DIVERSITY OF DESMIDS FROM FRESHWATER BODIES OF KOHIMA DISTRICT, NAGALAND, INDIA

KEVIPHRUONUO KUOTSU AND S.K. CHATURVEDI

Department of Botany, Nagaland University, Hqrs- Lumami, 798627
E-mail: keviphruonuo@gmail.com, sunchat1@rediffmail.com

Date of online publication: 31st December 2020
DOI:10.5958/2455-7218.2020.00035.2

Kohima district is located between 25°24’N-25°99’N latitude and 94°01’E-94°29’E longitude. It has a hilly landscape with an average elevation of 1261 m and an area of 1,595 sq. km. Out of these, 7 species belong to genus Cosmarium (C. anceps, C. blytii, C. botrytis, C. contractum var rotundatum C. crenatum, C. holmiense var hibernicum and C. ornatum), 5 species of Closterium (C. acerosum var minus, C. dianae, C. ehrenbergiiii, C. idiosporum and C. moniliferum) and one species each from Actinotaenium silvae-nigra, Acutodesmus acuminatus, Coelastrum sphaericum, Eaustrum sublobatum, Hyalotheca dissiliens, Netrium digitus, Spirotaenia condensata and Staurastrum punctulatum. Out of these 20 species, one species i.e., Acutodesmus acuminatus has already been reported in Nagaland, Actinotaenium silvae-nigra is a new record for India and the remaining species are first reports for Nagaland.

Key Words: Desmids, cells, freshwater, Kohima

Kohima district is located between 25°00’N-25°99’N latitude and 94°01’E-94°29’E longitude. It has a hilly landscape with an average elevation of 1261 m and an area of 1,595 sq. km. Out of these, 7 species belong to genus Cosmarium (C. anceps, C. blytii, C. botrytis, C. contractum var rotundatum C. crenatum, C. holmiense var hibernicum and C. ornatum), 5 species of Closterium (C. acerosum var minus, C. dianae, C. ehrenbergiiii, C. idiosporum and C. moniliferum) and one species each from Actinotaenium silvae-nigra, Acutodesmus acuminatus, Coelastrum sphaericum, Eaustrum sublobatum, Hyalotheca dissiliens, Netrium digitus, Spirotaenia condensata and Staurastrum punctulatum. Out of these 20 species, one species i.e., Acutodesmus acuminatus has already been reported in Nagaland, Actinotaenium silvae-nigra is a new record for India and the remaining species are first reports for Nagaland.

RESULTS AND DISCUSSIONS

A detailed study on the morphological characters i.e. cell size, shape, ornamentation, shape, arrangement of the chloroplast, number and arrangement of pyrenoids were studied and the taxonomic identification had been made along with a table of the distribution of these taxa.

Annotation:
Class: Chlorophyceae
Order: Sphaeropleales
Family: Scenedesmaceae
Genus: Acutodesmus (Hedgewald) Tsarenko 2001
Acutodesmus acuminatus (Lagerheim) P.M. Tsarenko and Petlovanny (Plate-1, Figure-15)

Coenobia 4 celled, outer cell crescent shape having pointed ends, 15 µm long and 3 µm wide.
Locality: Jakhama, Kohima district, Nagaland
GPS coordinates: 24˚35'06.8” N, 94˚08'03.2” E
Habitat: Constructed pond
Collection number: KVP-259, BOT NU
Date of collection: 12-07-2018

Genus: Coelastrum Nageli 1849
Coelastrum sphaericum Nageli (Figure-9)
Colonies spherical with empty spaces and compose of conical cells with pointed end protruding towards outside, Cells 13 µm in diameter and arranged in a single layer.
Locality: Tseminyu, Kohima district, Nagaland
GPS coordinates: 25˚55'10.8” N, 94˚13'12.2” E
Habitat: Fish pond
Collection number: KVP-261, BOT NU
Date of collection: 15-07-2019

Class: Zyggnematophyceae
Order: Desmidiales
Family: Desmidiaceae
Genus: Actinotaenium (Nageli) Teiling 1954
Actinotaenium silvae-nigrae (Rabanus) Kouwets and Coesel (Plate 1, Figure-8)

Cells cylindrical with broadly rounded apex, cells 44 µm long and 15 µm wide, constriction of cell not visible, Cell wall smooth, asteroid chloroplast.
Locality: Dziikou valley, Kohima district, Nagaland
GPS coordinates: 25˚35'13.4” N, 94˚02'50.0” E
Habitat: Moist cave wall
Collection number: KVP-263, BOT NU
Date of collection: 20-09-2018

Genus: Cosmarium Corda ex Ralfs 1848
Cosmarium anceps P.Lundell (Plate 1, Figure-1)
Cells longer than breadth, 26 µm long and 13 µm, sinus open, Isthmus 10 µm, semi cells trapezium shape with slight constriction at the apices of the cells. Cell wall smooth and the sides are slightly concave.
Locality: Jakham, Kohima district, Nagaland
GPS coordinates: 25˚35'07.5” N, 94˚07'13.4” E
Habitat: Pond
Collection number: KVP-253, BOT NU
Date of collection: 12-07-2018

Cosmarium blytii Wille (Plate 1, Figure-5)
Cells 25 µm long and 18 µm wide. Semi cells sub- semicircular in shape with truncate apex. Sinus deep, linear and closed for most parts and lateral margins of the semi cells with 4 crenates each µ.
Locality: Khuzama & Jakhama, Kohima district, Nagaland
GPS coordinates: 25˚25'20.2” N, 94˚08'24.9” E; 25˚35'07.5” N, 94˚07'13.4” E
Habitat: Fish pond; temporary pool
Collection number: KVP-208, BOT NU; KVP-233, BOT NU
Date of collection: 24-04-2018, 21-04-2018

Cosmarium botrytis Meneghini ex Ralfs (Plate 1, Figure-2)
Cells 107 µm long and 68 µm wide, semi cells oval pyramidal shape with convex apex, sinus deep, linear and open towards outside cell wall granulated throughout the cells with about 30 granules around each semi cells.
Locality: Khuzama, Jakhama & New Teroguuyu, Kohima district, Nagaland
GPS coordinates: 25˚31'46.0” N, 94˚07'46.0” E; 25˚35'05.8” N, 94˚07'02.0” E; 25˚52'49.9” N, 94˚11'04.4” E
Habitat: Temporary pool; Rice field; Pond
Collection number: KVP- 233, BOT NU; KVP-255, BOT NU; KVP-282, BOT NU
Date of collection: 07-07-2018; 12-07-2018; 19-02-2019

Cosmarium contractum var rotundatum O.
**Borge (Plate 1, Figure-3)**
Cells 32 µm long and 20 µm in wide, sinus deep and Isthmus 13 µm wide semi cells circular in shape with smooth walls.
Locality: Tseminyu, Kohima district, Nagaland
GPS coordinates: 25°55'20.4” N, 94°13'07.9” E
Habitat: Fish pond
Collection number: KVP-285, BOT NU
Date of collection: 19-02-2019

**Cosmarium crenatum**
Ralfs ex Ralfs (Plate 1, Figure-7)
Cells 30 µm long and 22 µm wide, semi cells rectangular pyramidal shape with 4 crenates in lateral side of each cells, size of the crenate increases as we move towards the apex, sinus slightly open and shallow, Isthmus 8 µm wide.
Locality: Jakhama & Dzükou valley, Kohima district, Nagaland
GPS coordinates: 25°35'05.8” N, 94°07'02.0” E; 25°33'13.4” N, 94°03'54.8” E
Habitat: Stream; stagnant pool
Collection number: KVP-255, BOT NU; KVP-297,BOT NU,
Date of collection: 12-07-2018; 04-04-2019

**Cosmarium holmiense var. hibernicum**
(West) Schmidle (Plate 1, Figure-4)
Cells 46 µm long and 26 µm wide, semi cells trapezoid in shape with lateral sides of the semi cells slightly convex, sinus moderately deep and Isthmus 11 µm wide, cell wall smooth.
Locality: Jakhama, Kohima district, Nagaland
GPS coordinates: 25°35'05.8” N, 94°07'02.0” E;
Habitat: Pond
Collection number: KVP-255, BOT NU
Date of collection: 12-07-2018

**Cosmarium ornatum**
Ralfs ex Ralf (Plate 1, Figure-6)
Cells granulated almost as long as wide, 27 µm long and 24 µm wide, semi cells kidney shaped, sinus deeply constricted, linear and opening on the inside, Isthmus 5 µm wide.
Locality: Rüsoma, Kohima district, Nagaland
GPS: coordinate: 25°45'11.0”N, 94°10'51.0”E
Habitat: Dzü-ü river
Collection number: KVP-270, BOT NU
Date of collection: 31-01-2019

**Genus: Euastrum Ehrenberg ex Ralfs 1848**
**Euastrum sublobatum**
Brebiisson ex Ralfs (Plate 1, Figure-16)
Cells 18 µm long and 13 µm wide, pyramidal shape with flattened apices which is slightly constricted, lateral side of the semi cells lobed, sinus deep and wide, 1 chloroplast in each semi cell.
Locality: Jakham, Kohima district, Nagaland
GPS coordinates: 25°35'07.5” N, 94°07'13.4” W
Habitat: Temporary pool
Collection number: KVP-253, BOT NU
Date of collection: 19-02-2019

**Genus: Hyalotheca Ehrenberg ex Ralf 1848**
**Hyalotheca dissiliens**
Brebiisson ex Ralf (Plate 1, Figure-10)
Each cells appox 19 µm long and 31 µm wide, cylindrical shape, lateral side of the cell have medium constriction of 29 µm wide. Mucilaginous sheath that covers the cell is almost half the size of the cell.
Locality: Dzüleke & Kigwema, Kohima district, Nagaland
GPS coordinates: 25°62'95.0” N, 94°01'18.7” E; 25°35'07.5” N, 94°07'03.4” E
Habitat: Pond; stream
Collection number: KVP-164, BOT NU; KVP-176, BOT NU
Date of collection: 24-01-2018; 29-01-2018

**Genus: Staurastrum Meyen ex Ralfs 1848**
**Staurastrum punctulatum**
Brebiisson (Plate 1. Figure-11)
Cells hourglass shape, 38 µm long and 30 µm wide, sinus deep and wide constriction, semi cells ellipsoidal shape, isthmus 12 µm wide.
Locality: Dzüleke, Kohima district, Nagaland
GPS coordinates: 25°35'06.8” N, 94°08'03.2” E
Habitat: Roadside pool
Collection number: KVP-169, BOT NU
Date of collection: 24-01-2018

**Family: Closteriaceae**
**Genus: Closterium Nitzsch ex Ralf 1848**
**Closterium acerosum var minus**
Hantzsch
**Closterium idiosporum West & G.S.West** (Plate 1, Figure-19)

Cells elongated spindle shape and slightly curved and tapering towards the apices, 213 µm long and 7 µm wide, pyrenoids scattered along the cell, cell wall smooth.

**Locality:** Tuophema & Meriema, Kohima district, Nagaland

GPS coordinates: 25°84'77.5” N, 94°19'23.8” E; 25°71'40.5” N, 94°09'56.4” E

**Habitat:** Roadside pool; stream

**Collection number:** KVP-175, BOT NU; KVP-20193, BOT NU

**Date of collection:** 14-03-2018; 02-02-2019

---

**Family: Mesotaeniaceae**

**Genus:** *Netrium* (Nageli) Itzigsohn and Rothe 1856

*N. digitus* (Brebiisson ex Ralf) Itzigsohn and Rothe (Plate 1, Figure-12)

Cells broad, oblong elliptical shape, slight tapering towards the apex which is rounded and 18 µm in size, cells 190 µm long and 52 µm wide, cell wall smooth, 2 axial and radiating chloroplast are present.

**Locality:** Jakham, Kohima district, Nagaland

GPS coordinates: 25°35'05.0” N, 94°07'02.0” E
Habitat: Small stream  
Collection number: KVP-255, BOT NU  
Date of collection: 13-07-2018  

**Genus: Spirotaenia Brebisson 1848**  
* Spirotaenia condensata Brebisson (Plate 1, Figure-17)  

Cells elongated, cylindrical with slight tapering at the end, apex broadly rounded, cells 159 µm long and 17 wide, chloroplast parietal, arranged with 11 turns, many pyrenoids scattered along the length of the cells, cell wall smooth.  
Locality: Dzüleke, Kohima district, Nagaland  

**SUMMARY AND CONCLUSIONS**  
The paper records 20 species of desmids belonging to 4 families viz., Scenedesmaceae, Desmidiaceae, Closteriaceae, Mesotaeniaceae and 10 genera viz., *Cosmarium, Closterium, Actinotaenium, Acutodesmus, Coelastrum, Eaustrum, Hyalotheca, Spirotaenia*, *Staurastrum*, *Netrium*.  

**Table 1: Distribution of desmids in different water bodies of Kohima district, Nagaland**  

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Organisms</th>
<th>Localities</th>
<th>Pond</th>
<th>Temporary/ stagnant pools</th>
<th>Streams</th>
<th>River</th>
<th>Rice field</th>
<th>Moist cave wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actinotaenium silvae-nigrae</td>
<td>Dzükou valley</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Acutodesmus acuminatus</td>
<td>Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Closterium acerosum var minus</td>
<td>Kohima &amp; Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Closterium dianae</td>
<td>Tuohema &amp; Rüsoma</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Closterium ehrenbergii</td>
<td>Khonoma &amp; Meriema</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Closterium idiosporum</td>
<td>Tuophema &amp; Meriema</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Closterium moniliferum</td>
<td>Jakhama &amp; Peducha</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Coelastrum sphaericum</td>
<td>Tseminyu</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cosmarium anceps</td>
<td>Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Cosmarium blytii</td>
<td>Khuzama &amp; Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Cosmarium botrytis</td>
<td>Khuzama, Jakhama &amp; New Terogunyu</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cosmarium contractum var rotundatum</td>
<td>Tseminyu</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Cosmarium crenatum</td>
<td>Jakhama &amp; Dzükou valley</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Cosmarium holmiense var hibernicum</td>
<td>Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Cosmarium ornatum</td>
<td>Rüsoma</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Euastrum sublobatum</td>
<td>Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Hyalotheca dissiliens</td>
<td>Dzüleke &amp; Kigwema</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Netrium digitus</td>
<td>Jakhama</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Spirotaenia condensata</td>
<td>Dzüleke</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Staurastrum punctulatum</td>
<td>Dzüleke</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Spirotaenia and Staurastrum. Majority of the species identified belongs to genus Cosmarium, viz., C. anceps, C. blyti, C. botrytis, C. contractum var rotundatum, C. crenatum, C. holmiense var hibernicum and C. ornatum followed by Closterium viz., C. acerosum var minus, C. dianae, C. ehrenbergiiii, C. idiosporum and C. moniliferum and one species each have been reported from Actinotaenium silvae-nigra, Acutodesmus acuminatus, Coelastrum sphaericum, Euastrum sublobatum, Hyalotheca dissiliens, Spirotaenia condensata and Staurastrum punctulatum. Out of the different water bodies that were surveyed,
desmids were found to be mostly distributed in ponds followed by temporary pools/stagnant water. The present study is a first for diversity study of algae of Kohima District, Nagaland. Out of the 20 algal species reported, *Acutodesmus acuminatus* is already reported in Nagaland, 18 algal species are first records for Nagaland and *Actinataenium silvae-nigrae* collected from the moist cave wall of Dzükou valley, Kohima district, Nagaland is a first report for India.

Nagaland comes under the Indo-Burma Biodiversity hotspot region and have rich flora, however, very few works on the study of algae has been done and majority of the area is still unexplored thus providing huge scope for algal studies.

The authors are thankful to the Head, Department of Botany for providing all the laboratory facilities. Authors also acknowledge the help of rendered by Algal Ecology Lab, NEHU, Shillong. Our gratitude is also accorded to the UGC. Non-NET, New Delhi to one of the authors for financial assistance during the present investigation (author K.K)

REFERENCES


Hirano M 1992 Contributions from the Biological Laboratory, Kyoto University: Desmids from Thailand and Malaysia. *Kyoto University Research Information Repository* 1-150.


Prescott G 1951 *Algae of the Western Great Lakes Area*. Cranbook Institute of Science, Boomfield Hills, Detroit, Michigan.


Singh N I, Dorycanta H, Devi G A, Singh NS and Singh MS 1997 Blue green algae from rice field soils of Nagaland *Phykos* 36 115 – 120.


