

FURTHER NOTES ON THE CHARALES OF PAKISTAN

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This paper deals with three genera of Charales, namely *Tolypella*, *Nitella* and *Chara* with their species have been described and their ecological distributions have been mentioned. In all seven species of *Chara* one species of *Tolypella* and one species of *Nitella* have been identified, according to the older classification of A. Braun which was further developed by Prescott 1951, Hoek 1959, Pal 1960. The monograph of Wood and Imahori (1964/65) is taken into account in the key to the species of *Chara*. Woods nomenclature in parantheses.

Key words: Charales, Taxonomy, Pakistan.

Introduction

The members of the Charales are usually distributed in stagnant freshwater habitats, such as, ponds, lakes and ditches. They form a submerged or bottom vegetation in shallow water but sometimes may grow at a greater depth of the lake water.

Pakistan has not been significantly explored and investigated for the study of the members of Charales. It was, however, Faridi [1] who has described some species of *Chara*, *Nitella* and *Tolypella*. On the other hand, no further report on Charales has ever been made. This paper, therefore, is the second of the series proposed to deal with the systematic and ecological accounts of the members of Charales, based on large number of collections made from different localities of Pakistan.

Materials and Methods

Plants were collected from ponds, drains, tanks, canal sides, marshy places and stagnant waters.

Collections were made by Plankton net, squeezing and scrapping the aquatic vegetation. Plants were studied soon after collection, then were preserved in 3% formaline.

Tolypella leonhardi. Stem and branchlets ecorticate. Branchlets monopodial, not furcately divided, with laterals from nodes near their base. Oospores terete, not compressed. Fertile branchlets densely clustered.

Tolypella intricata Leonhardi [2]. Thallus 8-25 cm, tall, gray-green, sparsely branched with a few primary branches and dense heads of fertile branchlets subtended by laterals of unequal length; the primary ray including but few nodes from which 2 or 3 lateral branches arise, simple or again divided, the laterals but 3 or 4 cells in length, the terminal cell sharp pointed or sometimes bluntly rounded; fertile branchlets densely clustered including also long, coarse branchlets of irregular length; the primary branch with 2 or 3 nodes, each bearing 3 or 4 lateral branches, the ultimate rays of the fertile branches 3 or 4 celled, the lateral branch rays branches at the first node and again branching, sometimes also branching from the second node, these branches simple if there are but 2 nodes in the branchlet; antheridia sessile or shortly stalked up to

0.3 mm. in diameter, lateral at the nodes of the fertile branchlets; oogonia at the base of or on the nodes of the fertile branchlets, several together, appearing above or beside the antheridia; oospore 0.3- 0.318 or sometimes upto 0.4 mm in diameter, light brown when mature, decorated with 10-11 ridges, the outer membrane yellowish, thin and granular (Fig. 1). Habitat: In freshwater lakes. Locality: Lahore, Jan. 3, 1986.

Nitella agardh. Stem and branchlets ecorticate; normally two branches arising from a stem node; branchlets usually furcate; antheridia terminal, produced between the forbs of the branchlets; oogonia lateral; coronula composed of ten cells in two layers of five. Oospore laterally compressed.

1. *Nitella batrachosperma* A. Braun [2]. (*Nitella gracilis* var. *confervoides* (Breb.) Wood). Plants minute and very delicate, upto 2 cm rarely 3 cm tall, with several branches arising from a basal node; internodal cells in the lower part of the thallus 2-3 times the length of the verticils, which are in whorls of 8 at the node, and spreading. The branchlets crowded towards the apex, forming a cone-shaped cluster at the tip; branchlets once or twice divided, the ultimate rays 2-celled, the terminal cell awl-shaped; monoecious; antheridia terminal on a short stalk in the furcation of a 'leaf', 0.135-0.210 mm in diameter; oogonia borne laterally to the antheridia and below them, with a persistent coronula; oospore globose, 0.27-0.30 mm. in diameter, dark brown in colour, the outer membrane with reticulations, (Fig. 2). Habitat : In freshwater ponds. Locality: Mardan- Feb. 2, 1986.

Chara Linn. Stem and branchlets corticate, rarely ecorticate; stipulodes well developed or rudimentary; oogonia and antheridia produced usually conjoined at the nodes of the branchlets; oogonium above the antheridium; coronula composed of 5 cells in one tier; oospore terete.

Key to the species of *Chara*

- 1a. Stem and branchlets ecorticate 2
- 1b. Stem corticate, branchlets corticate or ecorticate 3

- 2a. Branchlets terminate by a tiny cornula of several bracteoles..... *Chara schweinitzii* Braun (Ch. braunii f. schweinitzii (A. Br.) Wood)
- 2b. Branchlets terminated by one small cell *Chara nuda* Pal (Ch. socotrensis f. nuda (Pal) Wood)
- 3a. Stipulares in 2 tiers. Branchlets corticate, but cortex absent from the basal branchlet segment 4
- 3b. Stipulares in one tier 5
- 4a. Gametanges conjoined at branchlet nodes. Plants rigid, 15-25 cm high *Chara elegans* (A.Br. ex T.F.A.) Robinson (Ch. zeylanica f. elegans (A.Br. ex T.F.A.) H.J. Groves)
- 4b. Gametangia sejoined (Rarely conjoined) on different nodes of a plant. Plants fragile, 3-15 cm high *Chara sejuncta* A.Br. (*Chara sejuncta* var. *sejuncta* (A.Br.) Wood)
- 5a. Spine cells fasciculate *Chara excelsa* T.F. Allen *Chara fibrosa* var. *myriophylla* f. *crinitiformis* (Rob.) Wood)
- 6a. Branchlets ecorticate..... *Chara gymnopitys*, Braun (Ch. fibrosa var. fibrosa f. fibrosa Wood)
- 6b. Some segments of branchlets corticate, others ecorticate *Chara hydropitys*, Reich (Ch. fibrosa var. *hydropitys* (Reich.) Wood).

1. *Chara nuda* Pal. [3]. Monoecious; stem slender; 350cm thick; entirely ecorticate; internodes usually short, exceeded in length by the branchlets; stipulodes in single rows; usually rudimentary; acute; whorls of 7-8 incurved branchlets, ecorticate; of usually 5 jointed segments; terminal cell narrower and shorter; tapering to an acute point; bracts rudimentary; bracteoles slender; acute; varying in length from one half to as long as the fruit; gametangia at the two lowest nodes; antheridium small; 230 μ m broad; oogonia 800 μ m long; 525 μ m broad; spiral cells showing about 14 convolutions; coronula 70 μ m high; 190 μ m broad at the base; short, flattened, and connivent with sometimes a slight constriction between it and the apices of the spiral cells; oospore ovate-ellipsoidal, black, 450 μ m long 330 μ m broad, showing about 12 low ridges ending in short basal claws. (Fig. 3). Habitat: In fresh ponds and ditches. Locality: Peshawar, Jan. 1, 1986).

C. gymnopitys Braun, Pal *et al.* [3]. Monoecious; stem moderately stout, 500 μ m thick; internodes 1-4 times the length of the branchlets; whorls of 10-11 branchlets; cortex 2-(3) corticate spine cells single, acute; branchlets; spreading of 5 segments; entirely ecorticate; stipulodes well-developed in a single row; cortex diplostichous, primary series more prominent than the secondary series, spine-cells solitary, fairly well-developed, not exceeding the diameter of the stem in length, bract cells 6-8 μ m in length; usually exceeding the segment in

length; bracteoles similar to bract cells, exceeding fruit in length; gametangia usually at the two lowest, occasionally at the third node; antheridium 280 μ m in diameter; oogonia 580-620 μ m long; 385-400 μ m broad; spiral cells showing 10-11 convolutions; coronula straight, persistent, 60 μ m high; 110 μ m broad at base; cospore 380-450 μ m long; 230-280 μ m broad, showing 9-10 ridges, terminating in short claws; membrane black (Fig. 4). Habitat: In slow running water. Locality: Hyderabad (Sindh), March 2, 1986.

C. hydropitys Reich [4]. Monoecious; stem slender; 480 μ m thick; internodes 1-4 times the length of the branchlets; stipulodes in a single series; long and acute; cortex variable; usually diplostichous; sometimes haplostichous; spine-cells solitary; rudimentary; whorls of usually 11 spreading branchlets; branchlets of 5-7 segments, the lowest and some of the uppermost segments corticate and the intervening segments also corticate; bract-cells about 8; long and acute; bracteoles like bracts; 1.5-2 time the length of the fruit; oogonia and antheridia produced at the 4 lowest nodes, that is above the corticate segments also; antheridium 210 μ m in diameter; oogonia 500 μ m long; 330 μ m broad; ellipsoidal; spiral cells showing 13-14 convolutions; coronula 60 μ m high; 100 μ m wide at the base; oospore 315 μ m long; 230 μ m broad, oval-ellipsoidal, showing 12-13 low ridges terminating in very short basal claws; oospore membrane black, (Fig. 5). Habitat: In ponds. Locality: Mingora (Swat), Dec. 1, 1985.

C. elegans Robinson [2]. Plants green, not encrusted with lime; stem triply corticated, with a double row of stipulodes at the nodes, which bear whorls of 9-12 leaves; leaves uncorticated in the internode immediately above the node which bears them, the upper row of stipulodes usually exceeding and covering the uncorticated internode; leaves terminating in a long, cell, subtended by 3 spine-like cells from the last node; spine cells from the nodes of the cortical cells prominent, often forming whorls about the stem; sex organs monoecious, borne at the same node; oogonia 0.4-0.5 mm in diameter, subtended by 2 pairs of bracteoles which exceed it in length; antheridia 0.5 mm. in diameter oospore membrane dark green. (Fig. 6). Habitat: In streams, drains. Locality: Chitral, March 1, 1986).

C. excelsa F.T. Allen. [2]. Plants coarse and brittle, fully encrusted with lime, 6-14 cm high; stems bearing 7-8 leaves *C. excelsa* F.T. Allen is a form of *C. Fibrosa*, which has only one whorl of stipulates, cortication of the internode diplostichous, the primary cortical cells larger and more prominent than the secondary laterals; 2-3 cells at the tip of the leaves uncorticated; sex organs monoecious, produced on the same node; oogonia 0.8-1.5 mm long, investing cells showing 7-10 turns; bracts subtending the oogonium longer than the fruit; antheridia 0.32-0.35 mm in diameter. (Fig. 7). Habitat: In ditches and ponds. Locality: Quetta, Jan. 1, 1987.



Fig. 1. *Totypella intricata*.

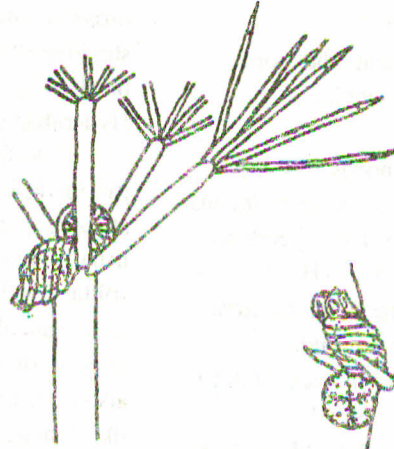


Fig. 2. *Nitella batrachosperma*.



Fig. 3. *Chara nuda*.

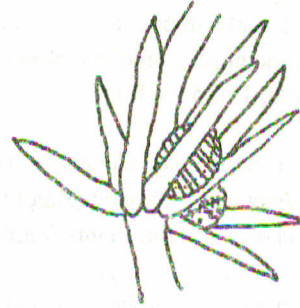


Fig. 4. *C. gymnopitys*.



Fig. 5. *C. hydropitys*.



Fig. 6. *C. elegans*.

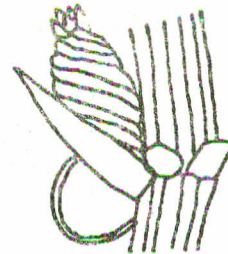


Fig. 7. *C. excelsa*.

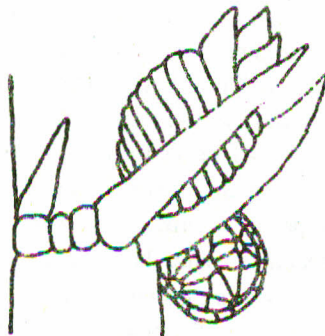


Fig. 8. *C. schweinitzii*.

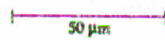


Fig. 9. *C. sejuncta*.

C. schweinitzii A. Braun [2]. Plants bright green, not at all encrusted with lime, 10-15 cm high; stem long-jointed, with a single whorl of stipulodes at the node which also give rise to 8-12 leaves; internodes of both stem and leaves uncorticated; branchlets sex organs monoecious, usually borne on the same node; oogonia 500 μ m long, subtended by bracts which are equal in length to the mature fruit or as much as 3 times longer; cortical cells of oogonium showing 7-9 turns, antheridia 0.78-0.3 mm in diameter. (Fig. 8). Habitat: In slow running water. Locality: Peshawar, April 1, 1987.

C. sejuncta A. Braun [2]. Plants fragile, 3-15 cm high, very little encrusted with lime, stem triplostichous in cortication, the primary and secondary cells about equal in diameter, in the upper internodes very short, bearing many recurved spines but almost smooth in the older stem internodes; nodes bearing a whorl of 9-13 leaves (usually 10), the lowest internode of which is uncorticated, and double whorl of stipulodes, the upper series of which is longer than the lower and exceeds the length of the uncorticated inter node of the leaves; sex organs monoecious, but on different nodes; oogonia 0.96-1.26 mm long, subtended by at least 2 pairs of bracts which are always shorter than the mature of fruit; investing cells of the oogonium showing 8-10 turns antheridia 0.3-0.48 mm in diameter oospore membrane brown. (Fig. 9). Habitat: In slow running water. Locality: Mardan, May 1, 1987.

Conclusion

The present study deals with the three different genera of Charales in Pakistan based upon the collections made by the

present author himself. The total numbers of species described in the present study in 9. All these 9 species are new additions to the algal flora of Pakistan.

Charales are seldom solitary in growth. Often several species occur together but a community may be formed even by a solitary species. Under favourable condition these may completely dominate, ousting other plants in a pond.

The members of the group are widely distributed from more or less still waters. Some species are fresh-water forms, some are confined to brackish waters while others occur in both the habitats. A few species have been reported from clear water. Their presence in a sheet of water is sometimes taken as an index of the purity of water. They usually grow in extensive subaquatic meadows and constitute sometimes characteristic zones extending to a considerable depth.

References

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