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Study of Cyanobacterial diversity from the major rivers of Chandrapur district, Maharashtra

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Abstract

Present manuscript deals with the record and distribution of Cyanophyceae in Chandrapur district of Maharashtra state, India. During the period from 2013 to 2015 three major rivers Wardha, Painganga and Waineganga of the district were studied to explore their biological wealth and documented 45 taxa belongs to 18 genera and 5 families of blue green algae. Among these 31 taxa are reported first time from the district and a taxa *Calothrix stagnalis* Gomont is new record for the state.

Key words: Wardha; Painganga; Waineganga; *Calothrix stagnalis*; New record.

Introduction

Cyanobacteria are widespread prokaryotic photosynthetic microorganisms among which some are able to fix atmospheric nitrogen. They occupied all possible habitats where moisture and light is available. But their distribution among different territory is regulated by physiochemical conditions of that particular habitat. Several habitats of India and Maharashtra state (Anand and Hopper, 1987; Mahajan and Mahajan, 1988; Tripathy et al., 1999; Pattanaik and Adhikary, 2002; Tirkey and Adhikary, 2006; Vijayakumar et al., 2007; Patil and Nandan, 2011; Dash et al., 2011; Ghosh and Keshri, 2011; Hazarika, 2013; Kumar et al., 2013; Kamble and Karande, 2014) have been explored by various workers for blue green algal diversity. But the Chandrapur district was neglected by algal taxonomists, and least literature regarding algae is available from the district. Hence, present work is undertaken during the period from 2013 to 2015 to study the biodiversity of three major rivers of the Chandrapur district.

Materials and Methods

Study area: Chandrapur is the easternmost district of the Maharashtra state, located between 18° 41' to 20° 50' north latitudes and 78° 48' to 80° 55' east longitudes . The district is bounded by Nagpur, Bhandara and Wardha on northern side, Yavatmal on western side, Gadchiroli on eastern side and Adilabad district of the Telangana state on southern side. Physiographically it is situated in the Wainganga and Wardha river basin. The entire area of the district falls in the Godavari basin. The area is drained by major tributaries Wardha, Wainganga and Painganga rivers of the Godavari river.

The climatic condition of the district is hot which ranges between minimum 11.6^0 C in December and maximum 49^0 C in May. The average annual rainfall is about 1142.07 mm. The district is highly industrialized and bears the pressure of about 6000 small, medium and large scale industries (Collector office Chandrapur). In the district, there exist few wetlands and that too are bearing the pressure of high industrialization. Day by day pollution in the district is increasing and changing the physico chemical environment and biota of the rivers. And the rivers of

the district are never explored for their biological wealth. Hence, present work is undertaken to explore the algae of major rivers Wardha, Painganga and Waineganga of the Chandrapur district.

Sampling and identification: Samples were collected from 21 selected sites (Table 1) of three major rivers during May, August, November and February months of 2013 – 15 period. From every site approximately 50 liters of running water is filtered through phytoplankton net of 20µ mesh size made of bolting silk. The filtrate was preserved in 4% formaldehyde solution. Microphotographs taken with the help of Coslab CCD camera inbuilt trinocolor microscope. Algae were identified with the help of standard flora of Indian Cyanophyta (Desikachary, 1959), Algae of the Western great lakes area (Prescott, 1965) and from several current research papers.

Table 1. Sample collection sites

Sr.No	Site	Location	Coordinates
1	S1	Pardi	19.74116, 78.91294
2	S2	Bori	19.806521, 78.999683
3	S3	Gadegaon Wirur	19.86346, 79.12374
4	S4	Dhanora	19.90364, 79.18398
5	S5	Kadoli	19.87521, 79.28792
6	S6	Sasti	19.83374, 79.33524
7	S7	Rajura	19.81348, 79.37489
8	S8	Koipara	19.76654, 79.49025
9	S9	Arvi	19.633623, 79.489308
10	S10	Polsa	19.508021, 79.588534
11	S11	Tatepalli	19.581930, 79.703676
12	S12	Gugus	19.955476, 79.099068
13	S13	Patala	20.127590, 78.996672
14	S14	Soit	20.279169, 78.818192
15	S15	Gondpipri - Ashti	19.677346, 79.785461
16	S16	Gangapur	19.841112, 79.753918
17	S17	Saoli – Chamorshi	20.008005, 79.786234
18	S18	Saoli – Gadhiroli	20.134877, 79.923606
19	S19	Kudesawali	20.323513, 79.949483
20	S20	Brahmapuri - Armori	20.483042, 79.946445
21	S21	Brahmapuri - Wadsa	20.619367, 79.940179

Results

The Cyanophyceae of the major rivers of Chandrapur district is as follows...

1. ***Aphanocapsa banaresensis*** Bharadwaja, 1935: Pl. I Fig. 1
   [Desikachary 1959, p. 133]
   Colony spherical, colourless. Cells spherical, individual sheath not clear, 5µ-6.5µ in diameter.

Occurrence: S3, S13

2. ***Aphanocapsa grevillei*** (Berkeley) Rabenhorst, 1865: Pl. I Fig. 2
(Synonym = *Microcystis grevillei* (Berkeley) Elenkin, 1938
[Desikachary 1959, p. 134]
Colony spherical, sheath distinct. Cells spherical, individual sheath not distinct. 4µ-5µ in diameter.
Occurrence: S1, S2, S5, S7, S11
3. ***Aphanocapsa pulchra*** (Kützing) Rabenhorst, 1865: Pl. I Fig. 3
[Desikachary 1959, p. 132]
Colony near spherical, gelatinous. Cells spherical with minute gas vacuoles, 3µ-4µ in diameter.
Occurrence: S5, S6, S7, S9, S11

Aphanothece Nageli 1849.

3. ***Aphanothece castagnei*** (Kützing) Rabenhorst, 1865: Pl. I Fig. 4
Basionym: Palmella castagnei Kützing 1846. [Desikachary 1959, p. 140]
Colony near spherical, sheath distinct. Cells ellipsoid cylindrical, arranged compactly, 3µ-4µ X 5µ-7µ in size.
Occurrence: S4

4. ***Aphanothece microscopica*** Nägeli, 1849: Pl. I Fig. 5 [Desikachary 1959, p. 142] Colony near spherical, gelatinous. Cells blue green, oblong cylindrical with rounded ends, 4µ-5µ X 8µ-9µ in size.Occurrence: S2

Chroococcus Nägeli 1849.

5. ***Chroococcus dispersus*** (Keissler) Lemmermann, 1904: Pl. I Fig. 6 Basionym: *Chroococcus minor* var *dispersus* Keissler 1902. [Desikachary 1959, p. 106] Colony mucilaginous with 4 or 8 cells. Cells spherical, light blue green, 3µ-4µ in diameter (without sheath). Occurrence: S15

6. ***Chroococcus limneticus*** Lemmermann, 1898: Pl. I Fig. 7
[Desikachary 1959, p. 107] Colony 4 or 8 celled, near tabular. Cells sub spherical to ellipsoid, Sheath thin, unlamellated, colourless. Orientation of cells in the colony is not similar. Cells 6µ-8µ in diameter (without sheath).
Occurrence: S1-S3, S6-S11, S16-S18, S21.
7. ***Chroococcus minor*** (Kützing) Nägeli, 1849: Pl. I Fig. 8

Basionym: *Protococcus minor* Kützing, 1845 Synonym: *Gloeocapsa minor* (Kützing) Hollerbach, 1937

[Desikachary 1959, p. 105] Colony slimy, 4 or 8 celled. Cells spherical, dirty green, sheath thin, 3µ-4µ in diameter (without sheath). Occurrence: S4, S5, S7, S12-S14
8. ***Chroococcus urgid*** (Kützing) Nägeli, 1849: Pl. I Fig. 9

Basionym: *Protococcus urgid* Kützing, 1843 Synonym: *Gloeocapsa minuta* (Kützing) Hollerbach, 1937

[Desikachary 1959, p. 103] Colony 2, 4 or 8 celled. Cells spherical, Sheath thick, unlamellated, 5µ-7µ in diameter (without sheath). Occurrence: S1, S2, S4, S10, S12-S15, S17-S20
9. ***Chroococcus tenax*** (Kirchner) Hieronymus, 1892: Pl. I Fig. 10
Basionym: *Chroococcus turgidus* var. *tenax* Kirchner, 1878
[Desikachary 1959, p. 103]
Cells 2 to 4 together, near spherical to triangular, blue green or olive coloured. Sheath thick, distinctly lamellated, colourless. Cells 17µ-20µ in diameter (without sheath).
Occurrence: S4, S5, S8, S12-S16
10. ***Chroococcus turgidus*** (Kützing) Nägeli, 1849: Pl. I Fig. 11 Basionym: *Protococcus turgidus* Kützing, 1846

Synonym: *Gloeocapsa urgid* (Kützing) Hollerbach, 1937 [Desikachary 1959, p. 101]

Colony ellipsoid, 1 or 2 celled. Cells near spherical to ellipsoid, sheath thick, colourless, 16µ-20µ in diameter (without sheath). Occurrence: S4, S5, S7, S9, S12, S13

Coelosphaerium Nägeli 1849.

11. ***Coelosphaerium kuetzingianum*** Nägeli, 1849: Pl. I Fig. 12
[Desikachary 1959, p. 148] Colony near spherical, mucilage diffluent, margin not distinct. Cells spherical, blue green, arranged around empty space. Gas vacuoles absent. Cells 3µ-5µ in diameter. Occurrence: S5, S7, S12

Gloeocapsa Kützing 1843.

12. ***Gloeocapsa rupestris*** Kützing, 1846: Pl. I Fig. 13
[Desikachary 1959, p. 117] [Voucher no. PC13.5.1] Colony spherical, crustaceous, yellowish. Cells spherical to oval, sheath vesicular, yellowish to colour less, and lamellated. Cells 6µ-9µ in diameter. Occurrence: S15

Gomphosphaeria Kützing 1836.

13. ***Gomphosphaeria aponina*** Kützing, 1836: Pl. I Fig. 14
[Desikachary 1959, p. 150, pl. 28, f. 1-3] Colony near spherical or pyriform. Cells cordate at longitudinal cell division, and distinctly placed at dichotomous branches of mucilage stalks. Cells 4µ-6µ X 9µ-11µ.
Occurrence: S1-S3, S5-S7, S9-S11, S19-S21

Merismopedia F.J.F.Meyen 1839.

14. ***Merismopedia elegans*** A.Braun ex Kützing, 1849: Pl. I Fig. 15
[Desikachary 1959, p. 156] Cells large, light blue green, in many celled large and folded colonies. Cells 7µ-9µ in diameter. Occurrence: S3, S4, S6-S8, S11, S18, S19
15. ***Merismopedia glauca*** (Ehrenberg) Kützing, 1845: Pl. I Fig. 16
Basionym: *Gonium glaucum* Ehrenberg, 1838 Synonym: *Merismopedia aeruginea* Brébisson, 1849
[Desikachary 1959, p. 155] Cells medium sized, blue green, in 16 – 64 celled colonies. Cells 4µ-6µ in diameter.
Occurrence: In all sites
16. ***Merismopedia minima*** Beck, 1897: Pl. I Fig. 17 [Desikachary 1959, p. 154] Cells minute, pale blue green, in four to many celled free floating colonies. Cells 0.8µ-1µ in diameter. Occurrence: In all sites
17. ***Merismopedia punctata*** Meyen, 1839: Pl. I Fig. 18
[Desikachary 1959, p. 155] Cells small, blue green, in four to many celled free floating colonies. Cells 2.5µ-3.5µ.
Occurrence: S1, S2, S4-S7, S9-S12, S14-S17, S19
18. ***Merismopedia tenuissima*** Lemmermann, 1898: Pl. I Fig. 19
[Desikachary 1959, p. 154] Cells minute, pale blue green, in eight to many celled free floating colonies. Cells 1.5µ-2µ in diameter. Occurrence: S4, S5, S9, S10, S12, S13,

Microcystis Lemmermann 1907.

19. ***Microcystis aeruginosa*** (Kützing) Kützing, 1846: Pl. II Fig. 12
Basionym: *Micraloa aeruginosa* Kützing, 1833. [Desikachary 1959, p. 154]
Colony circular or irregular, clathrate. Cells small, spherical, with gas vacuoles. Cells densely arranged 5µ-7µ in diameter. Occurrence: S6, S7, S12, S13, S19, S20
20. ***Microcystis flosaquae*** (Wittrock) Kirchner, 1898: Pl. II Fig. 3 Baasionym: *Microcystis aeruginosa* f. *flosaquae* (Wittrock) Elenkin, 1938 [Desikachary 1959, p. 154] Colonies mostly spherical, sometimes ellipsoid. Cells small, spherical with gas vacuoles, compactly arranged, 5µ-7µ in diameter. Occurrence: S1, S5, S7, S9, S10, S13, S14

21. ***Microcystis protocystis*** W.B.Crow, 1923: Pl. I Fig. 20
[Desikachary 1959, p. 154]
Colonies spherical to elongate. Cells small, spherical, with gas vacuoles, densely to loosely arranged, but not dispersed, 4µ-5µ in diameter.
Occurrence: S4, S5, S7
22. ***Microcystis robusta*** (H.W.Clark) Nygaard, 1925: Pl. II Fig. 1

Basionym: *Clathrocystis robusta* H.W.Clark, 1908. [Desikachary 1959, p. 154] [Voucher no. PC13.8.4]

Colony mostly lobate and gelatinous. Cells large, spherical, aggregated, colonial margin distinct but not refractive, 6µ-8µ in diameter. Occurrence: S1, S4, S9-S11
23. ***Microcystis wesenbergii*** (Komárek) Komárek ex Komárek, 2006: Pl. II Fig. 2

Basionym: *Diplocystis wesenbergii* Komárek, 1958. Colony near spherical or lobed, sometimes clathrate. Cells large, spherical with many gas vacuoles, 6µ-7µ in diameter. Occurrence: S9-S11

Synechocystis Sauvageau 1892.

24. ***Synechocystis aquatilis*** Sauvageau. 1892: Pl. I Fig. 21
[Desikachary 1959, p. 144] [Voucher no. PC13.9.1] Cells small, pale blue green, in one to many celled free floating colonies. Cells 5µ-6µ in diameter. Occurrence: S1-S3, S5-S7, S12, S14-S16, S18, S19, S21
25. ***Synechocystis sallensis*** Skuja, 1930: Pl. I Fig. 22
Cells medium, blue green, two to four together, 8µ-9µ in diameter. Occurrence: S1-S3, S11

Order **PLEUROCAPSALES** Geitler.

Family **PLEUROCAPSACEAE** Geitler.

Myxosarcina Printz 1921.

26. ***Myxosarcina burmensis*** Skuja, 1949: Pl. I Fig. 23
Basionym: *Cyanosarcina burmensis* (Skuja) Kovácik, 1988. [Desikachary 1959, p. 178]
Colony small, spherical, sarcinoid, sheath indistinct. Cells minute, angular spherical with rounded corners. Cell divides in both vertical and horizontal directions, 2µ-4µ in diameter. Occurrence: S1, S2, S14, S16
27. ***Myxosarcina spectabilis*** Geitler, 1933: Pl. I Fig. 24
Basionym: *Cyanosarcina spectabilis* (Geitler) Kovácik, 1988
[Desikachary 1959, p. 178] Colony small, irregular, free floating with distinct sheath. Cells small, angular ovate, blue green, 6µ-8µ in diameter.Occurrence: S15

Order **NOSTOCALES** Geitler.

Family **OSCILLATORIACEAE** Kirchner.

Arthrospira Sitzenberger ex Gomont 1892.

28. ***Arthrospira khannae*** Drouet & Strickland, 1942: Pl. II Fig. 5 [Desikachary 1959, p. 189, pl. 35, f. 12] Trichome

blue green, regularly spirally coiled and not constricted at cross walls. Cells broader than long, end cells

subcapitate, cross walls granulated. Cells 3µ-5µ X 1µ-2µ, Trichome 3µ-5µ broad, Spiral 18µ-20µ broad & 25µ-

30µ apart. Occurrence: S7, S8, S11

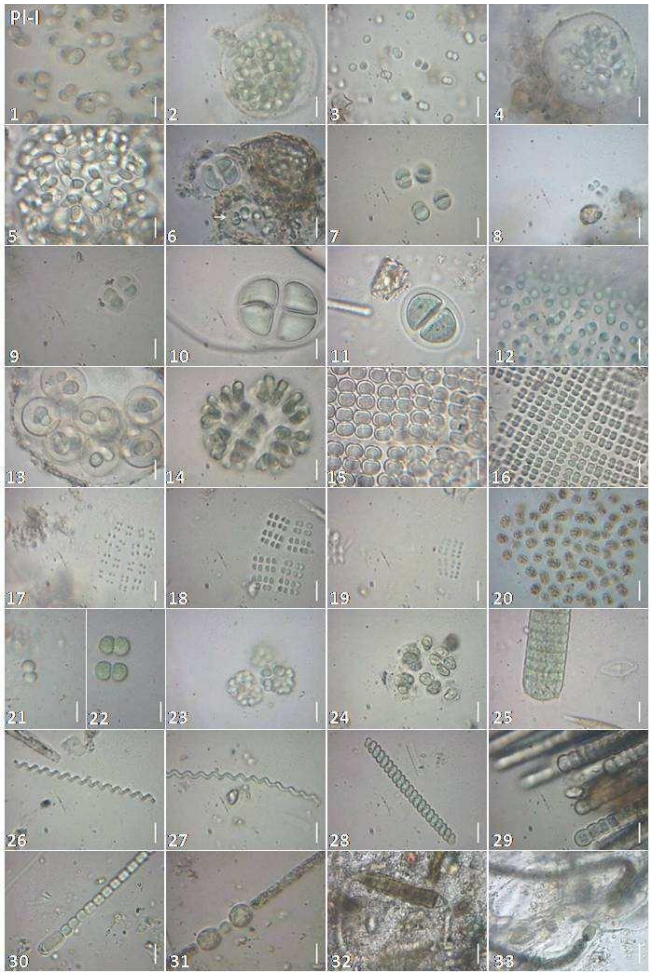

Plate I (scale 10 µm): 1. *Aphanocapsa banaresensis,* 2. *Aphanocapsa grevillei*, 3. *Aphanocapsa pulchra*, 4. *Aphanothece castagnei,* 5. *Aphanothece icroscopic*, 6. *Chroococcus disperses,* 7. *Chroococcus limneticus*, 8. *Chroococcus minor,* 9. *Chroococcus minutes*, 10. *Chroococcus tenax*, 11. *Chroococcus turgidus,* 12. *Coelosphaerium kuetzingianum,* 13. *Gloeocapsa rupestris,* 14. *Gomphosphaeria aponina,* 15. *Merismopedia elegans,* 16. *Merismopedia glauca,* 17. *Merismopedia minima,* 18. *Merismopedia punctata,* 19. *Merismopedia tenuissima,* 20. *Microcystis protocystis,* 21. *Synechocystis aquatilis,* 22. *Synechocystis sallensis,* 23. *Myxosarcina burmensis,* 24. *Myxosarcina spectabilis,* 25. *Oscillatoria limosa,* 26. *Spirulina major,* 27. *Spirulina meneghiniana,* 28. *Spirulina subsalsa,* 29. *Trichodesmium lacustre,* 30. *Anabaena laxa,* 31. *Anabaena sphaerica,* 32. *Calothrix fusca,* 33. *Calothrix stagnalis*.

29. ***Arthrospira maxima*** Setchell & N.L.Gardner, 1917: Pl. II Fig. 6
    Synonym: *Spirulina maxima* (Setchell & N.L.Gardner) Geitler, 1932
    Trichome blue green, regularly spirally loosely coiled and constrictions not clear. Cells broader than long, end cells slightly attenuated.
    Cells 7µ-8µ X 4µ-6µ, Trichome 7µ-8µ broad, Spiral 40µ-50µ broad & 70µ-80µ apart.
    Occurrence: S12-S14, S16, S17
30. ***Arthrospira platensis*** (Nordstedt) Gomont, 1892: Pl. II Fig. 7
    Synonym: *Spirulina jenneri* var. *platensis* Nordstedt, 1884
    [Desikachary 1959, p. 190, pl. 35, f. 2] Trichome blue green, regularly spirally coiled and slightly constricted at cross walls. Cells quadrangular as broad as long or broader, end cells broadly rounded.
    Cells 5µ-8µ X 4µ-6µ, Trichome 5µ-8µ broad, Spiral 30µ-45µ broad & 50µ-60µ apart.

Occurrence: S16, S17

Lyngbya Agardh 1892.

31. ***Lyngbya hieronymusii*** Lemmermann, 1905: Pl. II Fig. 4
[Desikachary 1959, p. 297] Filaments free floating, single, and straight. Sheath firm, homogenous, colourless. Cells broader than long, not or slightly constricted at cross walls, granulated. End cells broadly rounded. Filament 14µ-16µ broad, Cells 12µ-14µ X 3µ-4µ.
Occurrence: S2, S3

Oscillatoria Vaucher 1892.

32. ***Oscillatoria limosa*** Agardh ex Gomont, 1892: Pl. I Fig. 25
[Desikachary 1959, p. 206] Trichome straight, not constricted or slightly constricted. Cross walls granulated, end cell flatly rounded. Cells 3µ-6µ X 15µ-20µ.
Occurrence: S4-S12, S16-S18, S20, S21
33. ***Oscillatoria princeps*** Vaucher ex Gomont, 1892: Pl. II Fig. 9
[Desikachary 1959, p. 210, pl. 37, f. 1, 10, 11, 13, 14] Trichomes straight, not constricted at cross walls, slightly attenuated at apex and slightly bent. End cells flatly rounded, slightly apitates. Cells 3µ-6µ X 40µ-60µ.
Occurrence: S4, S5, S7-S9, S11
34. ***Oscillatoria princeps* var. *pseudo-limosa*** Ghose, 1924: Pl. II Fig. 8
[Desikachary 1959, p. 210] Trichome straight, rigid, not constricted. Apical cell convex, not capitates, not bent. Cells 2µ-4µ X 30µ-40µ.
Occurrence: S15-S17, S19-S21

Spirulina Turpin ex Gomont 1892.

35. ***Spirulina major*** Kützing ex Gomont, 1843: Pl. I Fig. 26
Synonym: *Arthrospira major* (Kützing ex Gomont) W.B.Crow, 1927 [Desikachary 1959, p. 196, pl. 36, f. 13]
Trichomes blue green, regularly spirally loosely coiled. Trichome 1.5µ-2µ broad, Spiral 3µ-4µ broad & 4µ-5µ apart. Occurrence: In all the sites
36. ***Spirulina meneghiniana*** Zanardini ex Gomont, 1892: Pl. I Fig. 27 Synonym: *Arthrospira meneghiniana* (Zanardini ex Gomont) W.B.Crow, 1927 [Desikachary 1959, p. 195, pl. 36, f. 8] Trichomes blue green, irregularly spirally loosely coiled. Trichome 1.5µ-2µ broad, Spiral 3µ-5µ broad & 4µ-6µ apart. Occurrence: S6, S7, S12, S14
37. ***Spirulina subsalsa*** Oersted ex Gomont, 1842: Pl. I Fig. 28
Synonym: *Arthrospira subsalsa* (Oersted ex Gomont) W.B.Crow, 1927
[Desikachary 1959, p. 193, pl. 36, f. 3, 9] Trichomes blue green, regularly spirally compactly coiled. Trichome 2µ-3µ broad, Spiral 5µ-7µ broad. Larger than the dimensions given by Desikachary. Occurrence: S7

Trichodesmium Ehrenberg ex Gomont 1892.

38. ***Trichodesmium lacustre*** Klebahn, 1895: Pl. I Fig. 29
Synonym: *Oscillatoria lacustris* (Klebahn) Geitler, 1925 [Desikachary 1959, p. 246, pl. 42, f. 22]
Trichomes straight, constricted, arranged parallel in bundles. Cells short barrel shaped, end cells rounded and somewhat capitates, 6µ-8µ X 5µ-7µ Occurrence: S15, S16, S18, S20, S21

Family **NOSTOCACEAE** Kützing.

Anabaena Bory 1822.

39. ***Anabaena laxa*** (Rabehn.) A. Braun, 1886: Pl. I Fig. 30

[Desikachary 1959, p. 413] Trichomes straight, parallel and free. Cells spherical to barrel shaped with attenuated ends, apical cell with broadly rounded ends. Heterocyst spherical to elongate. Spore cylindrical with smooth epispore and away from the heterocyst.
Cells 4µ-5µ X 5µ-6µ, Heterocyst 5µ-6µ X 7µ-8µ, Akinete 7µ-8µ X 14µ-16µ
Occurrence: S7, S13

40. ***Anabaena sphaerica*** Bornet & Flahault, 1888: Pl. I Fig. 31
[Desikachary 1959, p. 393] Trichomes moniliform, straight, parallel and free. Cells barrel shaped, ends rounded. Heterocyst spherical, spores oval to spherical present on both the sides of heterocyst. Epispore smooth and yellowish brown. Cells 5µ-6µ, Heterocyst: 6µ-7µ, Akinete 10µ-12µ diameter.
Occurrence: S8, S13, S14
41. ***Anabaena volzii*** Lemmermann, 1906: Pl. II Fig. 10
Synonym: *Macrospermum volzii* (Lemmermann) Komarek, 2008
[Desikachary 1959, p.403, pl. 77, f. 1] Trichome straight or bent, free. Cells barrel shaped to cylindrical, end cells with rounded ends, heterocyst nearly cylindrical, spore ellipsoidal and present on only one side of the heterocyst. Epispore smooth and colourless. Cells 5µ-7µ X 7µ-10µ, Heterocyst 8µ-10µ X 10µ-12µ, Akinete 20µ-25µ X 50µ-60µ
Occurrence: S16-S20

Family **MICROCHAETACEAE** Lemmermann.

Microchaete Thuret 1875.

42. ***Microchaete violacea*** Fremy, 1929: Pl. II Fig. 11
[Desikachary 1959, p. 511] Filament straight or slightly curved, slightly narrower than broad. Sheath thin, colourless and unlamellated. Trichome constricted at the cross walls. Cells broader than long, cylindrical. Heterocyst basal, compressed spherical. Spores not observed. Cell 9µ-10µ X 7µ-8µ, Filament 12µ - 13µ X 75µ - 125µ. Occurrence: S20, S21
Family **RIVULARIACEAE** Rabenhorst.

Calothrix Agardh 1824.

43. ***Calothrix fusca*** Bornet & Flahault, 1886: Pl. I Fig. 32. [Desikachary 1959, p. 527, pl. 107, f. 10; Prescott 1962, p. 551, pl. 132, f. 4, 5] Filament single or few together, embedded in the mucilage of other algae. Strongly curved from horizontal basal portion, distinctly broad at base and tapered into a long hair. Cells discoid, broader than long at base, heterocyst single, hemispherical or pyramidal, and basal in position. Cell 7µ-10µ X 3µ-4µ, Heterocyst 5µ-6µ broad, Filament 10µ-14µ broad. Occurrence: S18, S19

44. ***Calothrix stagnalis*** Gomont, 1895: Pl. I Fig. 33
[Prescott 1962, p. 553, pl. 132, f. 7]
Plants few together , attached with the substratum with basal portion, but suddenly bent to form erect apical portion. Trichome gradually tapers into a long narrow tail. Cells short near rectangular with constriction at septa. Heterocyst singe, spherical, basal. Spore single, adjacent to the heterocyst.
Cell 5µ-7µ X 5µ-9µ, Heterocyst 5µ-6µ broad, Filament 8µ-10µ broad.
Occurrence: S15, S16
This is probably first report of the taxon from Maharashtra.

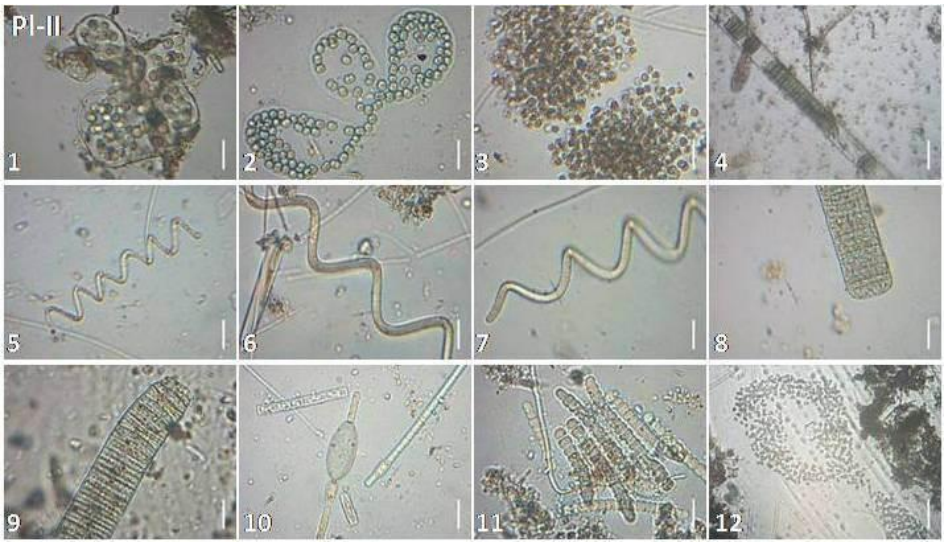

Plate II (scale 25 µm): 1. *Microcystis robusta.,* 2. *Microcystis wesenbergii.,* 3. *Microcystis flosaquae*, 4. *Lyngbya hieronymusii*, 5. *Arthrospira khannae*, 6. *Arthrospira maxima., 7. Arthrospira platensis*, 8. *Oscillatoria princeps* var. *pseudo-limosa*, 9. *Oscillatoria princeps*, 10. *Anabaena volzii*, 11. *Microchaete violacea*, 12. *Microcystis aeruginosa* (fig. 12 scale100µm)

Discussion & Conclusion

In India the Cyanophyceae is represented by 1232 taxa of 90 genera (Gupta, 2012) and distributed widely in all possible types of habitats. From the Maharashtra state several workers have enlisted a number of taxa of Cyanophyceae from different habitats.

But, from the district there are only few studies are available concerning Cyanophyceae. Kamat (1975) reported 13 taxa of Cyanophyceae from few sites of Chandrapur proper and Warora city. And Wadhave (2014) reported 74 taxa from rice fields of the Bhadrawati taluka of the district.

In present work, 444 km length of rivers was studied by selecting 21 sites and identified 45 taxa of 18 genera of blue green algae from the district. Among these 31 are reported first time from the district and a taxa *Calothrix stagnalis* Gomont is reported first time from the state. From this study it is observed that the district is rich in biodiversity and need further extensive taxonomic studies in different ecological habitats.

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