a shoot, spheroid amidst sterile branchlets, upper whorls compacted smaller than lowers, without mucus. Gametangia conjoined formed at the second and third branchlet node, absent at lowest furcation. Oogonia solitary 220 - 308  $\mu\text{m}$ . long (incl. coronula ) 175 - 264  $\mu\text{m}$ . wide, convolutions 5 - 7 and striae 14 - 59  $\mu\text{m}$ .. Coronula 14 - 44 high and 44  $\mu\text{m}$ . wide at base. Oospores dark orange to brown, 117 - 293  $\mu\text{m}$ . long, 117 - 162  $\mu\text{m}$ . wide, 7 - 8 ridges, fossa 14 - 44  $\mu\text{m}$ .. Membrane finely granulate. Antheridia 145 - 220  $\mu\text{m}$ . in diameter.

Locality - Urmodi Dam .

**Discussion**

During present investigation eight species of *Chara* and two species of *Nitella* were collected from various localities within the district. The taxa collected are *Chara vulgaris* v. and f. *gymnophylla*, *Chara globularis* v. and f.



*globularis*, *Chara setosa* f. *setosa*, *Chara setosa* f. *lunermis*, *Chara zeylanica* v. *zeylanica* f. *elegans*, *Chara braunii* f. *kurzii*, *Chara socotrensensis* f. *pashanii*, *Chara socotrensensis* f. *nuda*, *Nitella stuartii*, *Nitella gracilis* f. *minuta*. Most of the species of *Chara* were found growing at lower altitude except *C. braunii* while those of *Nitella* growing at higher altitude. Except *Chara socotrensensis* f. *pashanii* and *nuda* and all species of *Nitella*, remaining species of *Chara* were corticated and encrusted with calcium carbonate. *Chara socotrensensis* f. *pashanii* collected during investigation was the only charophytes reported earlier from this region. Remaining species are being reported for the first time from the district.

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