



ENUMERATION OF FRESH WATER ALGAL FLORA OF RANCHI, JHARKHAND, INDIA

KIRAN TOPPO AND M.R. SUSEELA*

*Algology Laboratory, Plant Biodiversity and Conservation division,
National Botanical Research Institute (CSIR), Lucknow-226001*

*Author for correspondence

The present paper enumerates 61 taxa of fresh water algae from Ranchi district of Jharkhand state, India. Out of these 47 were Chlorophyceae, 11 were Cyanophyceae and 3 were Bacillariophyceae algae. Chlorophyceae algae were the dominant in all the localities.

Key words: Algae, Freshwater, Ranchi, Jharkhand.

Ranchi is the capital city of Jharkhand state of India located at 23°21' N 85°20' E. The total area covered by the Ranchi municipal area is 175.12 square kilometres and the average elevation of the city is 651 m above sea level. It is located on the southern part of the Chota Nagpur plateau which forms the eastern edge of the Deccan plateau. Ranchi is referred to as the "City of Waterfalls", due to the presence of numerous large and small falls around the close vicinity of the city. It has a sub-tropical climate. During summers (March to June), the maximum temperature observed is 37°C and a minimum of 20°C. Winters (November to February) are cool and have a maximum temperature of 22°C and a minimum of 2°C.

There were few cursory reports on algal flora of Jharkhand. Such as Bohra and Kumar (2004), worked on wetland plankton, Guru (2007a,b) reported chlorophycean assemblage from polluted tank and studied distribution and diversity of desmid, Gouri (2009) worked on algal flora and water quality of river Roro, Arpana and Radha (2009) explored the phycodiversity of Tenughat thermal power station of Jharkhand, Arundhati and Kargupta (2009) reported cyanophytes of Damodar river, Mehta and Sahu (2010), recorded diversified algae from Swarnrekha river, Amit and Radha (2012) studied ecology of cyanobacteria in a sewage pond, Ranchi and

Guru and Kuma (2012) recorded Phytoplanktonic community status in a freshwater shallow lake of Ranchi. As such there was no information on the algal floristic enumeration of Ranchi district. To fill the gap the present investigation has been carried out and enumerated fresh water algal flora of Ranchi.

MATERIALS AND METHODS

Algal samples were collected from various freshwater habitats such as, in and around Ranchi, Gumla road, and Rampur road of Ranchi district, Jharkhand during October 2008. A total of 47 fresh water algal samples were collected and preserved in 10% formalin. All samples were deposited in the herbarium of the National Botanical Research Institute, Lucknow. Microscopic observations were made in Leica DM 5000 light microscope attached with Leica EC3 Camera with computerized image analysis system. Taxa were identified by using the standard publications (Prescott 1951, Tiffany and Britton 1952, Desikachary 1959, Scott and Prescott 1961).

RESULTS

Microphotography was done to all the taxa and presented in Plate 1 to 3.

The following are the Enumeration, distribution and diversity of algae in Ranchi, Jharkhand

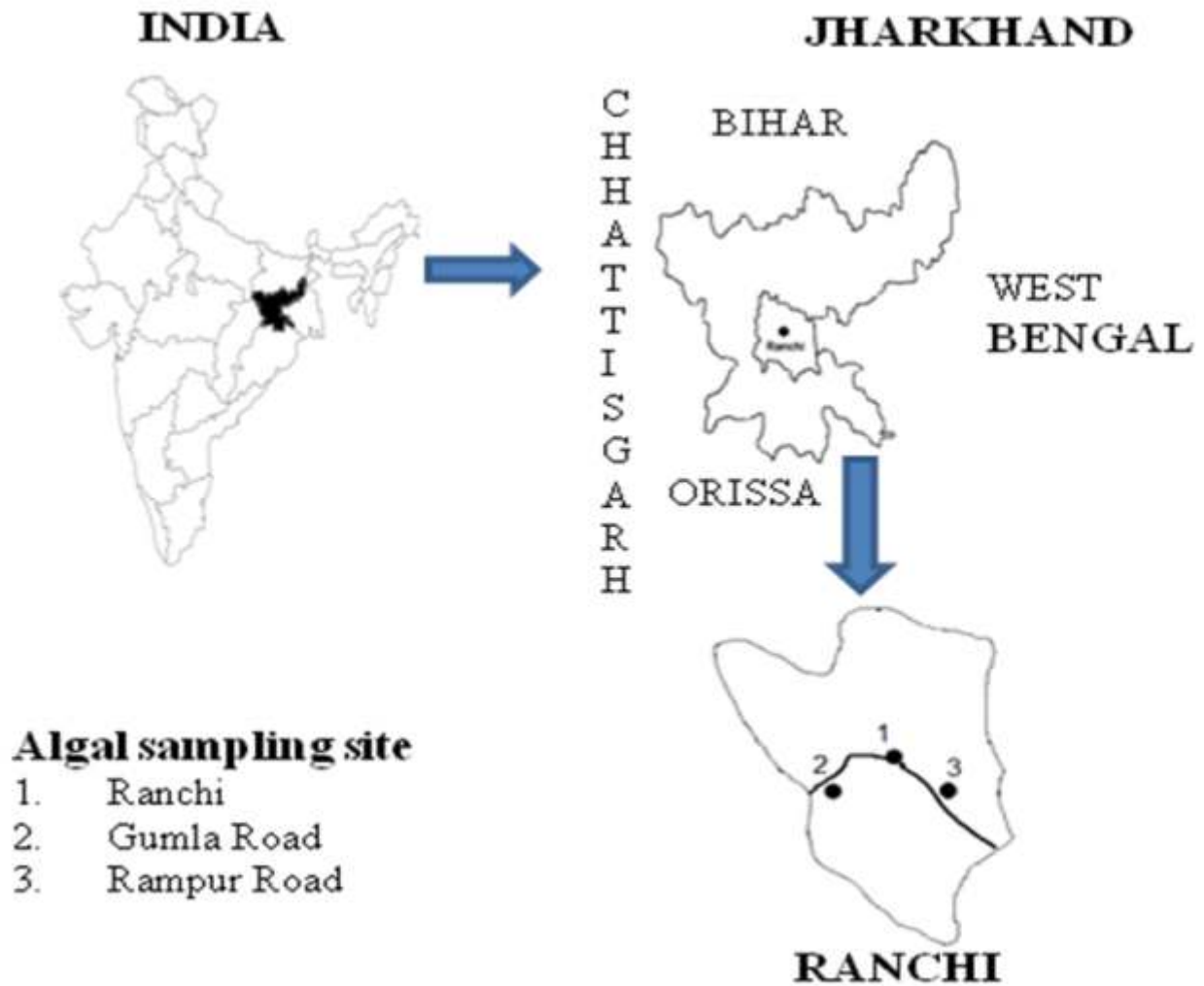
Algal taxa	Ranchi (1)	Gumla Road(2)	Rampur Road (3)
Class Cyanophyceae			
Order Chroococcales			
Family Chroococcaceae			
Genus Chroococcus			
Species cohaerens (Breb.) Nageli	+++	+	-
Genus Merismopedia			
Species elegans A. Braun in Kutzing	++	-	-
Order Nostocales			
Family Oscillatoriaceae			
Genus Spirulina			
Species meneghiniana Zanard	++	-	+
Genus Oscillatoria			
Species O.curviceps C. Agardh	+	-	-
O.tenuis C. Agardh	+	+	-
O.limosa (Roth) C. Agardh	+++	-	+
O.acuta Bruhl et Biswas	++	-	++
Family Nostocaceae			
Genus Cylandrospermum			
Species majus Kutzing	+	-	-
Genus Anabaena			
Species constricta (Szafer) Geitler	+	-	++
Family Scytonemataceae			
Genus Plectonema			
Species wollei Farlow	-	+	-
Genus Tolypothrix			
Species distorta Kutzing	+	-	-
Class Chlorophyceae			
Order Tetrasporales			
Family Tetrasporaceae			
Genus Tetraspora			
Species lubrica (Roth) C. Agardh	++	+	-
Family Hydrodictyaceae			
Genus Tetraedron			
Species bifurcatum (Wille) Lagerh.	+	++	-
Genus Pediastrum			
Species tetras (C. Ehrenb.) Ralfs	-	+	++

Family Oocystaceae			
Genus <i>Oocystis</i>			
Species <i>O.pusilla</i> Hansgirg	+	-	-
Species <i>O.elliptica</i> W.West	+	+++	-
Genus <i>Gloeotaenium</i>			
Species <i>loitelsbergianum</i> Kants	+	-	-
Order Sphaeropleales			
Family Radiococcaceae			
Genus <i>Coenochloris</i>			
Species <i>polycocca</i> (Kors.) Hind	-	-	+
Family Selenastraceae			
Genus <i>Kirchnerella</i>			
Species <i>lunaris</i> (Kirchh.) K. Moebius	-	+	-
Genus <i>Ankistrodesmus</i>			
Species <i>densus</i> Kors.	-	++	-
Order Chaetophorales			
Family Chaetophoraceae			
Genus <i>Stigeoclonium</i>			
Species <i>polymorphum</i> (Franke) Heering	+	+++	-
Genus <i>Coleocete</i>			
Species <i>orbicularis</i> Pringsheim	-	-	++
Order Cladophorales			
Family Cladophoraceae			
Genus <i>Pithophora</i>			
Species <i>mooreana</i> Collins	+++	+	+
Order Oedogoniales			
Family Oedogoniaceae			
Genus <i>Oedogonium</i>			
Species <i>globosum</i> Wordst	+++	+	+
Order Zygnematales			
Family Zygnemataceae			
Genus <i>Spirogyra</i>			
Species <i>setiformis</i> (Roth) Kutzing	+++	+++	++
Order Desmidiiales			
Family Gonatozygaceae			
Genus <i>Gonatozygon</i>			
Species <i>G.monotaenium</i> De Bary	++	-	-
 <i>G. aculeatum</i> Hastings	+	-	+

Family Desmidiaceae			
Genus Pleurotaenium			
Species ehrenbergii (Breb. Ex Ralfs) Delponte	+	-	+
Genus Spondylosium			
Species S. nitens (G.W. Wall.) W. Archer	++	+	-
<i>S. Planum</i> (Walle) W. And G.S. West	+	++	-
<i>S.excalatum</i> Ralfs W. And G.S. West	++	-	+
Genus Closterium			
Species lunula (Mull.) Nitzsch.	+	-	++
Genus Staurastrum			
Species S. furcatum (Ehr.) Breb.	-	-	++
<i>S.nonanum</i> Turner	-	++	-
<i>S. pseudotetrecerum</i> (Nordst.) West and G.S. West	++	-	+
<i>S.corniculatum</i> P. Lundell	+	-	+
<i>S.tohopekaligense</i> Wolle	++	-	-
Genus - Cosmarium			
Species- C. Aequale (Turner)	-	++	-
<i>C. Apertum</i> Turner	+++	-	++
<i>C. cucurbitanum</i> (Bisset)	+	-	-
<i>C. holmiense</i> E.E. Lund	++	-	+
<i>C. lapponicum</i> Borge	+++	++	-
<i>C. leave</i> Rabenh.	++	+	-
<i>C. margaritatum</i> (Lund) Roy and Biss	+	-	+
<i>C. octihods</i> Nordst	++	+	+
<i>C. pachydermum</i> E.E. Lund	-	++	-
<i>C. phaseoles</i> Breb.	++	-	-
<i>C. Portianum</i> Archer	+	-	-
<i>C. pulchellum</i> Breb.	+++	+	-
<i>C. Punctulatum</i> Breb.	-	-	++
<i>C. pseudogramatum</i> Nordst.	++	++	-
<i>C. staurochondrum</i> A. Lem.	-	-	+++
<i>C. trilobulatum</i> Reinsch	++	-	-
Genus Arthrodesmus			
Species convergens e C. Ehrenb.	+	-	++
Genus Euastrum			
Species spinulosum Delponte	+	++	+
Class Bacillariophyceae			
Order Bacillariales			
Family Achnanthaceae			
Genus Pinnularia			
Species appendiculata (C. Agardh) A.Cleve	-	+++	-

Order Melosirales			
Family Melosiraceae			
Genus <i>Melosira</i>			
Species <i>granulate</i> (C. Ehrenb.) Ralfs	++	-	++
Order Naviculales			
Family Diploneidaceae			
Genus <i>Diploneis</i>			
Species <i>elliptica</i> (Kutzing) A.Cleve	+	-	++

Frequency status- Dominant(+++), Common (++) , Rare (+), Absent (-)



Map showing Ranchi in Jharkhand and Jharkhand in India

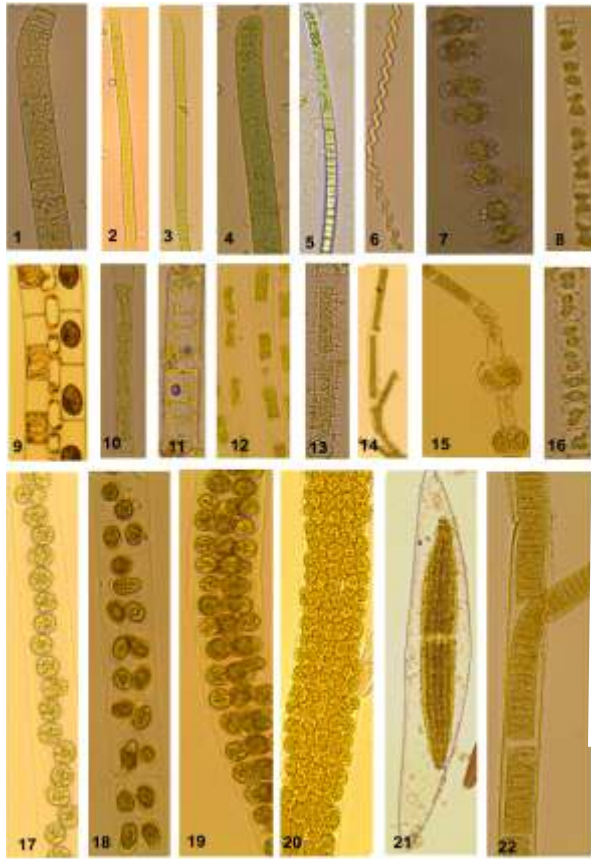


Plate-1 (Figures 1-22)

1. *Oscillatoria curviceps* C.A. Agardh
- 2,3. *O. tenuis* (C.A. Agardh)
4. *O. limosa* (Roth) C.A. Agardh
5. *O. acuta* Bruhl et Biswas
6. *Spirulina meneghiniana* Zanard
7. *Spondylosium nitens* (G.W. Wall.) W. Archer
8. *Spondylosium planum* (Walle) W. and G.S. West
9. *Spirogyra setiformis* (Roth) Kutzing
10. *Gonatozygon monotaenium* De Bary
11. *Melosira granulata* (Ehr.) Ralfs
12. *Rhizoclonium heiroglyphicum* (C.A. Agardh) Kuetzing
13. *Gonatozygon aculeatum* Hastings
14. *Pithophora mooreana* Collins
15. *Oedogonium globosum* Wordst
16. *Spondylosium exalatum* Ralfs W. and G.S. West
- 17,18,19,20. *Palmodictyon viride* Kutzing
21. *Closterium lunula* (Mull.) Nitzsch.
22. *Plectonema wollei* Farlow

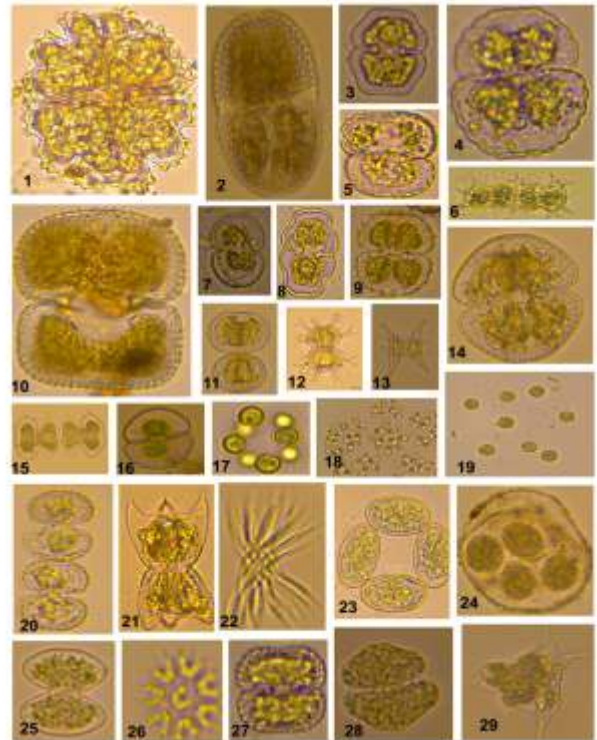


Plate-2 (Figures 1-29)

1. *Euastrum spinulosum* Delponte
2. *Cosmarium cucurbitanum* (Bisset) Lutkemuller
3. *Cosmarium trilobulatum* Reinsch
4. *Cosmarium Ochthods* Nordst
5. *Cosmarium pulchellum* Breb.
6. *Staurastrum furcatum* (Ehr.) Breb.
7. *Cosmarium leave* Rabenh.
8. *Cosmarium holmiense* E.E. Lund
9. *Cosmarium staurachondrum* A. Lem.
10. *Cosmarium margaritatum* (Lund) Roy & Biss
11. *Cosmarium lapponicum* Borge
12. *Staurastrum nonanum* Turner
13. *Staurastrum pseudotetracerum* (Nordst.) West & G.S. West
14. *Cosmarium pachydermum* E.E. Lund
15. *Arthrodesmus convergens* Ehr.
16. *Cosmarium phaseoles* Breb.
17. *Coenochloris polycocca* (Kors.) Hind
18. *Tetraspora lubrica* (Roth) C.A. Agardh
19. *Asterococcus limenticus* G. M. Smith
20. *Cosmarium portianum* Archer
21. *Staurastrum corniculatum* P. Lundell
22. *Ankistrodesmus densus* Kors.
23. *Oocystis pusilla* Hansgirg
24. *Gloeotaenium loitelsbergianum* Kanss
25. *Cosmarium apertum* Turner
26. *Pediastrum tetras* (Ehrenb.) Ralfs
27. *Cosmarium punctulatum* Breb.
28. *Cosmarium aequale* (Turner)
29. *Tetraedron bifurcatum* (Wille) Lagerh.)

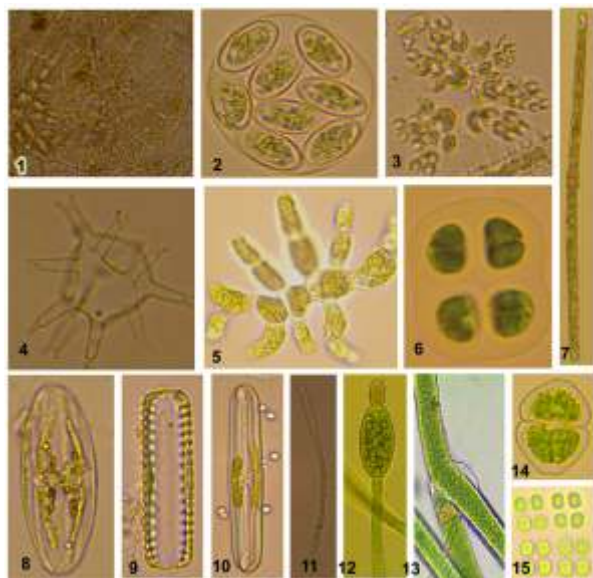


Plate-3 (Figures 1-15)

1. *Coleochaete orbicularis* Pringsheim
2. *Oocystis elliptica* W. West
3. *Kirchnerella lunaris* (Kirchh.) K. Moebius
4. *Staurastrum tohopekaligense* Wolle
5. *Stigeoclonium polymorphum* (Franke) Heering
6. *Chroococcus cohaerens* (Breb.) Nag.
7. *Pleurotaenium ehrenbergii* (Breb. ex Ralfs) Delponte
8. *Diploneis elliptica* (Kuetzing) Cleve
- 9,10. *Pinnularia appendiculata* (C.A. Agardh) Cleve
11. *Anabaena constricta* (Szafer) Geitler
12. *Cylindrocystis majus* Kutzing
13. *Tolypothrix distorta* Kutzing
14. *Cosmarium pseudogranatum* Nordst.
15. *Merismopedia elegans* A. Braun in Kutzing

DISCUSSION

During the course of present investigation a total of 59 taxa of three different classes Cyanophyceae, Chlorophyceae and Bacillariophyceae have been identified on the basis of morpho-taxonomic observations (Table 1). They have been systematically arranged according to Fritsch (1935) except the order Conjugales which has been treated as the Zygnematales after Smith (1933). Class Chlorophyceae exhibited largest diversity with 46 species which belongs to 6 orders and 11 families. The order Desmidiaceae is represented maximum of 8 genera and 30

species. Second dominant class was Cyanophyceae with 11 taxa belonging to 2 orders and 4 families. Least dominant class was Bacillariophyceae with 3 taxa.

Due to ever increasing population growth, urbanisation and industrialization, natural habitats of fresh water algae are getting disturbed and many water bodies are disappearing too. Because of that many important algal species are getting extinct. This is an alarming signal not only to conserve our precious water bodies along with that the precious flora and fauna too. Developing algal floristic baseline data not only gives the presence of algal population but also helpful for the future environmental monitoring studies.

The authors are thankful to the Director, CSIR-National Botanical Research Institute, Lucknow, India for his constant encouragement and laboratory facilities.

REFERENCES

- Arundhati M & Kargupta A 2009 Cyanophytes of Damodar River, Jharkhand, India. *An international Journal of Plant Research* **22**(2)71-74.
- Amit K & Radha S 2012 Ecological studies of cyanobacteria in sewage pond of H.E.C. industrial area, Ranchi india. *Bioscience Discovery* **3**(1)73-78.
- Arpana S & Radha S 2009 Phycodiversity in tenughat thermal power station at Lalpania District Bokaro, Jharkhand. *Asian Journal of Environmental Science* **3**(2)169-173.
- Bohra C & Kumar A 2004 Plankton diversity in the Wetland of Jharkhand In: *Biodiversity and Environment*. APH Publishing corporation. Pp.91-123.
- Fritsch F E 1935 *The structure and reproduction of the Algae*, Vol.1, Cambridge Univ. Press, London, pp.791.
- Guru SD 2007 A comparative study of the species richness and diversity of chlorophycean assemblage of two city based polluted tanks of Ranchi. *Biospectra* **2**(2) 343-345.
- Guru SD 2007 Distribution and biodiversity of desmids in a freshwater lake of Ranchi. *Vegetos* **20** (2)81-85.
- Guru SD & Kumar 2012 Phytoplanktonic community status in a freshwater shallow lake of Ranchi. *J. Indian bot.Soc.* **91**(1-3)230-235.
- Desikachary TV 1959 *Cyanophyta*. I.C.A.R. Monograph on Blue-green algae, New Delhi.
- Gouri S 2009. Water quality and the algal flora of river Roro, Chaibasa, Jharkhand. *Journal of Ecobiology* **25**(4) 397-399.
- Mehta S & Sahu R 2010 Morphotaxonomical studies on

diversified algal community from Swarnrekha river at Namkum, Ranchi, Jharkhand. *Asian Journal of Environmental Science* **5**(2) 181-184.
Prescott GW 1951 *Algae of the western great lakes area*. Wm. C. Brown Co. Publishers, Dubuque Iowa, pp.977.
Scott AM & Prescott GW 1961 Indonesian Desmids. *Hydrobiologia* **17** 1-132.

Smith GM 1933-1950 *The freshwater algae of United States* (2nd ed.), New York, London, pp.719f.559.
Tiffany LH & Britton ME 1952 *Monograph on the algae of Illinois*, The University of Chicago press Pp.407.