

SHORT NOTE

Observations on the rare alga *Arnoldiella conchophila* V. Miller (Ulvophyceae: Cladophorales) from India

Jai Prakash KESHRI^{a*} & Ashis Ghosh HAZRA^b

^aCAS in Botany, The University of Burdwan, Golapbag,
Burdwan-713104, West Bengal, India

^bKonnagar High School, Konnagar, Dist. – Hooghly, West Bengal, India

(Received 16 September 2008, in revised form 31 March 2009, accepted 14 July 2009)

Abstract – The rare alga *Arnoldiella conchophila* V. Miller has been recorded from India. It was found growing vigorously on snail shells (*Pila globosa* Swainson) in the Kangsabati, a small river in the Purulia district of West Bengal, India. The thallus morphology was investigated using light microscopy and compared with the known records for this species.

Arnoldiella / Cladophorales / Distribution / Morphology

Résumé – Observations sur une algue rare trouvée en Inde: *Arnoldiella conchophila* V. Miller (Ulvophyceae: Cladophorales). L'algue rare *Arnoldiella conchophila* a été observée en Inde. Elle croissait vigoureusement sur des coquilles d'escargots (*Pila globosa* Swainson) dans une petite rivière (Kangsabati) du district de Purulia au Bengale occidentale (Inde). La morphologie de cette algue a été étudiée au microscope photonique et comparée avec les trouvailles antérieures.

Arnoldiella / Cladophorales / Distribution / Morphologie

INTRODUCTION

The genus *Arnoldiella* Cladophorales) was established by Miller (1928) based exclusively on the type species, *A. conchophila* V. Miller from lake Pereslawl in central Russia. The specimens observed by Miller were found growing on the surface of molluscan shells (*Anodonta* and *Unio*), on which they formed dark green crusts. Miller gave a detailed description of the unusual morphology of the thallus, consisting in a one-layered creeping system formed by the coalescence of prostrate threads from which densely apposed, little branched

* Correspondence and reprints: jpkeshri@indiatimes.com
Communicating editor: Pierre Compère

short upright threads arise. Miller also observed quadriflagellate zoospores produced in terminal sporangia and akinetes. To our knowledge, this genus appears to have been reported from only few localities around the world: USA (Cox Downing, 1970), China (Guoxiang & Zhengu, 1999), India (Kargupta, 1994) and Japan (Hanyuda *et al.*, 2002), and therefore it appears to be rare.

During a systematic investigation on the algal flora of West Bengal, we found *Arnoldiella conchophila* in a small river in the Purulia district and report our observations here.

MATERIAL AND METHODS

Algal samples were collected from the Kangsabati, a small river in the Tulin village, Purulia district of West Bengal. The specimens were preserved in a solution consisting of 1 part commercial formalin, 5 parts 50% ethanol and 4 parts water. For detailed microscopical studies a 5% KOH solution was used to clear the calcified filaments. Camera lucida drawings were made under a light microscope, both from living specimens and specimens preserved in GFW solution (1 part glycerin, 1 part commercial formalin and 1 part water: Bando, 1988).

OBSERVATIONS AND DISCUSSION

Arnoldiella conchophila V. Miller

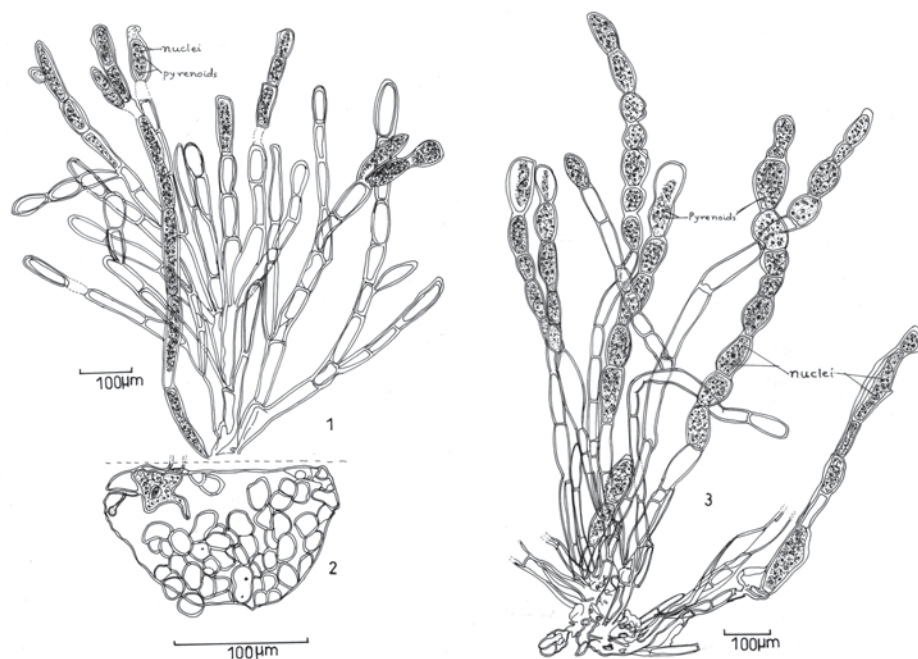
Figs 1-3

Miller 1928, pp. 1-21; Fritsch 1935, p. 245, figs. 73A-G.

Thallus forming green cushions up to 1 mm in thickness, tightly growing on snails, heterotrichous; basal part tightly adhering to the substratum, 1-layered, formed by creeping coalescent filaments, 150-250 μm thick; cells in the basal part more or less globose to irregular, 10-28 μm \times 14-40 μm , multinucleate with 5 or more nuclei; cell wall up to 4 μm thick; cells forming erect branches mostly irregular in shape, sometimes with rhizoidal protrusions; erect part dichotomously branched, branches frequent and close; cells in erect part elongated, cylindrical, swollen in the middle in some parts, 14-36 μm wide, 30-120 μm long, multinucleate (nuclei 5 or more); chloroplast reticulate; exact number of pyrenoids not established in the examined material; akinetes forming erect filaments mostly unbranched and forming chains of globose, barrel shaped to irregular akinetes; akinetes profusely formed in mature thallus, 40-60 μm \times 40-60 μm ; zoosporangia and zoospores not observed in the examined material.

Collection No.: AGH 353, 19.3.2008, Tulin (Purulia district), growing on common snails (*Pila globosa* Swainson) in submerged condition in a small river (Kangsabati); pH 6, temperature 28 $^{\circ}\text{C}$ as recorded at the time of collection. Sample stored in the Algal Herbarium, Department of Botany, The University of Burdwan (BURD).

As observed by Miller (1928) the profuse growth of this alga on molluscan shells suggests that calcium is an important requirement for growth. Our material was also found growing on molluscan shells (*Pila globosa* Swainson) and it was only possible to study the prostrate part of the thallus after overnight



Figs 1-3. *Arnoldiella conchophila* V. Miller from West Bengal, camera lucida drawings. **1.** Erect part showing branching pattern and nature of cells. **2.** Thallus in prostrate part showing coalescent threads and portions of rhizoidal part. **3.** Thallus showing akinetes and rhizoidal portions). Scale bar = 100 µm.

treatment with 5% KOH solution. Unlike Miller's observation the erect branches in our material were lax. Branches were also long, thick walled and diverging although plants grew gregariously and it was not always possible to separate an individual plant as the basal parts formed dense coalescent mats, in which apparently individual plants intermingled with each other. The profuse formation of akinetes recalls *Cladophorella* Fritsch, a terrestrial genus of Cladophorales. Kargupta (1994) also recorded this species growing on shells but he observed much reduced plants with vacuolated cells, which were not observed in our material. Fritsch (1935) compared this species with *Basycladia* Hoffman *et* Tilden, another genus of Cladophorales which grows commonly on the carapace of turtles. He mentioned the little branched, erect nature of the thallus in the latter genus. In *Basycladia*, coarse erect filaments that are sparingly branched in the basal region arise from creeping rhizome like threads fastened by holdfasts having free or coalescent branches. The cells of erect filaments in this genus are cylindrical towards the base and several times longer than broad, becomes gradually broader, shorter, and more or less barrel shaped towards the apex, walls are thick and lamellated. The nature of the branching, cells and the nature of prostrate part could all be considered as important morphological identification features.

We are aware of only few existing reports of *Arnoldiella conchophila* around the world. Cox Downing (1970) found it growing on *Cladophora*, wood, metal pipe and dolomite rock in Green Island, South Bass Island and western

shore of Western Lake Erie. Like Miller (1928, Cox Downing observed compact upright filaments of the thallus. Kargupta (1994) reported it from Suri (Dist. Birbhum, West Bengal), India, growing on snail shells in a pond during winter. Kargupta found plants with a much reduced erect part represented by bud-like unicellular outgrowths with vacuolated cells; the prostrate part was well developed and compact in nature. In our plants the thallus was found to be well developed both in the erect and prostrate parts. Guoxiang & Zhengyu (1999) recorded this alga from China; they described an elaborate organization of the prostrate part of the thalli and, like Kargupta (1994), observed more or less angular cells, whereas cells in this part of the thallus were found to be globular to irregular in our material, as in Miller's specimens. Hanyuda *et al.* (2002) recorded this alga in Lake Panke, Japan, and included it in a phylogenetic analysis within the Cladophorales based on 18S rRNA sequences, but no information was provided on its external morphology.

Acknowledgements. Thanks are due to the Head of the Department of Botany, the University of Burdwan for laboratory facilities and University Grants Commission (New Delhi) for financial assistance. Valuable suggestions from Prof. A. N. Kargupta are highly appreciated. The constant encouragement of our revered teacher Prof. Pranjit Sarma through out this work is gratefully acknowledged.

REFERENCES

- BANDO T., 1988 — A revision of the genera *Docidium*, *Haplotaenium* and *Pleurotaenium* (Desmidiaceae, Chlorophyta) of Japan, *Journal of Science Hiroshima university Series B, Division 2 (Botany)* 22(1): 1-63.
- COX DOWNING R., 1970 — Shore line algae of Western Lake Erie. *The Ohio journal of science* 70 (5): 257-276.
- FRITSCH F. E., 1935 — *The structure and reproduction of the Algae*. Vol. – I. Cambridge, Cambridge University Press, 791 pp.
- GUOXIANG A. & ZHENGYU H., 1999 — Three new records of freshwater Cladophorales from China. *Acta hydrobiologica Sinica* 23(1): 93-96.
- HANYUDA T., WAKANA I., ARAI S., MIYAJI K., WATANO Y. & UEDA K. 2002 — Phylogenetic relationships within the Cladophorales (Ulvophyceae, Chlorophyta) inferred from 18S rRNA gene sequences with special reference to *Aegagropila linnaei*. *Journal of phycology* 38: 564-571.
- KARGUPTA A. N., 1994 — Monotypic genus *Arnoldiella* (Cladophorales: Chlorophyceae) – a new record from Indian subcontinent. *Journal of economic and taxonomic botany* 18: 439-441.
- MILLER V., 1928 — *Arnoldiella*, eine neue Cladophoraceaeengattung. *Planta* 6: 1-21.