

BANGIA DISCOIDEA SP. NOV. (RHODOPHYCEAE), FROM BRACKISH WATER PASSUR RIVER, KHULNA, BANGLADESH

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Abstract

Bangia discoidea sp. nov. (Bangiaceae, Bangiales, Rhodophyceae) was growing with *Polysiphonia* sp. on a steel boyar in brackish water river Passur in Khulna district, Bangladesh. The red unbranched filamentous alga had a solid cylindrical body having a basal discoid attachment cell instead of typical rhizoids and is described and illustrated here as a new species.

Introduction

So far seven species under five genera (*Pterosiphonia*, *Bostrychia*, *Caloglossa*, *Catenella* and *Polysiphonia*) of brackish water red algae have been reported from Bangladesh Sundarbans through which Passur River passes in to the Bay of Bengal (Islam 1973, 1976). In addition 94 species under 48 genera of marine red algae have been reported from the St. Martin's Island, Bangladesh (Aziz 1997, Aziz and Islam 2008, Aziz and Rahman 2010, 2011, Aziz and Islam S. 2009, Aziz *et al.* 2002a, b, 2004, 2008, 2015; Islam 1976, Islam and Aziz 1982, 1987, Islam *et al.* 2002, Islam S. *et al.* 2010). But none of the above reports contain the genus *Bangia* Lyngb.

In the database, there are 142 species names of *Bangia* of which 17 are flagged as currently acceptable (Guiry and Guiry 2016). Under Bangiales there are four filamentous genera (*Bangia*, *Dione*, *Minerva* and *Pseudobangia*) all characterized by rhizoidal attachment cells internal to the cell wall, bipolar spores and lacking pit connections (Sundarland *et al.* 2011). Species of *Bangia* particularly is difficult to differentiate due to uniform cylindrical morphology. A collection made in April 2003 from the surface of a steel boyar in the Passur River with brackish-water ($14.80 \pm 0.45\%$ salinity), in the Mongla Port area, Khulna on examination was found to contain a species of *Bangia* that does not match with existing species with respect to attachment mechanism (Taylor 1957, 1960, Sundarland *et al.* 2011, Guiry and Guiry 2016). All the *Bangia* species described validly so far produces rhizoids from the lower cells for attaching with a substratum. The present sample did not produce any rhizoids but the basal cell become disc-like for attaching with a substratum for which it is illustrated as a new species in the present account.

Materials and Methods

A sample collected (no. 14) from Passur River, Mongla Port Area, Khulna, Bangladesh, during April, 2003 by Mr. Zakir Hossain Mridha, Assistant Prof., BL College, Khulna. The sample was preserved in 4% formaldehyde and stored in the National Prof. AKM Nurul Islam Laboratory, Department of Botany, University of Dhaka.

Results and Discussion

A sample of *Bangia*, primitive red alga on examination was found to produce a disc-like attaching cell at the base unlike typical rhizoids from basal cells (Figs 1-2). This particular character made to consider the organism as a new species, *Bangia discoidea* sp. Nov. The organism has been described and illustrated with photomicrographs of all stages of development in the following account.

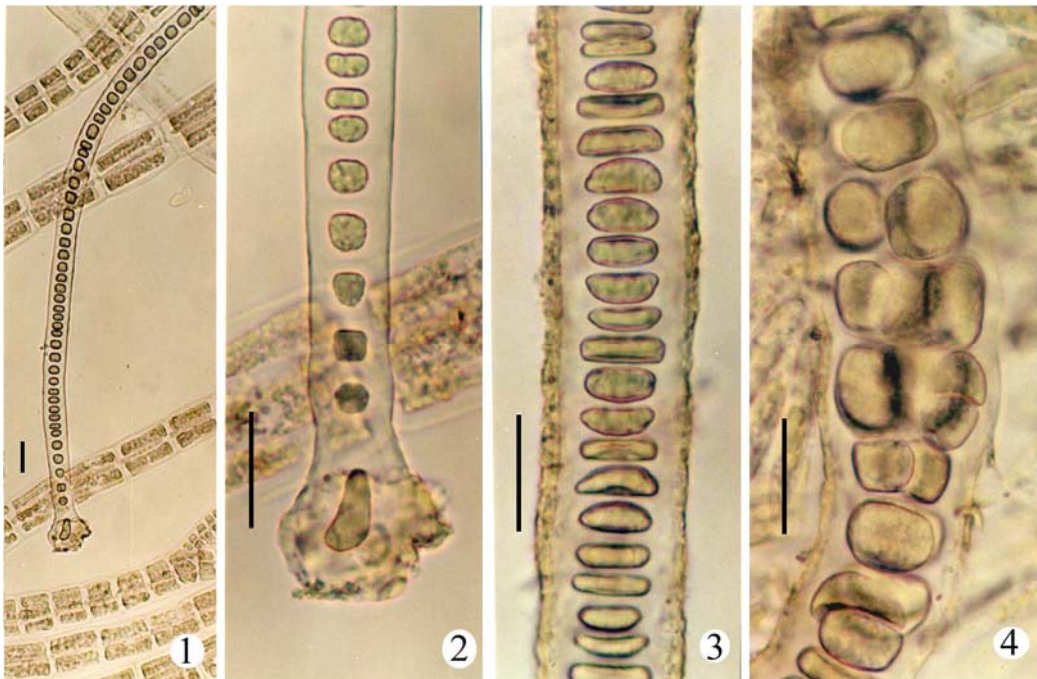
Class: Rhodophyceae; Order: Bangiales; Family: Bangiaceae

Genus: *Bangia* Lyng.

***Bangia discoidea* A. Aziz sp. nov.**

(Figs 1-4)

Plants 1-3 cm long, dark-purple colour unbranched filaments, at first consisting of a single row of rectangular cell protoplast of 7.86 - 9.48 μm diameter (Figs 1-2), cells later transversely divided repeatedly producing short cells 0.20 to 0.33 μm long with wide space between protoplasts and without protoplasmic connections; the cells appear cylindrical, concave to biconcave and ellipsoid to wedge-shaped distally (Fig. 3). At a further distance in some part of the filament, cells divide longitudinally and radially in to a number of groups of cells giving multiseriate feature followed by single row of cells distally (Fig. 4). The multiseriate nature develops at the time of entering in to the reproductive phase of the alga. The basal cell of the filament enlarged about double to its adjacent cell size producing a discoid holdfast whose cell protoplast is about 2.5 times longer than the breadth. Plastid massive and stellate with single large axial pyrenoid, one in each cell; cells covered by thick, firm homogenous mucilage all through the filament; sheath 5.30- 10.84 μm broad; filaments 19.00-36.58 μm broad when uniseriate, 42.00-46.72 μm broad when multiseriate. Cell protoplasts of the multiseriate part are 14.42 x 15.57 μm and 19.64 x 20.00 μm (Fig. 4).



Figs. 1-4. *Bangia discoidea* A. Aziz sp. nov. showing portions of a filament from base to distal parts. 1. Basal part of a detached filament along with *Polysiphonia* sp. 2. Basal part further enlarged showing the discoid holdfast-cell with elongate protoplast and cells with single stellate plastid in the upper cells. 3. A median portion of the filament with single row of variously shaped cells surrounded by thick mucilage. 4. Upper part of the filament with multiseriate, most likely reproductive cells (of carpogonial nature, appearing to produce packets derived from repeated longitudinal and transverse divisions) between segments of uniseriate cells where numerous *Nitzschia* sp. were found to be preferably growing. Bars = 20 μm .

Habitat: The alga was attached to a steel boyar along with *Polysiphonia* sp. in the Passur River having a salinity $14.80\text{‰} \pm 0.45$ during high tide.

Holotype: Photomicrographs, Figs 1-4; collection no. 14, preserved in 4% formaldehyde and stored in the National Prof. A.K.M. Nurul Islam Laboratory, Botany Dept., Dhaka University.

Latin diagnosis

***Bangia discoidea* A. Aziz sp. nov.**

(Figs 1-4)

Etymology: Greek *discoidea* = disc-like holdfast cell

Plantae 1-3 cm longa, atropurpureus, non ramosus, ad basim singulus seriatum, cellula protoplasti rectangularibus $7.86 - 9.48 \mu\text{m}$ (Figs 1-2), cellula postea divisionem transversaliter identidem producents brevis cellulae, 0.20 ad $0.33 \mu\text{m}$ atque longus, latus, concavus ad biconcavus, ellipsoidens ad cuneatus. sine protoplasmicus conjunctivus (Fig. 3), further distantia in alliqui parte cellulae dividens longistrosum et radialis in aggregatus multiserialis praebentibus in statu reproductivus, lectus a incrassatus, firmus, homogeneous vagina, $5.30 - 10.84 \mu\text{m}$ latis; filaments $19.00 - 36.58 \mu\text{m}$ latis ubi uniseriate, $42.00 - 46.72 \mu\text{m}$ ubi multiseriate (Fig. 4). Cellula basalis amplificatus circum super duplex ad contiguus cellula producents disciformis holdfast. Cellulae protoplastus circa 2.5 times longa quam latus. Plastids stellatum cum singularis macro (grandis) axialis pyrenoide, unus cellula singularis continens.

Habitatis: Alga affixus in steel boyer cum *Polysiphonia* sp. in fluminis salsa $14.80\text{‰} \pm 0.45$.

Locus: Fluminis Passurum, region Portus Mongla, Khulna, Bangladesh, April 2003. Collector Mr. Zakir Hossain Mridha, botanices Assistant Professor, BL College, Khulna, Bangladesh.

Holotypus: Collectio numero 14, conservtus National Prof. AKM Nurul Islam Laboratory, Botany Department, Dhaka University; Photomicrographs, Figs 1-4.

The genus *Bangia* (Holotype species: *Bangia fuscopurpurea* (Dillw.) Lyngb.) is characterized by solid cylindrical filament with firm gelatinous sheath, a dilated base, wherein the original attaching cell the holdfast is supplemented by intra-matrical filiform or rhizoidal extensions from the nearby distal cells (Newton 1931, Taylor 1957, 1960, Bold and Wynne 1985), and cells are closely placed. The holdfast in the present material is dilated more than double into a discoid structure and no rhizoidal extensions were found to be produced from any of the cells above (Fig. 2), though the described material is at maturing stage as indicated by multiseriate parts to reproduce in the upper part of the filament (Fig. 4). Newton (1931, Fig. 145E) illustrated *Bangia fuscopurpurea*, which is close to the present material by the widely placed constituting cells, but with rhizoidal extension to produce the holdfast structure. The holdfast of *Porphyrostrominm ciliare* (Carmiech) Wynne, syn. *Bangia ciliaris* Carmiech is not reinforced by rhizoids but forms a multicellular disc-like structure (Taylor 1957, Figs. 5 & 8) but in the present material the disc is unicellular. In *Bangiopsis*, the holdfast cell is not reinforced by rhizoids from above (Taylor 1960), a character similar to the present material but filaments are branched.

There are 15 genera under the Bangiales (Sundarland *et al.* 2011). *Bangia* is resolved within a well-supported clade that also includes two foliose clades (*Clymene* and *Porphyra*) and nine marine filamentous species ("Bangia" 1) from both the Atlantic and Pacific, and from Northern and Southern hemispheres (Sundarland *et al.* 2011). The nine filamentous species were not resolved as monophyletic in their analysis, and it is likely that taxon sampling in this group is inadequate at present to resolve relationships among them (Sundarland *et al.* 2011).

Under the genus *Bangia* a total of 17 species have been flagged as currently accepted, and in all cases development of rhizoidal outgrowth from proximal cells has been described for

attachment (Guiry and Guiry 2016). Filamentous genera of Bangiales *Bangia*, *Dione*, *Minerva* and *Phsudobangia* are also characterized by rhizoidal attachment cells. The very discoid nature of the basal single-celled holdfast in the filiform unbranched and solid cylindrical filament of the present material is thus a distinct character that deserves to consider it as *Bangia discoidea* A. Aziz sp. nov.

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