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Filamentous Blue greens from the Marathwada Region of Maharashtra

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Abstract: While working on algal taxonomy of Bhandarwadi minor irrigation project during January 2018 to December 2019, the author came across some interesting members of filamentous blue green algae. A total of 62 taxa under 7 genera have been encountered from the Bhandarwadi minor irrigation project for first time. The present paper deals with the systemic enumeration of Oscillatoria (27), Phormidium (14), Lyngbya (14), Schizothrix (2), Symploca (1), Microcoleus (2) and Hydrocoleum (1).

Keywords: Filamentous, Blue greens, Marathwada, Maharashtra.

INTRODUCTION

In the present century great advances have been made in the investigations of fresh water algae, marine algae and soil algae in many parts of the world and particular attention has been paid to their taxonomy, ecology and applied aspects. Review of literature reveals that, studies on algal taxonomy in abroad and in India have been done extensively by many research workers. India has a very rich and diversified algal flora. In Maharashtra tremendous work has been done on algal taxonomy by various workers. In Marathwada region of Maharashtra except few reports (Ashtekar 1979a, Andhale 2008, Jadhav 2007, Talekar 2009) very rare attention has been paid towards algal taxonomy, although the climatic conditions of Marathwada region are most suitable to grow algae luxuriantly and in diverse form, therefore to fulfil this lacuna, it has been decided to work on algal taxonomy of Bhandarwadi minor irrigation project in Marathwada region of Maharashtra.

MATERIALS AND METHODS

The present investigation was carried out for first time from the Bhandarwadi minor irrigation project, constructed on Rena River, just 15 kms away from the Renapur town, in the Latur district of Marathwada region of Maharashtra. The algal samples were collected during January 2018 to December 2019. The algal collections were made regularly from selected sampling stations. Acid washed collection bottles were used for the collection of algal samples. On return to the laboratory from field, the collections were carefully observed under the microscope and important points were noted. All collections were preserved in 4% commercial formalin added with 5% glycerine. Identification of algal taxa was performed by referring to the standard literature on algae.Desikachary (1959), Forest (1954), Prescott (1951), Smith (1950).

SYSTEMIC ENUMERATION

OSCILLATORIA Voucher, 1803

***Oscillatoria amoena* (Kuetzing) Gomont**

Thallus blue-green; Trichome straight or curved, tapering towards the ends, with slightly constricted at the cross walls, cross walls granulated; cells 3-3.5µ in diameter, 2.5-3µ long; end cell globose, capitate with calyptra.

***Oscillatoria amoena* (Kuetzing) Gomont v. *non-granulata* Ghose**

Thallus blue-green; trichomes straight or curved, tapering towards the ends, with slight constrictions at the cross walls, not granulated; cells 3-4.5µ in diameter, 2.2- 2.5µ long; end cell globose, capitate, with a calyptra.

***Oscillatoria animalis* Agardh ex Gomont**

Thallus blue-green; trichomes straight, curved or bent at the ends, slightly constricted at the cross walls, not granulated at the cross walls, briefly attenuated at the ends; cells slightly shorter than broad, seldom longer, 3-4.8µ in diameter 2-4.5µ long; end cell conical, without a cap or a calyptra.

***Oscillatoria annae* Van Goor**

Thallus blue-green; trichomes long, constricted at the cross walls, not attenuatecd at the ends; cells much shorter than broad. 5-5.5µ in diameter, 1-1.5µ long; end cell rounded, without a cap or a calyptera.

***Oscillatoria amphibia* Ag. ex Gomont**

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Thallus blue-green; trichomes straight or coiled, not constricted at the cross walls, not attenuated at the ends; cells 2 times longer than broad. 2-2.5µ in diameter, 3.8-5.5µ long, with two granules at the septa; end cell rounded, without a cap or calyptra.

***Oscillatoria amphigranulata* Van Goor**

Thallus blue-green; trichomes straight, distinctly constricted at the cross walls, not attenuated at the ends; cells 2 times longer than broad, 2.2-2.5µ in diameter, 3.2-5.8µ long, with two gas vacuoles at the septa; end cell rounded, without a cap or a calyptra.

***Oscillatoria chalybea* (Mertens) Gomont**

Thallus dark blue-green; trichomes usually bent at the ends, slightly constricted at the cross walls, very slightly tapering at the ends; cells shorter than broad, 5-7.2µ in diameter, 3-4.8µ long; end cell conical, without a cap or a calyptra.

***Oscillatoria curviceps* Ag. ex Gomont**

Thallus dark blue-green; trichomes more or less straight, bent at the ends, not constricted at the cross walls, not attenuated at the ends; cells 2.2-3.5µ in diameter, 8-8.5µ long; cross wall granulated; end cell flat rounded, without a cap or a calyptra.

***Oscillatoria laete-virens* (Crouan) Gomont**

Thallus blue-green; trichomes straight, fragile, slightly constricted at the cross walls, slightly attenuated at the ends, curved; cells nearly as long as broad, 3.2-5µ in diameter, 3-4.8µ long; end cell rounded, more or less conical, without a cap or a calyptra.

***Oscillatoria limosa* Agardh ex Gomont**

Thallus blue-green; trichomes straight, slightly constricted at the cross walls; cell shorter than broad. upto 1/3 – 1/6 as long as broad, 10.5 – 11.8µ in diameter, 2.2-3.5µ long; end cell flately rounded, with a slightly thickened membrane.

***Oscillatoria margaritifera* (Kuetzing) Gomont**

Thallus blue-green to olive green; trichome straight, fragile, constricted at the cross walls, slightly attenuated at the ends; cells 1/3 – 1/7 as long as broad, 10.5-11.5µ in diameter, 2.8-4µ long, cross walls granulated; end cells capitate, with slightly convex calyptra.

***Oscillatoria martini* Fremy**

Thallus blue-green; trichome loosely, irregulary spirally coiled, not constricted at the cross-walls, not granulated at the cros walls, attenuated at the ends, ends slightly curved; cells ½ - 1/3 as long as broad; 3.2-4.5µ in diameter, 1.5-2.5µ ling; end cell with flat, convex, distinctly thick, broad outer membrane.

***Oscillatoria okeni* Agardh ex Gomont**

Thallus blue-green; trichomes straight, fragile, constricted at the cross walls, attenuated at the ends; cells shorter than broad, 5-7.5µ in diameter, 1.5-2.8µ long; end cell conical, bent, without a cap or a calyptra.

***Oscillatoria ornata* Kuetzing ex Gomont**

Thallus dark blue-green; trichome spirally coiled at the ends, constricted at the cross walls, scarcely tapering towards the ends; cells ½ - 1/6 as long as broad, 8.5-10.2µ in diameter, 2.5-4.8µ long; cross walls granulated; end cells broadly rounded, without a cap or a calyptra.

***Oscillatoria princeps* Vaucher ex Gomont**

Thallus blue-green; trichomes long, curved, not constrited at the cross walls, slightly tapering at the ends; cells (much shorter than broad) ¼ as long as broad, 15-16.5µ in diameter, 2.2-4.2µ long; not granulated at the cross walls, end cells capitate without a calyptra.

***Oscillatoria proboscidea* Gomont**

Thallus blue-green; trichome more or less straight, not constricted at the cross walls, briefly attenuated at the ends; cells 1/3 – 1/6 times as long as broad, (shorter than broad) 6.5-7.5µ in diameter, 2.8-3.8µ long; not granulated at the cross walls; end cells flatly rounded, capitate, with a slightly thickened membrane.

***Oscillatoria pseudogeminata* G. Schmid**

Thallus blue-green; trichomes not constricted at the walls, not attenuated at the ends; cells shorter than broad; 2.5-3.8µ in diameter, 1.5-2.2µ long; end cell rounded, without a cap or a calyptra.

***Oscillatoria pseudogeminata* G. Schmid v. *unigranulata* Biswas**

Thallus blue-green; trichomes slightly curved, not constricted at the cross walls, not attenuated at the ends; cells nearly as long as broad, 2-2.5µ in diameter, 2.2-2.8µ long; cell wall thick, disticnt with one large granule situated at the centre of the partition walls on either side; end cells rounded, without a cap or a calyptra.

***Oscillatoria quadripunctulata* Bruhl et Biswas**

Thallus dark blue-green; trichomes curved or nearly straight, not constricted at the cross walls, not attenuated at the ends; cells longer than broad, 1.5-2.5µ in diameter, 3.8-5.2µ long; granulated at the cross walls, with a pair of granules on either side; end cell rounded, without a cap or a calyptra.

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***Oscillatoria raoi* De Toni, J.**

Thallus pale blue-green; trichomes straight, slightly tapering at the ends, not constricted at the cross walls, septa indistinct, granulated; cells slightly longer than broad, 4.5-5µ in diameter, 5.2-6.5µ long; end cell rounded, without any cap or a calyptra.

***Oscillatoria rubescens* De Candolle ex Gomont**

Thallus blue-green; trichome straight, not constricted at the cross walls, gradually attenuated at the ends; cells ½ - 1/3 as long as broad, 6-6.8µ in diameter, 3-4µ long; cross walls granulated, with gas vacuoles; end cell capitate, with convex calyptra.

***Oscillatoria sancta* (Kuetzing) Gomont**

Thallus blue-green; trichomes straight or bent, constricted at the cross walls, briefly attenuated at the ends; cells much shorter than broad, 10-12.5µ in diameter, 2.5-3.5µ long; not granulated at the cross walls; end cell flattened, hemispherical, slightly capitate, with a thickened membrane.

***Oscillatoria splendida* Grev. ex Gomont**

Thallus blue-green; trichomes straight or curved, tapering at the ends, not constricted at the cross walls; cells 2-3 times longer than broad, 2-2.5µ in diameter, 5.2-7.5µ long; granulated at the cross walls; end cell capitate, nearly rounded, without calyptra.

***Oscilatoria subbrevis* Schmidle**

Trichomes blue-green, single, nearly straight, not constricted at the cross walls, not attenuated at the ends; cells 6.5-7.2µ in diameter, 1.5-2µ long; not granulated at the cross walls; end cell rounded, without a cap or a calyptra.

***Oscillatoria tenuis* Agardh ex Gomont**

Thallus blue-green; trichomes very long, generally straight, constricted at the cross walls, not attenuated at the ends; cells shorter than broad, 5-6.5µ in diameter, 2.5-3.5µ long, constricted at the cross walls; end cell rounded, without a cap or a calyptra.

***Oscillatoria terebriformis* Agardh ex Gomont**

Thallus blue-green; trichomes not constricted at the cross walls, slightly attenualted towards the ends, end bent in a screw like manner; cells slightly shorter, nearly as long as broad, 4-4.8µ in diameter, 2.5-4.5µ long, not granualated at the cross walls; end cell rounded, without a cap or a calyptra.

***Oscillatoria vizagaptensis* Rao, C.B.**

Thallus blue-green; trichomes straight or bent, not constricted at the cross walls, uniformly broad except at the ends; cells much shorter than broad, 8-9.8µ in diameter, 1.5-1.8µ long; not granulated at the cross walls; end cell broadly rounded, with a cap and with a slightly thickened membrane.

PHORMIDIUM Kuetzing, 1843

***Phormidium ambiguum* Gomont**

Thallus blue-green; filaments flexuous, entangled, 5.4-6µ in diameter; sheath thin, firm, coloured violet by chlor-zinc-iodide; trichomes slightly constricted at the cross walls, not attenuated at the ends; cells shorter than broad, 4.5-4.8µ in diameter 1.5-2.5µ long; end cell rounded, without a cap or a calyptra.

***Phormidium anomala* Rao, C.B.**

Thallus expanded, soft, mucilaginous, dark blue green; filaments 9.5-10.1µ in diameter; sheath, thin, hyaline, not stained by chlor-zinc-iodide; persistant or dissolved; trichomes not constricted at the cross walls; cells disc shaped, much broader than long, 7-7.5µ in diameter, 1-1.2µ long; end cells bluntly rounded, without a cap or a calyptra.

***Phormidium autumnale* (Agardh) Gomont**

Thallus dark blue green; filaments strainght, rarely curved, 6-6.5µ in diameter; sheath firm, hyaline, mucilaginous, distinct or diffluent; trichomes not constricted at the cross walls, granulated at the cross walls, briefly attenuated at the ends, straight or scarcely curved; cells shorter than broad, 3-4.8µ in diameter,1.8-2.5µ long; end cell capitate, with a conical calyptra.

***Phormidium corium* (Agardh) Gomont**

Thallus expanded, membranous, leathery, brownish green; filaments long, more or less flexuous, entangled, 5.8-6.5µ in diameter; sheath thin, gelatinizing, coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, briefly attenuated at the ends; cells nearly quadrate, upto twice as long as broad, 4.5-4.8µ in diameter, 5-8.5µ long; not granulated at the cross walls; end cell obtuse, conical, without a cap or a calyptra.

***Phormidium calcicola* Gardner**

Thallus blue-green, thick, firm, entangled; sheath thick, colourless, unlamellated; trichomes not constricted at the cross walls, not attenuated at the ends; cells slightly longer than broad, 6-6.5µ in diameter, 6.2-7.5µ long; not granulated at the cross walls; ends cell truncated, rounded, with a thickened outer membrane.

***Phormidium favosum* (Bory) Gomont**

Thallus blue-green; trichomes mostly without sheath, in an amorphous mucilage, mucilage not coloured blue with chlor-zinc-iodide; trichomes elongate, more or less flexuous, not constricted at the cross walls, granulated at the cross

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walls; ends straight or loosely spirally coiled, gradually attenuated at the ends, cells 5-7.5µ in diameter, 4.8-6.8µ long; end cell obtuse, truncated or capitate, with subhemispherical caplyptra.

***Phormidium jenkelianum* Schmid G.**

Thallus brownish black, slimy, filaments 3.5-3.8µ in diameter, flexuous, not attenuated at the ends; not coloured violet by chlor-zinc-iodide; trichomes brownish blue green, distinctly constricted at the cross walls, not granulated at the cross walls; cells ½ as long as broad, 3-3.8µ in diameter, 1.5-1.8µ long; end cell rounded, truncated, without a cap or a calyptra.

***Phormidium microtomum* Skuja**

Thallus expanded, lamellose, light blue-green; filaments more or less straight, 6.7-7.5µ in diameter; sheath thin, colourless later diffluent; trichome end briefly attenuated, not constricted at the cross walls; cells 5.2-6.5µ in diameter, 1-1.5µ long; end cell rounded with a hyaline calyptra.

***Phormidium molle* (Kuetzing) Gomont**

Thallus light blue-green, thin; sheath more or less diffluent, colourless, not coloured by chlor-zinc-iodide; trichomes 2.5-3µ in diameter, nearly straight, distinctly constricted at the cross walls, not attenuated at the ends, not granulated at the cross walls; cells quadrate, to longer than broad, 2.2-2.5µ in diameter, 4.8-6µ long; end cell rounded, without a cap or a calyptra.

***Phormidium pachydermaticum* Fremy**

Thallus blue-green; filaments 6-6.5µ in diameter; sheath thick, lamellated, trichomes not constricted at the cross walls, not granulated at the cross walls, not attenuated at the ends; cells not quadrate, ½ as long as broad, 4.8-5.1µ diameter, 1.8-2.2µ long; end cell slightly convex or obtuse, conical, with a thickened membrane.

***Phormidium purpurascens* (Kuetzing) Gomont**

Thallus compact; filaments flexuous, 4.5-4.8µ in diameter; sheath thin, diffluent; not coloured violet by chlor-zinc-iodide; trichomes strongly bent, not constricted at the cross walls, two granules on either side of the cross walls, not attenuated at the ends; cells nearly quadrate, or longer than broad, 2.2-2.5µ in diameter, 3-4.8µ long; end cell rounded, without a cap or a calyptra.

***Phormidium retzii* (Agardh) Gomont**

Thallus blue-green; filaments more or less straight, 6-6.8µ in diameter, sheath thin, diffluent, trichomes constricted at the cross walls, not granulated at the cross walls, not attenuated at the ends; cells 5-5.2µ in diameter, 4.5-5.2µ long; end cell rounded, without a cap or a calyptra.

***Phormidium tenue* (Menegh.) Gomont**

Thallus pale blue-green, thin, membranous, expanded; filaments 2.6-3.5µ in diameter; straight or slightly bent, densely entangled; sheath thin diffluent, coloured violet by chlor-zinc-iodide; trichomes slightly constricted at the cross walls, not granulated at the cross walls, cross walls not commonly visible; cells 3 times longer than broad, 1.5-2µ in diameter 3.5-6.1µ long; end cell conical, without a cap or a calyptra.

***Phormidium uncinatum* (Agardh) Gomont**

Thallus broadly expanded, dark green to brownish black; filaments 4.6-6.5µ in diameter, straight or slightly bent; sheath mucilaginous, distinct or diffluent in an amorphous mucilage, not coloured blue by chlor-zinc-iodide; trichomes not constricted at the cross walls, frequently granulated at the cross walls, broadly attenuated at the ends, curved or short spirally coiled; cells ½-1/3 as long as broad, 2.5-4.8µ in diameter, 1.5-2µ long; end cell capitate, with a round or a depressed conical calyptra.

LYNGBYA Agardh, 1824

***Lyngbya birgei* Smith, G.M.**

Filaments blue-green, straight, 16.5-17.2µ in diameter; sheath firm, colourless, unlamellated, seldom lamellated; trichomes not constricted at the cross walls, not attenuated at the ends; cells shorter than broad, 15-16µ in diameter, 2-3µ long, gas vacuoles not observed.

***Lyngbya ceylanica* Wille**

Thallus blue-green; filaments straight, 9.2-9.8µ in diameter; sheath thin, colourless; not coloured violet, by chlor-zinc-iodide; trichomes not constricted at the cross walls, not attenuated at the ends, cross walls not granulated; cells quadrate to ½ or 1/3 as long as broad, 7-7.5µ in diameter, 3.2-3.5µ long; end cell rounded, without a cap or a calyptra.

***Lyngbya confervoides* Agardh ex Gomont**

Thallus blue-green; filaments straight, entangled, 15-15.8µ in diameter; sheath thin, colourless, lamellated, not coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, not attenuated at the ends; cells 12.5-13.2µ in diameter, 2.5-3µ long; end cell rounded, without a cap or a calyptra.

***Lyngbya cryptovaginata* Schkorbatow**

Filaments blue-green, straight 7-7.5µ in diameter; sheath thin, colourless not coloured blue by chlor-zinc-iodide; trichomes slightly constricted at the cross walls, not attenuated at the ends; cells nearly quadrate or up to ½ as long as broad with pseudovacuoles, 6-6.5µ in diameter, 3.4-4.5µ long; end cell rounded, without a cap or a calyptra.

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***Lyngbya dendrobia* Bruhl et Biswas**

Thallus blue green, more or less expanded, compact, thin; filaments long, flexible, more or less straight 7-7.5µ in diameter; sheath thin, smooth, hyaline; trichomes vary slightly constricted at the cross walls, uniformly, densely granular; cells 2 times shorter than broad (as broad as long), 6-6.8µ in diameter 2.5-3.2µ long; end cell rounded, without a cap or a calyptra.

***Lyngbya hieronymusii* Lemmermann**

Filaments blue-green; straight, 12.5-13.1µ in diameter; sheath firm, homogeneous, colourless, not coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, granulated with gas vacuoles, not attenuated at the ends; cells very much broader than short, 10-11.7µ in diameter, 2.8-4µ long; end cell broadly rounded, without a cap or a calyptra.

***Lyngbya lagerheimii* (Moebius) Gomont**

Filaments blue-green, 2.5-3µ in diameter, single or entangled with one another, irregularly spirally coiled; sheath thin, hyaline; trichomes not constricted at the cross walls, not granulated at the cross walls, not attenuated at the ends; cells longer, end cell rounded, without a cap or a calyptra.

***Lyngbya laxespiralis* Skuja**

Filaments blue-green, more or less straight, or irregularly bent or coiled into loose spirals, 8-8.5µ in diameter; distance between two spirals 75-80µ; sheath thin, firm, colourless, not lamellated; trichomes slightly constricted at the cross walls, not granulated at the cross walls; cells shorter than broad, 6.5-7.5µ in diameter, 2.8-4µ long; end cell rounded, without a cap or calyptra.

***Lyngbya major* Meneghini ex Gomont**

Filaments dark blue-green, long, straight, 15-16.5µ in diameter; sheath thick, colourless, lamellated, not coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, granulated at the cross walls, not attenuated at the ends; cells 1/4-1/8 as long as broad, 10-12.2µ in diameter, 2.5-3.2µ long; end cell rounded, with slightly thickened membrane.

***Lyngbya majuscula* Harvey ex Gomont**

Thallus blue-green, expanded; filaments very long, curved or seldom, 14-15.1µ in diameter; sheath colourless, lamellated, colourless lamellated, not coloured violet by chlor-zinc-iodide; trichomes blue-green; not constricted at the cross walls, not attenuated at the ends, cells shorter than broad, 1/6-1/5 times as long as broad 11.7-12.5µ diameter, 2.8-3.5µ long; cross walls not granulated, end cell rotund, without a cap or a calyptra.

***Lyngbya martensiana* Meneghini ex Gomont**

Thallus blue green; filaments long, 11.8-12.5µ in diameter; sheath hyaline, thick, not coloured violet with chlor-zinc-iodide; trichomes not constricted at the cross walls, granulated at the cross walls, not attenuated at the ends; cells shorter than broad, ½-1/4 times as long as broad, 10-10.2µ in diameter, 1.5-2.5µ long; end cell rounded, without a cap or a calyptra.

***Lyngbya perelengans* Lemmermann**

Thallus blue-green; filaments straight or curved, entangled, 2-2.5µ in diameter, sheath, thin, hyline; trichomes not constricted at the cross walls, not attenuated at the ends, cross walls with a single granule on either side; cells 4-5 times longer than broad, 1.5-2µ in diameter, 8-10µ long; end cell rounded, without a cap or a calyptra.

***Lyngbya semiplena* (C. Agardh) J. Agardh ex Gomont**

Thallus caespitose, dark yellowish-green; filaments 7.5-8µ in diameter, entangled, curved or straight; sheath hyaline, thick, unlamellated, not coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, often granulated at the cross walls, slightly attenuated at the ends; cells 1/3-1/2 times as long as broad, 6.2-6.5µ in diameter, 2.5-4.2µ long; end cell capitate, without a calyptra.

***Lyngbya spiralis* Geitler**

Thallus blue green; filaments 8.5-9.4µ in diameter; spirals 6.8-9.4µ broad, the distance between two consecutive spirals 25.2-32.5µ; sheath hyaline, firm, not lamellated, not coloured violet by chlor-zinc-iodide; trichomes not constricted at the cross walls, not attenuated at the ends; cells shorter than broad, ½ times as long as broad, 6-6.5µ diameter, 2.5-3.2µ long; end cell broadly rounded, without a cap or a calyptra.

SCHIZOTHRIX Kuetzing, 1843.

***Schizothrix friesii* (Agardh) Gomont**

Thallus blue-green; filaments in lower parts contorted, above rarely straight; sheath hyaline, lamellated, acuminate at the ends, coloured violet by chlor-zinc-iodide, with few trichomes or single trichomes; trichomes distinctly constricted at the cross walls; cells nearly quadratic or 2 times as long as broad, 2.5-3µ in diameter, 3.8-6.2µ long; end cell obtuse, conical.

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***Sohizothrix mulleri* Naegeli ex Gomont**

Thallus blackish green; filaments arranged in creeping bundles; sheath firm, lamellated, uneven, at the ends pointed, coloured violet by chlor-zinc-iodide; trichomes slightly constricted at the cross walls; cells shorter than broad, 7-7.8µ in diameter, 4.2-6.3 µ long; end cell obtuse.

SYMPLOCA Kuetzing, 1843

***Symploca catilaginea* (Mont.) Gomont**

Filaments blue-green; sheath seemingly thick, firm, coloured violet by chlor-zinc-iodide; Trichomes not constricted at the cross walls, with single granule on each side; cells longer than brand, 2.2-2.5 µ in diameter 4.3-5 µ long; end cells obtuse, with a very slightly thickened outer membrane.

MICROCOLEUS Desmazieres, 1823

***Microcleus lacustris* (Rabenh.) Farlow**

Thallus blue-green; filaments 32-36µ in diameter, contorted, seldom branched; sheath colourless, slimy, not coloured violet by chlor-zinc-iodide; trichomes distinctly constricted of the cross walls, cells 4-5.2µ in diameter, 6.5-8.5µ long, slightly attenuated at the ends; not granulated at the cross walls; end cell more or less rounded, conical, without a cap or a calyptra.

***Microcoleus vaginatus* (Vaucher) Gomont**

Thallus dark green; filaments 25-27.5µ in diameter, sometimes sparsely branched, sometimes coiled; sheath hyaline, watery, uneven not coloured by chlor-zinc-iodide, often agglutinated with one another; trichomes blue-green or dirty green, not constricted at the cross walls, aften granulated at the cross walls, attenuated at the ends; cells subquadrate or ½-2 times as long as broad, 3.2-4.8 µ in diameter, 2-4.7 µ long; end cell capitate, with a flat, conical calyptra.

HYDROCOLEUM Kuetzing, 1843

***Hydrocoleum contharidosum* (Mont) Gomont**

Thallus blue green; filaments straight, sheath thick, slimy, uneven, occasionally lamellated; trichomes blue-green, few in each sheath, nearly parallel, in the upper parts of filaments single in each sheath, not constricted at the cross walls, briefly attenuated at the ends; cells 1/5-1/9 as long as broad, 1.5-2µ in diameter, 3-4.5µ long; cross walls granulated; end cell rounded, with a calyptra.

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Research Contribution:

Papers Published in International Journals	: - 48
Papers Published National level	: - 19
Books Published	: - 01
Paper/Article/Chapter Published in Books	: - 08
Papers/Articles Accepted	: - 02
Papers Communicated	: - 04
Abstracts Published	: - 09

Papers Presented in International Conferences in India	: - 10
Papers Presented in International Conferences in Abroad	: - 01
Papers Presented in National Conferences/Seminar	: - 37
Papers Presented in State level Seminar/Conference	: - 05