Studies on Algal diversity of Kohima district, Nagaland

By

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DEPARTMENT OF BOTANY

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DECLARATION

I, Ms. Keviphruonuo Kuotsu bearing Ph. D. Registration No. 779/2017 (w.e.f 26/07/2016) hereby declare that the subject matter of my Ph. D. thesis entitled 'Algal Diversity of Kohima District, Nagaland' is the record of original work done by me, and that the contents of this thesis did not form the basis for award of any degree to me or to anybody else to the best of my knowledge. This thesis has not been submitted by me for any Research Degree in any other University/ Institute.

This is further certified that the Ph. D. thesis is submitted in compliance with the UGC Regulation 2016 dated May 05, 2016 (Minimum Standard and Procedure for award of M. Phil. /Ph. D. Degree). It is certified that the content of the thesis is checked for 'Plagiarism' with licensed software 'Urkund' and satisfies with the norms of 'University Grants Commission, Govt. of India'. This thesis is being submitted to the degree of 'Doctor of Philosophy in Botany'.

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Subject(s)/Paper(s)	Max. Marks	Minimun Qualifying Marks	Marks Secured
Paper No. B.Ph.D -1 Research Methodology	100	35	77
Paper No. B.Ph.D -02 Elective Paper	100	35	79
Paper No. B.Ph.D -03 Review of literature, Report Writing & Seminar	100	35	84
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Result	Division	Percentage
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Abbreviations

Abbreviations	**Expanded form**
^0C	Degree Celsius
%	Percentage
P	Ponds
CP	Constructed Pond/ Water tanks
RF	Rice fields and fish ponds
TP	Temporary pools
DS	Depression spring
R	River
ST	Stream/ small water spring
D	Drain
MR	Moist rocks/walls/caves
MS	Moist soil
Cyano	Cyanophyceae
Bacci	Bacciliriophyceae
Cosci	Coscinodiscophyceae
Xantho	Xanthophycea
Zygne	Zygnematophyceae
Chloro	Chlorophyceae
Treubo	Treubouxiephyceae
Ulvo	Ulvophyceae

Glauco	Glaucophyceae
Flori	Florideophyceae
Eugle	Euglenophyceae
µM	Micro meter
Sp.	Species
Masl	Meter above sea level
Fig.	Figure

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Abstract

Algae are a diverse group of organisms that are distributed in varied habitat since it can grow in areas where light and moisture is available. Majority of the algae are aquatic, their diversity being highest in freshwater bodies. Algae are known for their ecological importance, source of pharmaceutical and nutritional human food, animal fodder, bio-fertilizer, sustainable bio-fuel production, bio-indicators of environmental conditions in water bodies and countless future prospects. The present research was taken up to study the algal diversity of the mountainous terrains and plains of Kohima district, Nagaland at varying altitude. Algal samples from various aquatic and terrestrial habitats of Kohima was carried out during the period of October, 2017 to April, 2019 covering the seasons of spring, summer, autumn and winter. Only a few phycology studies were conducted in few locations in Nagaland while Kohima district is still untouched. The area has rich vegetation due to its favourable climatic conditions, geographical location and many parts of the area have primary forest unaffected by development. The prime aim of this research is to document the algal species and check their species richness. Also keeping in mind the importance of algae in taxonomy research and it being the base of most biological scientific studies the aforementioned topic was taken up. The algae were randomly sampled from aquatic and terrestrial habitats. Samples were picked by hand, twigs, scrapped with forceps or brush, some were directly collected into sample bottles while some algae were collected by squeezing aquatic plants, submerged leaves, plastics etc. Formalin (4%) was used to preserve the sample and further stored at 4˚c for preservating the delicate algal samples. The collected samples were than orderly observed and photographed under Motic BA-210 and Euromex light microscope. Latter, the clear distinctly observable photographed samples were identified following standard literatures-monograph and systematically arranged following Guiry and Guiry (2021).

An absolute total of 331 algal taxa belonging to 117 genera, 71 families, 38 orders and 14 classes were recorded from Kohima district. The Largest representation was from the Class Baccillariophyceae, followed by Cyanophyceae, Zygnematophyceae, Chlorophyceae, Trebouxiophyceae, Ulvophyceae, Xanthophyceae, Euglenophyceae, Charophyceae, Klebsormidiophyceae, Coscinodiscophyceae, Gaucophyceae and Florideophyceae. The dominating genera are *Cosmarium* (15), *Spirogyra* and *Oscillatoria* (13 each), *Closterium,* and *Pinnularia* (12) and *Navicula* (11). In most of the habitat (Constructed pond, Pond, Rice fiels/ fish pond, River, Streams/ water springs, Depression spring), Bacillariophyceae was prominently dominant and in other habitats: Moist soil, moist rocks/walls/caves and drains, the class Cyanophyceae was dominant while in Temporary pools, Zygnematophyceae was dominant. Seasonally, the algal class Bacillariophyceae showed high dominance in its distribution along various altitudinal range (600-2600 masl). The recorded algal taxa *Actinotaenium silvae-nigrae* belonging to class Zygnematophyceae sampled from a moist cave of Dziikou valley which is located at 2452 masl was the first report for India. The phycology study conducted elucidated a rich source of algal taxa distribution in the hilly region of Kohima. The documentation followed by identification of the algal species provides a database that will comprehensively depicts the succinct way of evaluating their diverse nature by providing knowledge to researchers working in this field. This research will significantly proof helpful as it inductively reasons with the ecological status of Nagaland by imparting ideas of algal habitat in various region that was once unexplored. Some economically important algal species were also documented such as *Spirogyra, Chlorella* which known for their nutritional values*, Nostoc* and *Cylindrospermum* for manufacturing biofertilizers, *Cladophora* for its anti microbial. Algae like *Spirogyra* and *Chlorella* found in the study have emerged to be potentially useful in scientific models and space research. These attributes of algae raised sustainable developmental strategies for future perspectives to scientist and researchers. On local ground, the resources derived from these species will bring possibilities of marketing to tribal inhabitants and promote self-sustenance. Overall, the meticulous study would initiate necessary steps by inculcating the positive prospects of algae in North East India and the Indo Myanmar hotspot region as a whole.

Chapter-1: Introduction and Review of literature

1.1 Introduction

Describing algae remains a challenge for phycologist due to their varying nature and characteristics. According to Fritsch (1935), algae include all halophytic organisms that fail to reach the level of differentiation characteristic of archegoniate plants. Smith (1950) described algae as 'Simple plants with autotrophic mode of nutrition'. Chapman (1962) defined algae (seaweeds of the seashore and green skeins in stagnant fresh water, ponds and pools) as among the simplest in the plant kingdom. Prescott (1962) explained that 'the algae are those chlorophyll bearing organisms (and their colourless derivatives) which are thalloid i.e., having no roots, stems and leaves or leaf like organs'. Algae are indeed a highly diverse group of organism, from their thallus structure and organisation to their size, shape, nutrition, reserve food, reproduction and pigment content, algae shows great variations and is distinguished accordingly. Algae can either be single-celled like *Phacus*, colonial like *Volvox*, filamentous like *Spirogyra* or large multicellular organisms like *Sargassum.* They are mostly autotrophic organism; however, heterotrophic forms like *Heligosporidium* and mixtrophic form like *Euglena* are also present. Majority of the algae are aquatic where they form the basis of food chain. Leith and Whittaker (1975) stated that algae are the dominant primary producer and contribute nearly 14% of the total global productivity.

Till date, the information regarding the number of algal taxa remains elusive. Algaebase have processed more than 50,000 algal species (www.algaebase.org) for algal studies. Guiry (2012) estimated that the number of algae may range from 30,000 to about 1 million species. Hasle and Syvertsen (1997) also estimated that the number of diatoms alone may range from 60,000 to 600,000 species. New species of algae are discovered every now and then, while many still remains unexplored.

Propitious habitat of light and moisture allows algae to flourish widely in nature. Majority of the algae thrives in aquatic habitat; their diversity recorded highest from freshwater bodies. Freshwater can be divided into lentic and lotic water system. Lentic water systems are standing water which include lakes, ponds, wetlands, water tanks, ditches, temporary and permanent pool, reservoirs etc and lotic water systems are moving water like streams, rivers, springs, channels and drains. Depending upon their type of habitat, various algal taxa can broadly be classified as follows:-

Lithophytes

1. Aquatic algae/ Hydrophytes: Majority of the algae are aquatic, their diversity being highest in freshwater bodies. They may occur free floating or attached to rocks, sand and other plants or animals. The algal species that grow at the bottom of the water are known as **Benthophytes/ Benthic algae** and they are found attached to subtracts growing approx. about 40 m deep e.g. *Chara* and benthic diatoms. **Planktophytes/ Phytoplankton** are those algae that are found free floating in the water such as *Scenedesmus, Volvox* etc. Some phytoplanktons initially remain attached to various substrates at the beginning of their life cycle but later become free floating as in *Oedogonium, Zygnema* etc. Some algae like *Rhizoclonium, Mougeotia* etc are found growing attached to larger plants or other algae that are submerged inside water bodies while some grow attached to animals such as turtle, snails, fishes etc. e.g *Cladophora*. They are called epiphytes and Epizoophytes respectively. Aquatic algae can be divided according to the type of water where they occur.

a. Brackish Water Algae- Algae that grows in brackish water, e.g. *Oscillatoria*

b. Marine Algae- Algae that grows in sea water and oceans, e.g. *Gracillaria*

c. Freshwater Algae- Algae that are found frowning in freshwater habitat like rivers, streams, wetlands, lakes, ponds, tanks, ditches, temporary and permanent pool, reservoirs etc. e.g. *Spirogyra*

2. **Terrestrial Algae:** These algae are found growing inside the soil and well aerated moist fertile soil. e.g., *Nostoc.* Algae growing on the soil surface are described as saphophytes or epiterranean algae and those growing inside the soil are called cryptophytes or subterranean algae.

3. Aerial and Sub-aerial Algae: Algae are found growing above soil level on tree trunks, leaves of plants, attached to animals, moist walls, rocks etc. e.g., *Trentopohlia.*

4. Specialized Habitats Algae: Many taxa of algae have been reported from some extreme habitats and they are known as follows-

a. **Thermophytes**- These algae are found in hot springs and thermal pools; they are blue green algae and can survive up to 85ºC, e.g., *Oscillatoria*, *Synechococcus*.

b. Cryophytes (Polar Region Algae) - Those algal species like *Chlamydomonas, Scottiella*, *Nostoc* etc which are found in the ice and snow of Northern and southern Polar Regions. These algal forms causes red snow, green snow, yellow snow, yellowish green snow and violet snow colours to the mountains (Hoham and Remias 2020).

c. **Endophytic Algae** - Some algae are found growing inside the tissues or cell of other plants, e.g., *Nostoc* grows within the thallus of Liverwort.

d. **Epizoic and Endozoic Algae**: Algae found growing in association with animals, e.g., C*hlorella* which is found within the tissue of *Hydra* and sponges and a green algae and *Trichophilus welckeri* which grows in the grooves and cracks of sloth hair which turns the fur green in colour.

e. **Symbiotic Algae**- Many green algae like *Trebouxia, Chlorella, Nostoc, Scytonema* and *Gloecopsa* are found in association with fungi forming Lichens and *Anabaena* in coralloid roots of Cycads.

f. **Parasitic algae**- Some green algae like *Cephaleuros virescens* causes the red rust of tea; *Cephaleuros coffea* is known to attack the leaf of coffee plant.

1.2 Economic Importance of algae

Algae can be considered as one of the most important group of organisms on our planet but they are usually one of the most misunderstood group of plants. Many consider them as nuisance while many remain oblivious to the importance of algae and our dependency on them. Chapman (2013) in his article '*Algae: the World's Most Important Plants - an Introduction*' wrote about the importance of algae from the ancient times to the future prospect of algae, highlighting the present use of this group of plant and its importance for our ecosystem, some of which are its photosynthetic abilities, as source of pharmaceutical and nutritional human food and animal fodder, bio-fertilizer in agriculture, active compounds, their diverse use in industries, sustainable bio-fuel production and so many more. Reynolds (1984) stated that about 70% of the total atmospheric oxygen is produced by algae. Algae as bioindicators of water quality status have received a lot of attention worldwide. Round (1981) considered the algae as one among the most widely used bio-indicators of water health Stoermer and Smol (1999) have stated that since algae grows quickly and have rapid response to environmental change, they can be used as bio-indicators of environmental conditions in water bodies. McCormick and Cairns (1994) noted that algae can be used as indicator of environmental change and ecosystem's health due to their many attributes like their ubiquitous distributions, their sensitivity to wide range of pollutants, their short life cycle, and their fast reaction to pollution which provides early information regarding the deteriorating water conditions. Algae are also known to control organic pollution in aquatic ecosystem and thus this potential ability of bioremediation of wastewater by these organisms are gaining focus. Kumari (1999) in his study has revealed the potential of blue green algae (BGA) to be used in reclamation of wasteland. The BGA are known for their nitrogen fixing ability where they act as a natural fertilizer. Many nitrogen fixing BGA are now being isolated and exploited for commercial production of bio-fertilizers.

1.3 Status of Algal Research

History of algal research is very old. Extensive studies have been undertaken in different parts of the world on algal diversity. Some works worthy to be noted are deliberated below:

International Status

According to the Royal Botanical Society, London, an unknown Englishmen collected the first alga, a diatom *Tabellaria flocullosa* (Round, 1981) while some other literatures cites that it was Anton Von Leewenhook who in 1674 collected the first algae (Randhawa, 1959). However it was only up till the 19^{th} century, biodiversity study of freshwater algae took plight and hence the algal genera described. Some of the earlier prominent workers were, Agardh (1820-24) who worked on Scandinavian algal flora, Hassal (1842-52) who studied the algal flora of Great Britain, Kuetzing (1834-1849) who was known to have described more number of algal genera than any other phycologists. West and West (1880-1920) who worked on countries like South Africa, Madagascar, West Indies, Egypt, Tanganyika, Victoria, Burma and India where they documented and discovered new algal species, Fritzsch (1907-1935) who documented many algae and also studied their life cycle and Fritsch and Rich (1923, 1929) also studied the freshwater algae of South Africa documenting many algal taxa. Prescott (1962) and Tiffany and Britton (1952) were also notable workers in the 20^{th} century. Wehr and Sheath (2002) documented more than 770 genera from America and John et al. (2002) documented more than 2200 species of freshwater algae from British Isles.

National Status

The earliest work on algae in India was mostly done by foreigners. Prasad and Mehrotra (1977) in his record of Algal floristic survey of India states that the first record of algal study in India was done by John Gerard Koenig in 1768 from Tranquebar, South India. Dicikie (1882) reported algae from the lakes and pools in Batong valley in Sikkim. West and West (1907) have documented 58 diatoms, 148 desmids and 53 bluegreen algae from Madras and Burma. Biswas (1949) in his manuscript documented some of the earliest worker in the field of algae in India some of whom were Belange who in 1836 collected sea weeds from South India and Jaimes Forbes Royle who in 1939 reported few algal species from Bengal. He also stated that William Griffith was known for his work on *Chara* sp., H. J. Carter who in 1858 reported few members of Volvocaceae and Flagelatta from Bombay, Dr. G. C. Wallich who in 1860 published his works on desmids from Bengal, Hobson in 1863 and Lagerheim in 1888 who recorded desmids from Bombay (now Mumbai) and Bengal respectively, Prof. W. B. Turner who in 1892 published a paper 'Algae aqua dulcis Indiae orientàlis' (Freshwater algae of East India). He also mentioned some notable pioneers like Dr. Nils Svedelius, Freeman, N. Svedelius and Nellie Carter.

Phycological studies were started by Indian workers from the first part of 20th century onwards. Ghose (1924, 1925, 1933, 1926) studied the blue-green algae from Lahore and Shimla, road slimes of Calcutta (now Kolkata), freshwater algae of India and flora of salt lakes in Calcutta (Kolkata). M.O.P. Iyengar, is known as 'Father of Indian Phycology', he along with his co-researchers Balakrishnan, Desikachary, Ramanathan, Dixit and Subramanian published numerous papers and established a number of new genera and species. Some of their works are Iyengar (1920, 1923, 1925, 1927, 1932a, 1932 b, 1933, 1973, 1981, 1985). Iyengar and Bai (1941) desmids of Kodaikanal, South India. Iyengar and Desikachary (1981) made some of their most notable works on freshwater Volvocales of South India. Iyengar and Venkataraman (1981) also studied diatoms of a river in Madras (now Chenai). Biswas (1924, 1932) studied sub-aerial algae and algal flora of Chilka Lake. Bruhl and Biswas (1926) documented the algal flora of Laktak Lake. Bharadwaja (1933, 1934, 1935, 1964) also made notable contribution mostly on the Cyanophycean flora of Uttar Pradesh. He also worked on freshwater flora of Manipur (Biswas, 1963). Singh (1938, 1939, 1939 a and b, 1947) documented different groups of algae, mostly concentrating on blue green algae from Uttar Pradesh. Singh (1941, 1960) recorded the Chlorophyceae of the Banaras district and Phytoplankton of Uttar Pradesh. Rao (1936, 1937, 1938a, 1938b, 1939a and 1939b) studied the myxophyceae of United province, Madras (now Chennai), Orissa Province and Bihar province. Randhawa (1934, 1936 a, b and c, 1938, 1943, 1948, 1958, 1959,1961) made significant contributions mostly on Zygnemataceae, Ulotrichales and Chaetophoraceae. Krishnamurthy (1954) mostly worked on marine algae, some of his work on freshwater algae were where he studied the diatom flora of South India, Krishnamurthy (2000) studied the chlorophyta of India and Bharati (1965, 1966) recorded desmids from Karnataka. Desikachary (1959) published a monograph on Cyanophyta which is one of the most recognised works on Blue green algae in India, he along with other workers also published monographs on Red algae (Desikachary et al.1990) and Volvocales (Iyengarand Desikachary 1981). Philipose (1967) published a monograph on Chlorococcales. Gandhi (1956) studied the freshwater algae of river Ganga. Gandhi (1959, 1960, 1962, 1966, and 1970) also documented freshwater diatoms from Maharashtra. Das and Santra (1962) studied the diatoms of Senchal Lake in Darjeeling, West Bengal. Rattan and Rawla (1983) explored the algal flora of Punjab and its neighbouring areas. Suxena and Venkateswarlu (1966 a and b, 1968 a and b, 1970) studied the desmids and Baccillariophyceae from Andhra Pradesh and Kashmir. Khan (1970) documented the algal flora of Dehradun. Khan and Sarma (1967 a and b) studied cytotaxonomy of Charophytes from India and Khan and Rawat (1972) documented the flora in some areas of Uttarakhand. Pandey and Pandey (1980 a and b, 1982) have recorded the algal flora of Allahabad. Srivastava (1962) recorded blue green algae from Central Himalya. Sarma and Khan (1980) in their book 'Algal Taxonomy in India' have enumerated that over 4269 species of algae belonging to 653 genera have been documented so far from India, among these 3023 are freshwater algae and I222 are marine algae. Anand (1997, 1998) published Indian freshwater Microalgae and the blue green algae from the rice fields of South India, whereas Anand and Hopper (1995) and Anand and Subramanian (1995) studied the blue green algae from the rice fields of Kerela and Tamil Nadu respectively. Srivastava and Odhwani (1990) reported few Chlorococales from Johdpur. Kant and Gupta (1998) made an extensive survey of algae of Ladakh, recording a considerable number of algal taxa and published a book titled 'Algal flora of Ladakh'. Kant and Vohra (1999) also documented the flora of Jammu and Kasmir. Suseela and Dwivedi (2001, 2002) recorded the algal flora (Chlorophyceae and Xanthophyceae) and Bacillariophyceae respectively from Uttar Pradesh. Dwivedi and Pandey (2002) surveyed the pond diversity of algae from Faizabad, UP and reported 70 algal species, whereas Dwivedi et al. (2008) studied the cyanophycean algae frtom southern Himachal Pradesh and Dwivedi and Mishra (2015) studied the freshwater diatoms of Himachal Pradesh. Srivastava and Odhwani (1990) studied the Chlorococales from Johdpur and reported algae from Bijolai lake Johdpur and Srivastava et al. (2010)

studied the algal biodiversity of Faizabad district, UP. Misra et al. (2005 a and b, 2006, 2008, 2009) documented some freshwater algae from eastern part of Uttar Pradesh, few fresh-water desmids from District Mandi, Himachal Pradesh, 42 desmids from Garhwal Region of Uttarakhand and some Chlorococcales and algae from Western U.P respectively. Kumar and Ra (2005) studied the Algal Flora (Chlorophyceae) of Namchi, Sikkim. Jena et al. (2006) reported 78 diatoms from Orissa state and neighbouring regions. Kumawat et al. (2008) studied the diatoms from Satpura Hills of Jalgaon District, Maharashtra. Samad and Adhikary (2008) reported 72 algae from building facades and monuments in India. Toppo and Suseela (2009) documented *Scenedesmus* species from Chhattisgarh and cyanobacteria of Sai River in Uttar Pradesh, whereas Suseela and Toppo (2007) studied desmids of India. Yasmin et al. (2011) reported 38 desmids from Eastern Himalaya. Kshirsagar et al. (2012) recorded 162 algal taxa from Mula River, Pune. Suresh et al. (2012) studied the biodiversity of Microalgae in Western and Eastern Ghats of India. Das and Adhikary (2012) recorded 75 algal taxa from 7 reservoirs in Odisha. Kumaraswamy et al. (2013) reported 105 algal taxa from two freshwater reservoirs of Warangal, Andhra Pradesh (now Telengana). Nasser and Sureshkumar (2013) documented 112 microalgae from the Western Ghats. Christi et al. (2014) reported 80 phytoplanktons from a natural spring pond from Tamil Nadu. Singh et al. (2014) have documented 76 algal taxa from Telengana. Srivastava et al. (2014, 2018) explored the Cyanobacteria of Sai River Chroococcales in river Ganga and fresh water algal diversity of Central India. Mir et al. (2010) recorded 95 algal taxa from Wular Lake, Kashmir. Radhakishn and Tagad (2016) reported 76 benthic algae and 344 phytoplankton from Pune district. Sankaran and Thiruneelagandan (2015) documented 67 species of algae Parthasarathy temple tank in Chennai. Das and Maurya (2015) reported 65 algal taxa from Bihar. Jitendra and Anand (2016) recorded eight new records of fresh water algae (*Oedogonium*) from India. Bourasi et al. (2016) have documented 45 algal taxa from River Narmada, (MP). Das and Keshri (2017) studied the cyanophycean algae from the foothills of Himalaya and reported 11 taxa of cocoid algae. Reddy and Chaturvedi (2017) recorded 45 desmids from the rivers of Chandrapur district, Maharashtra**.** Mehta and Sahu (2017) documented 107 algal taxa from Ranchi district of Jharkhand. Meena (2017) studied the freshwater Micro-algal diversity from Sawaimadhopur, Rajasthan. Reddy and Chaturvedi (2017) recorded 45 desmids from the rivers of Chandrapur district, Maharashtra. Bajpai et al. (2019) recorded 54 algae from Lakhna, Etawah, Uttar Pradesh. Bharati et al. (2020) studied the Cyanophycean algae from central Bihar in India and reported 27 taxa and Dash et al. (2021) reported 52 algal taxa from a lake in Odisha.

North Eastern Region of India

Among the Northeastern states of India, Assam is the most studied area. Many workers over the years have studied and documented considerabkle number of algal species from different areas of Assam. Srinivasan (1965) documented the diatom flora of Assam. Bordoloi (1974) described some fresh water algae from Assam. Hazarika and Gogoi (1985) studied algal flora of hot springs in Assam. Ahmed et al. (1999) reported 214 algal taxa from rice fields of Nagoan sub- division. Saha et al. (2007) studied epilithic cyanobacteria from freshwater streams of Kakoijana reserve forest, Assam. Baruah and Kakati (2012 a and b) reported 74 species and 45 species of phytoplankton from a temple pond and tanks respectively from Assam. Devi (1981) had made a detailed account of algae found in Darrang district of Assam. Das and Sarma (2011) studied the blue green algae of rice fields of Bongaigaon District, Assam. Hazarika (2013) studied the blue green algae of Upper Brahmaputra valley and recorded 78 algal taxa. Borgohain and Tanti (2014) reported 103 Diatoms from silica rich habitats of Assam, whereas

Bordoloi and Baruah (2015) reported 139 algae from a stream in Digboi oil refinery. Yasmin et al. (2015) documented 91 species of algae from aquatic habitat of Kaziranga forest. Baruah et al. (2020) studied the algae of Deepor Beel of Assam and reported 219 algal species. Borah et al (2021) recorded 92 algal species from the hilly rice field terrains of Southern Assam. Ghose (1930, 1934) recorded some fresh water algae of Manipur and algae from Khasi and Jhantia hills. Bharadwaja (1962) reported 17 algal taxa from Manipur. Briihl and Biswas (1926) and Singh et al (2015) studied the algal communities from Loktak lake, Manipur. Jena and Adhikary (2011) also studied the algal diversity of Loktak lake and reported 105 algal taxa. A considerable number of works have been done on algal diversity work in Meghalaya. Some of these workers are as follows: Biswas (1934) published his works on observations on the algae collections from the Khasi and Jaintial Hills. Alfred and Thapa (1978) studied the algal flora of Wards Lake, Shillong. Kharkongor and Ramanujam (2014) reported 85 sub aerial algal taxa from Meghalaya. Kalita et al (2015) reported 38 green algal taxa and 50 algal taxa respectively from Ri-Bhoi, Meghalaya. Ramanujan and Siangbood (2016) documented 117 algal species taxa from Umiew River, Meghalaya. Dirborne and Ramanujam (2017) and Dirborne et al. (2018) recorded 124 taxa of soil algae from sacred grove and pine forest in East Khasi Hills and reported 158 algal taxa while studying the diversity of soil algae from the farmlands of Khasi hills, Meghalaya respectively. Hajong and Ramanujan (2017, 2018) reported 140 algal taxa from Ganol River and 176 algal taxa from Dachi Lake, Meghalaya respectively. Hajong et al. (2021) recorded 95 algal taxa from cave ecosystem of Meghalaya. Ramanujan et al. (2020) reported 53 diatoms from Umiam reservoir, Meghalaya. Singh et al. (1996, 1997a, 1997b and 1997c) studied the rice field blue green algal flora of Mizoram, Tripura, Arunachal Pradesh and Nagaland respectively and they documented a considerable number of algal species. Mikter et al.

(2006) studied the algal flora of algae-moss association on barks of some trees in Arunachal Pradesh. In the North- eastern region of India, Prof. S.P. Adhikary and his associates are considered as one of the most notable contributors to the freshwater algal studies. Adhikary et al. (2010) reported 48 algae from Mizoram and Das et al (2010) recorded 119 freshwater algae from Tripura. Das and Adhikary (2012 a and b) recorded 94 freshwater from Nagaland and 86 algal taxa from Arunachal Pradesh, whereas Das and Adhikary (2014) documented the freshwater algae from Eastern India. Reddy et al. (1986) also reported 10 BGA from Arunachal, 8 BGA Tripura and 2 freshwater algae and 6 BGA from moist soils in Nagaland. Tiwari et al. (2009) have reported 25 BGA from rice fields and moist soils of Nagaland. Oinam et al. (2010) and Devi et al. (2010) have reported few algal species from Nagaland. Nath and Baruah (2021) reported 116 planktonic algae from Arunachal Pradesh. Most of the algal diversity works in Nagaland were done on the blue green algae. Das and Adhikary (2012) were the first workers to study the freshwater diversity of algae in Nagaland. They surveyed selected freshwater bodies of Dimapur, Chumu, Peren and Wokha and reported 94 algal taxa out of which 10 algal taxa were first reports for India.

The present study was focused on Kohima district, Nagaland. Kohima district is located in the southern part of Nagaland. It is divided into 8 administrative blocks and has 108 villagers under it. The area is mainly inhabited by the Angami Nagas and Rengma Nagas. Kohima district receives heavy rainfall but pertaining to its hilly terrain, groundwater recharge remains highly improbable causing water scarcity during dry seasons, especially in those areas which do not have streams or rivers nearby.There are four main rivers that flows through Kohima district : Dhansiri, Dikhu, Doyang and Zungki River.

The present study was taken up to explore the algal resources of Kohima district. The work was mainly concentrated on the water bodies (lentic and lotic water system) moist soil, rocks and walls of this area. The occurrence and distributional pattern of different algal classes were compared and studied from the different habitats.

1.4 Scope of the Present Study

Of late, taxonomic study is considered outdated and the research community fails to play up with the ongoing taxonomic works. There seems to be a huge decline in taxonomic study of lower plants as well. Researchers like Ali and Choudhary (2011), Hariharan and Balaji (2002), Kholia and Fraser-Jenkins (2002) and (Nair, 2004) have raised their issues regarding the decline in taxonomic researches. Irfanullah (2006) stated his concern with the limitation of detailed taxonomic work of algae, he explained that studies of algae is carried out with regards to limnological studies where algal taxonomy were presented mostly as a group or till genus level only. Many aquatic studies have also been presented till genera level only. In many Universities, their focus of work areas is on modern and experimental works thus contributing to the plight of Taxonomists. According to R.R. Rao (2012) “Taxonomy today is a dwindling subject, mostly avoided by younger generation, who are more attracted towards some of the fashionable and experimental areas of modern biology. Taxonomy teaching (and research) in most Universities is much neglected”. Valdecasas et al. (2000) have also voiced the issue faced by taxonomist to get journals with good impact factors. All these aspects are adding to the decline in interest by the younger generation researchers. The freshwater algae of North-eastern states particularly Nagaland is poorly studied. There are only a few scientific publications available on the algal flora and diversity of Nagaland (Reddy et al. 1986; Singh, 1997; Tiwari et al. 2009; Oinam et al. 2010 and Devi et al. 2010 and Das and Adhikary, 2012). Nagaland is a biodiversity hotspot with rich diversity of flora and fauna; however most of the area is still unexplored for algal studies thus providing a very high scope of study. Algal diversity study of Kohima district will give us the knowledge about the algal resources of this region. The study will also highlight the potential resources of economically important algae, impart a deeper sense of knowledge in its ecological structure, contribute to phycological studies and pave way for further scientific research.

Objectives of the Present Study

Following objectives have been chosen for carrying out research work on diversity of algae of Kohima district, Nagaland:

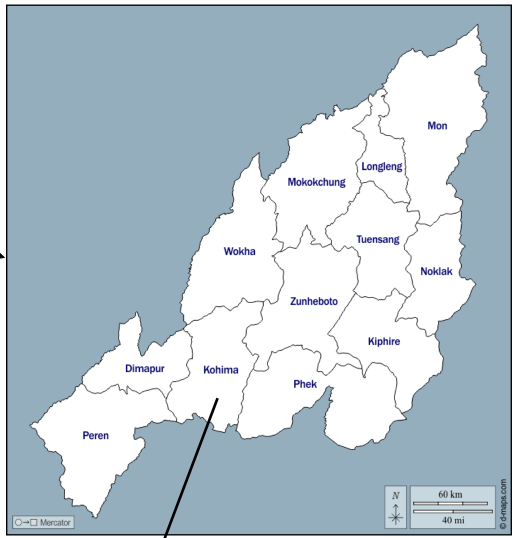
1. Survey, Collection and Identification of algae from Kohima District.
2. An Algal Atlas with coloured Photograph depicting morphological features, habit and habitats will be prepared.
3. The record of taxa collected in and around Kohima District shall be published in reputed National and International Journals.

Chapter -2: Materials and Method

2.1 Study Area

Nagaland lies in the North-eastern part of India bounded by the Indian states of Assam in the north-west, Manipur in the south, Arunachal Pradesh and the country of Myanmar in the east. It is located between 25˚6′ N to 27˚4′ N Latitude and 93˚20′ E to 95˚15′ E Longitude with an annual average rainfall which ranges from 1,800 to 2,500 mm characterised by typical monsoon climate. There are 12 districts in Nagaland: Dimapur, Kohima, Phek, Tuensang, Mon, Wokha, Zunheboto, Longlen, Mokokchung, Peren, Kiphire.

The present investigation has been carried out from Oct, 2017 to April 2019 in the Kohima district, Nagaland. Kohima district is hilly area which lies between 25º24'N–25º99'N and 94º01'E–94º29'E with an average elevation of 1261 m. Kohima district shares borders with Wokha district in the North, Phek district in the East, Manipur State and Peren district in the South and Assam State and Dimapur District in the West. Kohima has a humid sub tropical climate with a pleasant summer and frigid winter. The maximum temperature during the summer months usually ranges from 21˚C to 36˚C and during winter months 21°C to below 0˚C. During the coldest months, frosting and occasional snowfall occurs in the higher altitudes. The average rainfall is around 2,500 mm. Most of the rainfall is received in the month of July to August with occasional rain from September to October. The area has rich vegetation due to its favourable climatic condition and geographical location and many parts of the area are still left untouched by development.



Source :https://simple.wikipedia.org/wiki/Na

Source: www.d-maps.com

Source: www.indiagrowing.com

Figure 2.1 Map of study area

Plate 2.1

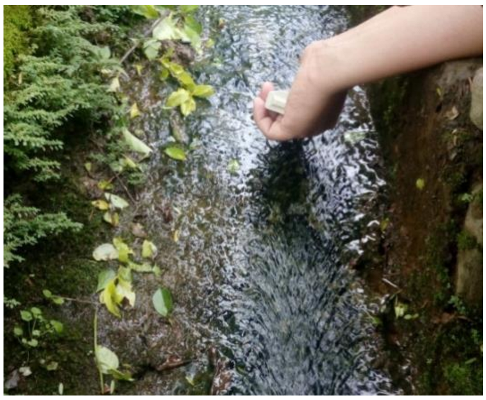
A. Mats of algae floating and attached to the walls of constructed pond.

B. Huge mats of filamentous algae growing in a constructed pond.

C. Algae occurring in a natural pond

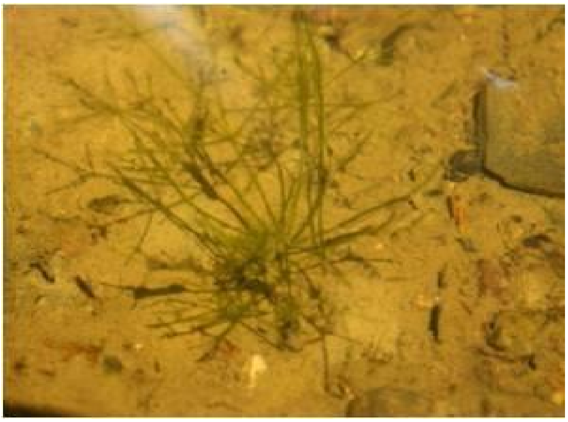
D. Bluish green layer of Cyanobacteria growing on the sides of a pond

E. Filamentous algae growing in a temporary pool



F. Layers of blue green algae in a drain

Plate 2.2



A. *Chara* sp. growing attached to the bottom of a fish pond

B. Algae growing in a rice field

C. Depression spring at Dziikou Valley

D. Filamentous algae growing in Dzii-ii river

E. Mats of filamentous algae growing in Dzii-ii River

F. Algae growing attached to rocks at the bottom of Dziileke River

Plate2.3

A. *Batrachospermum* sp. growing attached to rocks in a small stream

B. Greenish brown algae layer on the surface of rocks in a small stream

C. Algae growing in a small natural water spring

D. Dark green layer of algae on the surface of moist soil

E. Algae growing in the cave of Dziikou Valley

F. Greenish layer of algae growing on the surface of a constructed pond

2.2 Habitat, altitude and seasonal parameters

Collections of algal samples were done randomly and mostly from aquatic habitats i.e., streams, rivers, streams, small natural water springs, drains, natural ponds, constructed ponds and water tanks, fish ponds, paddy fields and temporary water pools. Algal samples were also collected from few terrestrial habitats such as moist rocks and walls, moist soil and moist caves. Photos of habitats of few collection sites are shown in Photo plate No. 2.1-2.3. Nagaland has four seasons in a year; Spring which lies between March and April, summer which lies between May to September, Autumn which lies between October and November and Winter which lies between December to February. Algal samples have been collected from all the seasons covering varying altitudes (600-1100 masl; 1101-1600 masl; 1601-2100 masl; 2101-2600 masl).

2.3 Collection of Materials

Filamentous algae were collected by hand and twigs, attached filamentous algae were scrapped using tools like forceps or sticks. Phytoplanktons were collected into sample bottles and occasionally algae were collected by squeezing of aquatic plants, submerged leaves, twigs, plastics etc. Submerged materials like small twigs, leaves and stones were also collected as offcuts. Algae from submerged rock surfaces were collected using forceps, brush etc., and the algal materials collected into the sample bottles. Soil algae was collected using scalpel, forcep or twigs and kept hydrated. The same procedure was followed for collection of alga from moist walls, caves and rocks. Seasonal collection was done with 2-3 samples representing small habitats like ponds and puddles, 3-6 samples representing larger sites like fish ponds, streams and rivers. The specimen tubes were numbered and notes were maintained in a field notebook recording details of their habit and habitat, mode of occurrence, date and place of collection for future references. Photographs of algae in their natural habitat and pictures of their habitat were also taken.

2.4 Storage and Preservation of Samples

Samples collected were fixed in 4% formalin (v/v) and stored at 4˚C. Accession number was assigned to each sample bottles (NU-BOT-KVP-001 to NU-BOT-KVP-363) and the voucher specimens deposited in the Department of Botany, Nagaland University, Lumami.

2.5 Observation and Identification of Algal Samples

Digital photographs were taken with Motic microscope BA-210 and Euromex microscope. Fresh algal samples were observed by mounting a drop of algal sample on a microscopic slide and carefully placed cover slip upon it. The slides were than observed under different magnification of microscope i.e., 5X, 10X, 40X and 100X and microphotographs were taken. Measurement of the algae was done using micrometer. The specimens were examined fresh in the laboratory as far as possible, albeit preserved in 4% formaldehyde solution. The Filamentous algae were separated with forceps and place on slides for observation. A detailed study of the habitat of occurrences, their morphological characters i.e. cell size, shape, cell wall, ornamentation, striae and raphe morphology, sex organs, type of branching, arrangement of the chloroplast, number and arrangement of pyrenoids were studied for identification of the samples. Identification of algal taxa was done by consulting literatures and monographs of Clarence (1945), Tiffany and Britton (1952), Desikachary (1959), Prescott (1951), Kant and Gupta (1998), John et al. (2002), Ohtsuka et al. (2002, 2007), Wehr and Sheath (2003), Taylor et al. (2007), Das and Adhikary (2014), Kihara et al. (2015) and other literatures, it was also further identified and confirmed from the internet (https://keys.lucidcentral.org/keys/v3/diatoms/index.html; https://www.algaebase.org/; http://www.digicodes.info/; galerie.sinicearasy.cz; https://diatoms.org/; ansp.org/dntf; http://www.desmids.nl/index.html and www. protist.i.hosei.ac.jp/).

Chapter- 3: Results and Discussion

Identification was made by studying their morphological characteristics and an attempt was made to identify the algal specimen till the species level. These species have been systematically arranged following Guiry and Guiry, 2021.

3.1 Systematic enumeration

Phylum Cyanobacteria

Class Cyanophyceae

Subclass Nostocophycidae

OrderChroococcales

Family Aphanothecaceae

Genus Aphanothece

1. ***Aphanothece conglomerate* F. Rich(Plate3.1; Fig. A)**

   Seu-Anoi, 2017, pg. 45, Fig. 1-2

   Colony made up of spherical cells embeddded as a whole within a gelatinous matrix which is yellowish brown in colour. Colony is 36.7 -43.9 µm in diameter and cells ellipsoidal to spherical, eachcell 3-5 µm in diameter**.**

2. ***Aphanothece stagnina* (Sprengel) A. Braun(Plate 3.1; Fig. B)**

   Desikachary, 1959, pg. 137, pl.21, Fig. 10

   Cells ovoid-cylindrical shape, 6 - 8.8 µm long and 3.7- 4.4 µ m wide. Cells densely or sparsely arranged; individual cells have no envelope.

Genus *Gloeothece*

3. ***Gloeothece tepidariorum* (A. Braun) Lagerheim (Plate 3.1; Fig. C)**

   Gama-jr. et al. 2014, pg. 66, Fig. 2: B-C

Colonies 17- 30 µm in diameter, 2 - 4 cells present in a colony. Cells spherical to sub-spherical, 5-9 µm in diameter; Each cell with individual colourless sheath.

Family Chroococcaceae

Genus *Chroococcus*

4. ***Chrococcus minor* (Kützing) Nageli (Plate 3.1; Fig.D)**

   John et al. 2002, pg. 40

   Cells in a group of 2-6 and embedded in a muciligenous sheat; Cells spherical 6-7 µm wide and 4-6 µm long. Colony 10-12 µm in diameter and its shape varies from spherical to hemispherical.

5. ***Chrococcus* spp.1 (Kützing) Nageli (Plate 3.1; Fig. E)**

   John et al. 2002, pg. 39

   Cells in a group of 2-4, embedded in a muciligenous sheath which is faintly visible; Cells sub-spherical, 3-3.5 µm in diameter. Colony 7-10 um in diameter and its shape varies from spherical to hemispherical.

6. ***Chrococcus* spp.2 (Kützing) Nageli (Plate 3.1; Fig. F)**

   John et al. 2002, pg. 39

   Cells embedded in a mucilaginous sheath and without their individual sheath. Cells very small, 1-5- 4 µm in diameter; shape varies from spherical, hemi-spherical, ovoid to oblong ovoid.

Family Microcystaceae

Genus *Gloeocapsa*

7. ***Gloeocapsa nigrescens* Nageli (Plate 3.1; Fig. G)**

   Gama-JR. et al. 2014, pg. 78: Fig. 9B-D

   Colonies round to spherical, 22 - 45.1 µm in diameter; Cells spherical, semi-spherical to ellipsoid, 1.8 - 3.2 µm in diameter.

8. *Gleocapsa novacekii* **Komarek&Anagnotidis (Plate 3.1; Fig. H)**

Hauer, 2008, pg. 132, Fig. 1: b

Cell in colony, 40-60 µm in diameter and often made up of 16 cells, these cells are spherical, 3 µm- 8 µm in size, usually in a group of 2-4 covered with mucilage and then surrounded by yellowish brown outer mucilage which covers the whole colony

9. *Gloeocapsa* **spp.1 Kiitzing (Plate 3.1; Fig. I)**

Desikachay, 1959, pg. 111

Colony irregular shape, 13-20 µm in diameter, made up of 4-8 cells compact in a colony and embedded in a sheath; cells spherical-ovoid shape, 3.5- 4.3 µm in diameter.

10. *Gloeocapsa* **spp.2 Kiitzing (Plate 3.1; Fig. J)**

Desikachay, 1959, pg. 111

Colonies in singles or in groups, sub-spherical in shapeand 17-43 µm in diameter; A total of2-8 cells forms aa colonye which are mbedded in a sheath. Cells are spherical, 7-8.6 µm in diameter, each cell with individual sheath covering and sometimes another sheath covering 2 cells are present.

Order Nostocales

Family Calothricaceae

Genus *Calothrix*

11. *Calothrix braunii* **Bornet & Flahault (Plate 3.1; Fig. K)**

Desikachary, 1959, pg. 535, pl. 114: Fig. 3

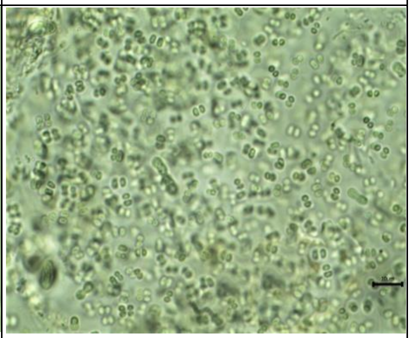
A. ***Aphanothece conglomerate*** **F. Rich**

B. ***Aphanothece stagnina*** **(Sprengel) A. Braun**

C. ***Gloeothece tepidariorum*** **(A. Braun) Lagerheim**

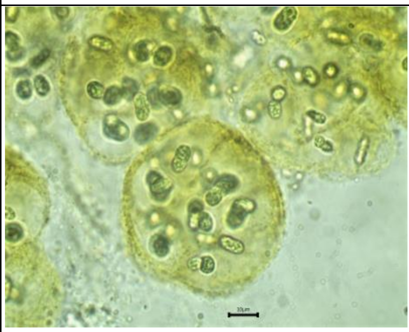
D. ***Chrococcus minor*** **(Kützing) Nageli**

E. ***Chrococcus*** **spp. 1 (Kützing) Nageli**



F. ***Chrococcus*** **spp. 2 (Kützing) Nageli**

G. ***Gloeocapsa nigrescens*** **Nageli**



H. ***Gleocapsa novacekii*** **Komarek & Anagnotidis**

I. ***Gleocapsa*** **spp. 1Kiitzing**

J. ***Gleocapsa*** **spp. 2 Kiitzing**

K. ***Calothrix braunii*** **Bornet & Flahault**

L. ***Calothrix marchica var. intermedia*** **Lemmerman**

Plate-3.1 (Scale bar: Fig. A-K-10 µm; Fig. L- 50 µm)

Trichome brownish green in colour, 6-8 µm wide with thin sheath; cells end tapers to a long hair like structur and cell wall is slightly constricted. Heterocysts are sub-spherical and present at the base.

12. ***Calothrix marchica*** **var.** ***intermedia*** **Lemmermann (Plate 3.1; Fig. L)**

Desikachary, 1959, pg. 544, pl. 113, Fig. 1-2

Trichome mostly occurs single, slightly attenuated and terminal hair is not present. Cells somewhat quadrate, 6.6-9.8 µm wide and 4-4.5 µm long. Cross walls are constricted with thin sheath. Heterocystsare spherical, 8-8.6 µm in diameter and present at the base.

13. Calothrix parietina (Naegeli) Thuret(Plate 3.2; Fig. A)

Prescot, 1951, pg. 553, pl. 132, fig. 6

Trichome straight or curved, yellowish green, 10-13 µm wide and 6- 6.5 µm wide at the narrowing ends and occurs in group.Cells constricted at cross walls. Sheath is thin and yellowish in colour. Heterocyst present both as basal and intercalary, mostly globose in shape and 8-10 µm in diameter.

14. ***Calothrix sp.*** **C. Agardh ex Bornet&Flahault (Plate 3.2; Fig. B)**

Desikachary, 1959,pg. 522

Filaments dark brown, present in small bundles, 7-7.7 µm wide; basal area 10-13.04 µm in diameter only slightly tapers towards the end. Cells mostly not constricted, sheath transparent, and seen at the base, heterocyst basal.

Family Hapalosiphonaceae

Genus ***Westiellopsis***

15. ***Westelliopsis*** **sp. Janet(Plate 3.2; Fig. C)**

Desikachary, 1959, pg. 596

Thallus filamentous branched; branching is of two types: thicker branching and the thinner and erect branching. Trichomes are 7-12.5 µm wide. Cells are sphreical to sub –spherical, 10-13 µm long. End cells of branches primay branching slightly swollen.

Family Nostocaceae

Genus *Cylindrospermum*

16. *Cylindrospermum majus* Kützing ex Bornet &F lahault (Plate 3.2; Fig. D)

Prescott 1951, pg. 530, pl. 122: Fig. 11,12; Desikachary 1959, pg. 360, pl. 80: Fig. 1

Thallus in a mucilaginous sheath, vegetative cell 4-5 µm wide and 5-7 µm long, constricted at the cross-wall and almost parallel. Heterocyst spherical, oblong, 5-6 µm wide; Akinete ovate with almost flattened ends, 10-15 µm wide and 25-35 µm long

17. *Cylindrospermum stagnale*Bornet & Flahault (Plate 3.2; Fig. E)

Desikachary, 1959, pg. 363, pl. 65, Fig. 9

Trichome 3-3.5 µm wide, yellowish green and constricted at cross walls. Cells are cylindrical to quadrate and 4- 4.5 µm long. Spores 9.5-13 µm wide and 19- 28 µm long. Heterocysts are 5-5.8 µm wide and 7-10 µm long with yellow-brown outer layer.

Genus *Anabaena*

18. *Anabaena iyengarii* Bharadwaja(Plate 3.2; Fig. F)

Desikachary, 1959, pg. 78, Fig. 2

Trichome irregularly curved, occurs single, 2.5- 5 µm wide and 3.6-4.2 µm long; end cells conical. Akinete spores are 15 µm long and 10-10.2 µm wide and formed on both sides of the heterocyst which is 6-7.3 µm in diameter.

19. *Anabaena laxa.* A. Braun(Plate 3.2; Fig. G)

Desikachary, 1959, pg. 413

Trichome usually occur single, filamentous, striaght, dark green, 4.8-5.2 µm long and 3-3.4 µm wide. Cells barrel shaped; end cell rounded. Heterocyst is single, spherical and occurs as both intercalary and terminal, 8-8.5 µm in diameter. Akinet 8 µm wide and 10.5 µm long andare not contigeous with heterocyst.

20. ***Anabaena variabilis*** **Geitler &Ruttner (Plate 3.2; Fig. H)**

Kadirova et al. 2012, pg.70: Fig. 2

Vegetative cells barrel shaped, 4-6 µm broad with apparent constriction; Heterocyst spherical, oval shape; Akinete intercalary, 6-7 µm wide and not contiguous.

Genus ***Nostoc***

21. ***Nostoc ellipsosporum*** **Rabenhorst ex Bornet&Flahault (Plate 3.2; Fig. I)**

Desikachary, 1959, pg. 383, pl.69, Fig. 5

Thallus is gelatinous trichomeswhich are 4-5.7 µm wide; cells are 7- 11.5 µm long. Heterocysts are sub spherical, mostly terminal; Akinetes oblong, ellipsoidal, 11.5-14 µm long and 8-8.5 µm wide.

22. ***Nostoc*** **spp.1 Vaucher (Plate 3.2; Fig. J)**

Desikachary, 1959, pg. 372

Trichomes are formed in a gelatinous colony; cells quadrate to barrel shape, 5-5.8 µm long and 3-3.5 µm wide.

23. ***Nostoc*** **spp.2 Vaucher (Plate 3.2; Fig. K)**

Desikachary, 1959, pg. 372

Trichome are embedded in a gelatinous sheath, yellowish green in colour, cells sub-spherical shape, 4-5 µm in diameter.

Family Nostochopsidaceae

Genus ***Nostochopsis***

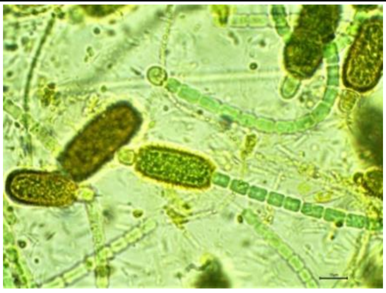
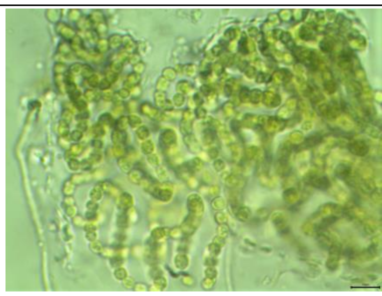
		
A. ***Calothrix parietina*** **(Naegeli) Thuret**	**B. *Calothrix* spp. C. Agardh ex Bornet & Flahault**	**C. *Westelliopsis* spp. Janet**
		
D. *Cylindrspermum majus* Kiitzing ex Bornet	**E. *Cylindrospermum stagnale* Bornet Flahault**	**F. *Anabaena iyenarii* Bharadwaja**
		
G. *Anabaena laxa* A. Braun	**H. *Anabaena variabilia* Geitler & Ruttner**	**I. *Nostoc ellipsosporum* Rabenhorst ex Bornet & Flahault**
		
J. *Nostoc* spp. 1 Vaucher	**K. *Nostoc* spp. 2 vaucher**	**L. *Nostochopsis lobata* H. C. Wood ex Bornet & Flahault**

Plate-3.2 (Scale bar: 10 µm)

24. ***Nostochopsis lobata*** **H.C.Wood ex Bornet&Flahault (Plate 3.2; Fig. L)**

Desikachary, 1959, pg.570, pl. 120: Fig. 1-8

Thallus irregularly lobed, olive green in colour; cells barrel shaped, 45 µm wide and 55-7.2 µm long.

Family Tolypothrichaceae

Genus *Tolypothrix*

25. ***Tolypothrix byssoidea*** **(Berk.) Kirchner(Plate 3.3; Fig. A)**

Desikachary, 1959, pg. 502, pl. 104: Fig. 3, 4, 7

Trichomes are yellowish brown in colour, 9-12 µm wide. False branching occurs as short and curved structure; sheath thin. Heterocyst basal and sometimes occurs as intercallary.

26. ***Tolypothrix distorta*** **Kützing ex Bornet&Flahault (Plate 3.3; Fig. B)**

Desikachary, 1959, pg. 495, pl. 102: Fig. 1: John et al. 2002, pg. 115, Pl. 21: Fig. B,C

Brownish green colony, trichome dull green, 10- 10.3 µm wide; cells quadrate to barrel shape, 6.6-7.7 µm long and cell walls more or less constricted. Sheath are thin and present close to trichome. Heterocyst basal, rounded discoid in shape, 7.2-11.5 µm wide and 10-12.2 µm long.

Family Stigonemataceae

Genus *Stigonema*

27. ***Stigonema tomentosum*** **Hieronymus (Plate 3.3; Fig. C)**

Desikachary 1959, pg. 606

Filaments mostly with one row of cell, sometimes two, 18 µm-22 µm wide; Branches rise perpendicular from the main filaments; cells spherical or irregularly rounded, 6-11 µm long, Sheaths yellow-brown colour.

28. ***Stigonema*** **sp. C. Agardh ex Boenwt and Flahault (Plate 3.3; Fig. D)**

Desikachary, 1959, pg. 603

Trichome yellowish green in colour and size varies from 14 -24 µm wide; 2 rows of cell are present in a trichome.

Subclass Oscillatoriophycidae

Order Oscillatoriales

Family Coleofasciculaceae

Genus ***Geitlerinema***

29. ***Geitlerinema splendidum*** **(Greville ex Gomont) Anagnostidis (Plate 3.3; Fig. E)**

Rosen and Maris, 2016, pg. 36: Fig. 69-70

Trichome 2.5-3 µm wide, light green in colour and ends are straight or sometimes attenuated at the apex which is slightly curved; cells 4-7 µm long.

Family Oscillatoriaceae

Genus ***Cyanotheceae***

30. ***Cyanotheceae ruginosa*** **(Nageli) Komarek (Plate 3.3; Fig. F)**

Dvorak et al. 2015, pg. 741: Fig.1c

Cell body ellipsoidal in shape with almost flattened apex; cells are 11-12.6 µm long and 8-10 µm wide; cells lacking sheath.

Genus ***Lyngbya***

31. ***Lyngbya*** **sp.1 C. Agardh ex Gomont (Plate 3.3; Fig. G)**

Desilkachary, 1959, pg. 278

Thallus in a campact colony, Trichome curved and light green in colour, thin sheaths are present and 7-7.8 µm wide withno constriction at cross walls. Cells not as long as broad, 5-6 µm long.

32. ***Lyngbya*** **sp.2 C. Agardh ex Gomont (Plate 3.3; Fig. H)**

Desilkachary, 1959, pg. 278

Trichome brownish green in colour, 23-26 µm wide; cells 6-10 µm long. Cross walls not constricted and sheath 3-6 µm wide**.**

33. ***Lyngbya*** **sp.3 C. Agardh ex Gomont (Plate 3.3; Fig. I)**

Desilkachary, 1959, pg. 278

Trichomes are 3.5- 4 µm wide; sheath thin and transparent. Cells 2.5- 2.9 µm long and cross walls are constricted.

Genus ***Oscillatoria***

34. ***Oscillatoria agardhi*** **Gomont (Plate 3.3; Fig. J)**

Desikachary, 1959, pg. 235

Trichome yellowish green, straight or curved at the apex, 5-8 µm wide andgradually tapering at the ends; cells 2.4 - 6.6 µm long with no constrictions at the cross walls. Granules present along septum, terminal cells forms conical-shaped or roundedcalyptras.

35. ***Oscillatoria agardhii*** **var isothrixSkuja (Plate 3.3; Fig. K)**

John et al. 2002, pg.72, pl. 11: A

Trichome dark green colour and slightly curved; cella have rounded end cells, caliptra absent, cell without constriction 6.2-6.4 µm wide and cells body 4- 5.5 µm long**.**

36. ***Oscillatoria brevis*** **Kützing ex Gomont (Plate 3.3; Fig. L)**

http://protist.i.hosei.ac.jp/PDB/Images/Prokaryotes/Oscillatoriaceae/Oscillatoria /brevis/sp_04.html; Desikachary, 1959, pg. 241.

Trichome dark green in colour, 5.7 µm wide and 2.2-3.5 µm long. End cells rounded or conical shape. Cross walls not constricted. Often granulated at septa.

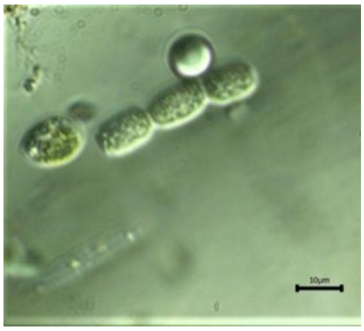
A. *Tolypothrix byssoidea* (Berk.) Kirchner

B. *Tolypothrix distorta* Kiitzing ex Bornet & Flahault

C. *Stigonema tomentosum* Hieronymus

D. *Stigonema* spp. C. Agardh ex Bornet & Flahault

E.*Geitlerinema splendidum* (Greville ex Gomont) Anagnostidis



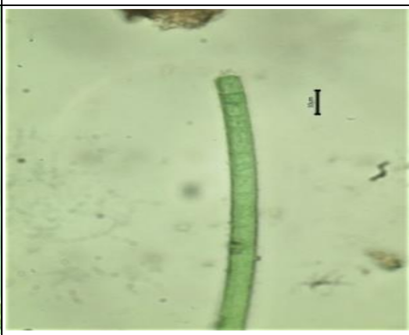
F. *Cyanotheceae ruginosa* (Nageli) Komarek

G. *Lyngbya* spp. 1 C. Agardh ex Gomont

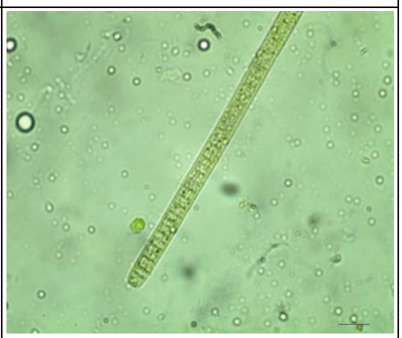
H. *Lyngbya* spp. 2 C. Agardh ex Gomont

I. *Lyngbya* spp. 3 C. Agardh ex gomont

J. Oscillatoria *agardhi* Gomont



K. *Oscillatoria agardhii* var. isothrix Skuja



L. *Oscillatoria brevis* Kützing ex Gomont

Plate-3.3 (Scale bar: Fig. B-G, I-L- 10 µm; A, H-50 µm)

37. ***Oscillatoria chlorine*** **Kiitz. Ex Gomont (Plate 3.4; Fig. A)**

Desikachary 1959, pg. 215, pl. 40: Fig. 4

Trichome slightly curved without constrictions at cross walls, 4.4 µm wide and each cell is as long as broad or slightly longer, 4-5 µm long. Cells slightly taper at the apex and calyptra is absent.

38. ***Oscillatoria curviceps*** **C.Agardh ex Gomont (Plate 3.4; Fig. B)**

http://protist.i.hosei.ac.jp/PDB/Images/Prokaryotes/Oscillatoriaceae/Oscillatoria/curviceps/sp 01.html; Desikachary, 1959, pg. 20, pl. 38: Fig. 2

Trichome straight, yellowish green colour, 9.4-10.2 µm wide; cells 1.5-3 µm, Cross walls not constricted, end cells rounded, not attenuated and calyptra absent.

39. ***Oscillatoria limosa*** **(C. Agardh) Gomont (Plate 3.4; Fig. C)**

Desikachary, 1959, pg. 206, pl. 42, Fig. 11

Trichome dark olive green, only slightly curved, cells 16-18 µm wide and 2-4 µm wide. End cells slightly narrow and broadly round, cell walls slightly constricted and granulated.

40. ***Oscillatoria perornata*** **Skuja (Plate 3.4; Fig. D)**

Desikachary, 1959, pg. 205, pl.41, Fig. 8,9,18

Trichome yellowish green in colour, straight or slightly curved, 12-12.5 µm wide, cells 4.3-4.8 µm long. Cells not attenuated, apex rounded. Cross walls constricted, cells finely granulated and calyptra absent.

41. ***Oscillatoria princeps*** **Vaucher ex Gomont (Plate 3.4; Fig. E)**

Desikachary, 1959, pg. 210, pl. 37, Fig. 1, 10, 11, 13, 14; John et al. 2002, pg.75,

Trichome straight, brownish green in colour with no constriction at cross walls. Trichome 14-19 µm wide; cells 3.8-6.5 µm long and apices slightly capitate.

42. *Oscillatoria raoi* **De Tani, J (Plate 3.4; Fig. F)**

Desikachary, 1959, pg. 223, pl. 42, Fig. 16-19

Trichome straight or slightly curved, dark green in colour and 5-7.8 µm wide. cells 6-9.5 µm long, not attenuated, end cells round; Cross walls not constricted, granules present.

43. *Oscillatoria rubescens* De Candolle ex Gomont (Plate 3.4; Fig. G)

Desikachary, 1959, pg. 235, pl.42, Fig. 12

Trichome slightly curled, 6-6.2 µm wide and cells 2.5-4.5 µm long; not constricted in cross walls and end cells slightly attenuated.

44. *Oscillatoria subbrevis* Schmidle (Plate 3.4; Fig. H)

Desikachary, 1959, pg. 207, pl.37: Fig. 2; pl. 40: Fig. 1

Trichome straight, dark green in colour and 6.5-7.3 µm wide. Cells 1.4-2.5 µm long, not attenuated, end cells rounded and calyptra is absent; Cross walls not constricted,

45. *Oscillatoria tenuis* C.A. Agardh (Plate 3.4; Fig. I)

Prescott, 1951, pg. 491, pl. 110: Fig. 8,9,14

Trichiome straight, dark green in colour, 4.5-5 µm wide. Cells 1.7- 3.3 µm long, granular, apex not attenuated, not capitates andcalyptras is absent; cell walls slightly constricted,

46. *Oscillatoria vizagapatensis* C.B.Rao (Plate 3.4; Fig. J)

Desikachary, 1959, pl. 3: Fig. 32

Trichome green, straight or slightly curved, 1.3-2 µm long. Cells are granular; end cells forms a cap.Cross walls not constricted.

Genus *Phormidium*

47. *Phormidium ambiguum* Gomont (Plate 3.4; Fig. K)

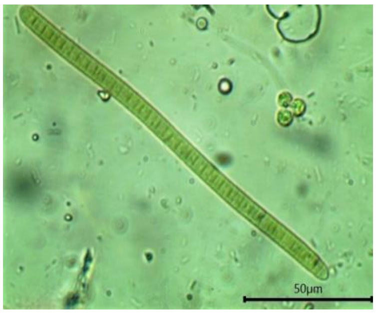
		
A. *Oscilatoria chlorine* Kiitz. ex Gomont	B. *Oscillatoria curviceps* C. Agardh ex Gomont	C. *Oscillatoria limosa* (C. Agardh) Gomont
		
D. *Oscillatoria perornata* Skuja	E. *Oscillatoria princeps* Vaucher ex Gomont	F. *Oscillatoria raoi* De Tani, J
		
G. *Oscillatoria rubescens* De Candolle ex Gomont	H. *Oscillatoria subbrevis* Schmidle	I. *Oscillatoria tenuis* C. A. Agardh
		
J. *Oscillatoria vizagapatensis* C. B. Rao	K. *Phormidium ambiguum* Gomont	L. *Phormidium favosum* Gomont

Plate-3.4 (Scale bar: Fig. A-F, H-L- 10 µm; G-50 µm)

Desikachary, 1959, pg. 266, pl.44: Fig. 16

Trichome slightly curved, dark green in colour, 5.2-8.4 µm wide. Cell 2.2-3.2 µm wide, end cell rounded, not capitates and a thin sheath is present.

48. ***Phormidium favosum*** **Gomont (Plate 3.4; Fig. L)**

John et al. 2002, pg. 79, pl. 12: Fig. L

Trichome yellowish green, attenuated towards the apices, 7- 8.6 µm wide. Cells 3-5.5 µm long, cells forms a conical calyptras and cross walls is not constricte.

49. ***Phormidium pachydermaticum*** **Fremy (Plate 3.5; Fig. A)**

Kumar and Jahingir (2018) pg. 13: Fig. 1

Trichome straight, blue green in colour and 6.1 µm wide. Cells 2.3-3 µm long;end cells slightly conical, calyptra is absent and cross wall is not constricted.

50. ***Phormidium stagnina*** **Rao (Plate 3.5; Fig. B)**

Desikachary. 1959, pg. 265, Pl. 45, Fig: 16-18

Trichome straight, yellowish green in colour and thin membrane is present. Cells are 9-12.3 µm wide and 1.2-2 µm long. Crosswalls granulated and mostly not constricted, end cells not attenuated.

51. ***Phormidium*** **sp. Kiitzing ex Gomont (Plate 3.5; Fig. C)**

Desikachary, 1959,pg. 250

Trichome slightly curved, blue green in colour, 6-7 µm wide and 6-10 µm long. Cells not constricted, end cells are rounded and calyptra is absent Sheath thin, colourless.

Order Spirulinales

Family Spirulinaceae

Genus *Glaucospira*

52. ***Glaucospira agilissima*** **Lagerheim (Plate 3.5; Fig. D)**

http://galerie.sinicearasy.cz/galerie/cyanobacteria/jeddnoduche-vlaknite-simple-trichal/glaucospira?image_id=14323

Trichome cylindrical, loosely coiled and 11- 1.4 µm wide; sheath is absent.

Genus *Spirulina*

53. ***Spirulina nodosa*** **Schiller (Plate 3.5; Fig. E)**

Das and Adhikary, 2014, pg. 52, pl. 2: Fig. 20

Trichome greenish in colour, 3.8- 5.3 µm wide, spiral and loosely coiled.

54. ***Spirulina laxissima*** **West, G.S. (Plate 3.5; Fig. F)**

Desikachary, 1959, pg. 196, pl. 36: Fig. 5

Trichome small, 0.7-0.8 µm wide, spiral loosely coiled; coiling 5.5-7.5 µm distant from each other.

Order Synechococcales

Family Merismopediaceae

Genus *Aphanocapsa*

55. ***Aphanocapsa grevillei*** **(Berkeley) Rabenhorst(Plate3.5;Fig.G)**

Prescott 1951, pg. 454, pl. 101: Fig. 15-16; Desikachary 1959, pg. 134, pl.21:Fig. 9

Microscopic spherical colony, 82-88 µm in diameter which is made up of numerous cells that are irregularly distributed and embedded in a gelatinous sheath; Cells 2-4 µm in diameter.

56. ***Aphanocapsa*** **sp. Nageli (Plate 3.5; Fig. H)**

Desikachary, 1959, pg. 130

Coenobia made up of numerous cells embedded in a gelatinous colony. Cells cylindrical to ellipsoidal in shape, 4.8-5.6 µm wide and 9.4- 12 µm long; cells without individual sheath.

Genus *Merismopedia*

57. *Merismepodia elegans* A.Braun ex Kützing (Plate 3.5; Fig. I)

Desikachary, 1959, pg. 156, pl. 29: Fig. 9

Colonies 16- 44 celled, embedded in a muciligenous sheath, closely arranged and mostly in perpendicular rows. Cells are subspherical in shape, 4- 4.6 µm long and 4.8-5.6 µm wide.

Family Pseudanabaenaceae

Genus *Pseudanabaena*

58. *Pseudanabaena catenata* Lauterborn (Plate 3.5; Fig. J)

John et al. 2002, pg.84, pl. 13: Fig. A

Filaments are small and unbranched. Cells cylindrical in shape, longer than wide, 4.5-6.7 µm long and 1.7-3.4 µm wide; conspicuous constriction at the cross wall almost apprearing seperated, End cells rounded

Genus *Lemmermaniella*

59. *Lemmermaniella terrestris* Gama Jr. (Plate 3.5; Fig. K)

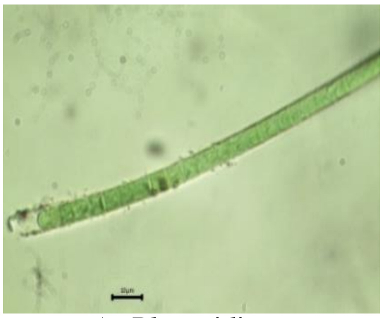
Junior et al. 2012, pg. 320: Fig. 2-8

Colonies made up of hollow and spherical cells; sheath gelatinous and inconspicuous. Cells are ellipsoid in shape, 3-7 µm long and 2-3 µm wide.

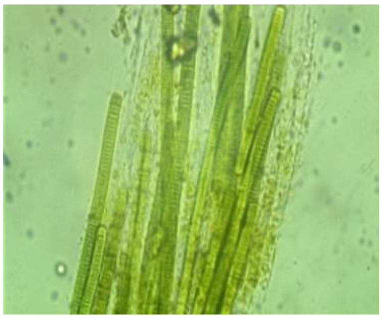
Order Synechococcales

Family Synechococcales familia incertae sedis

Genus *Schizothrix*



A. *Phormidium pachydermaticum* Fremy



B. *Phormidium stagnina* Raoi

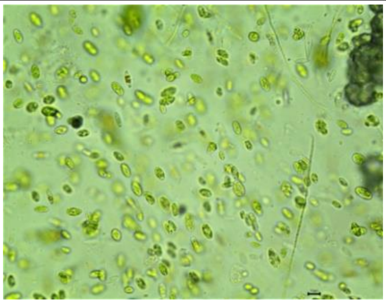
C. *Phormidium* spp. Kiitzing ex Gomont

D. ***Glaucospira agilissima* Lagerheim**

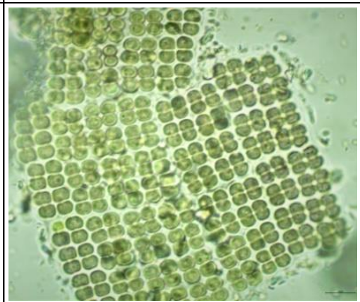
E. ***Spirulina nodosa* Schiller**

F. ***Spirulina laxissima* West, G.S.**

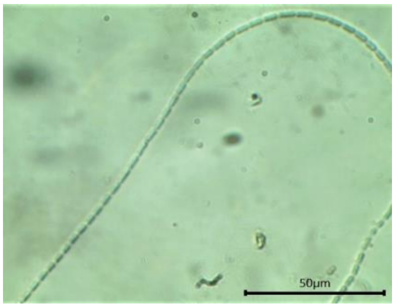
G.***<u>Aphanocapsa</u> grevillei* (Berkeley) RAbenhorst**



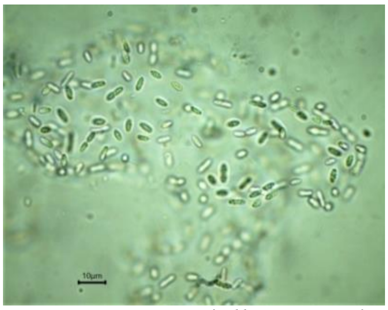
H. ***Aphanocapsa* spp. Nageli**



I. ***Merismepodia elegans* A.Braun ex Kützing**



J. *Pseudanabaena catenata* Lauterbor



K. *Lemmermaniella terrestris* Gama Jr.

L. *Schizothrix telephoroides* Gomont

Plate-3.5 (Scale bar: Fig. A-H, K-L- 10 µm; J-50 µm)

60. ***Schizothrix telephoroides*** **Gomont (Plate 3.5; Fig. L)**

Desikachary, 1959, pg. 330, pl. 57: Fig. 8

Trichome drak green in colour, cells cylindrical, 5-5.5 µm wide and cells 7.5- 9 µm long. End cells rounded and cross walls are constricted.

Phylum Bacillariophyta

Subphylum Bacillariophytina

Class Bacillariophyceae

Subclass Bacillariophycidae

Order Bacillariales

Family Bacillariaceae

Genus *Hantzschia*

61. ***Hantzschia amphioxys (*****Ehrenberg) (Plate 3.6; Fig. A)**

Kihara et al. 2015, pg. 26: Fig. 111

Valves linear, 50-60 µm long and 9-12 µm wide, apex round with sub-capitate ends and5-6.5 µm wide; Dorsal side convex, ventral side having depression in the middle; 7 straie present in 10 µm.

62. ***Hantzschia*** **sp. Grunow (Plate 3.6; Fig. B)**

https://diatoms.org/genera/hantzschia

Valves in girdle view which are rectangular shape, 103 µm long and 28.6 µm wide. Striae slightly radiate in the mid region and slightly convergent towards the apices, 8 striae are present in 10 µm.

Genus *Nitzschia*

63. ***Nitzschia clausii*** **Hantzsch (Plate 3.6; Fig. C)**

Taylor et al, 2002, pl. 147

Valves linear sigmoid with rounded end, 39.7 µm long and 3.1 µm wide; 10 striae are present in 10 µm.

64. ***Nitzschia nana*** **Grunow (Plate 3.6; Fig. D)**

Kihara et al. 2015, pg. 29: Fig 172

Valves are linear, sigmoid in shape; 46.45 µm long and 4.4 µm wide. The apices are rounded andcapitate.

65. ***Nitzschia linearis*** **W.Smith (Plate 3.6; Fig. E)**

https://www.biodiversidadvirtual.org/micro/Nitzschia-linearis-img1511.html;

Kihara et al. 2015, pg. 29: Fig 172

Valves are elongate, linear, 100.8 µm long and 8.5 µm wide. A slight constriction present at the centre of the valve; 9 striae are present in 10 µm.

66. ***Nitzschia palea (Kützing) W.Smith*** **(Plate 3.6; Fig. F)**

https://diatoms.org/species/nitzschia_palea

Valves are narrow lanceolate, 18-21.5 µm long and 4- 4.4 µm wide with tapering ends which are slightly capitate.

67. ***Nitzschia recta*** **Hantzsch (Plate 3.6; Fig. G)**

Taylor et al. 2007, pl. 145

Valves are linear lanceolate, ends are capitates, tapers towards the apex, 40.6 µm long and 5.9 µm wide. Fibulae density 10 in 10 µm

68. Nitzschia sigma (Kiitzing) W. Smith (Plate 3.6; Fig. H)

Taylor et al. 2007, pl. 149

Valves are slender, linear and sigmoid; valves 104 µm long and 11.4 µm wide. Apices are sub rostrate.

69. Nitzschia sigmoidea (Nitzsch) W.Smith (Plate 3.6; Fig. I)

https://diatoms.org/species/nitzschia_sigmoidea/guide

Valves sigmoid, 98.8 µm long and 9.9 µm wide, attenuated towards the apices. Striae parallel throughout; 6 striae are present in 10 µm.

70. ***Nitzschia vermicularis*** **(Kützing) Hantzsch (Plate 3.6; Fig. J)**

Tiffany and Britton, 1952, pg. 286, pl.76: Fig. 89

Valves sigmoid in girdle view, 160-162 µm long, 9- 10 µm wide having wide and almost, flat apex, Faint striae visible, 8 striae are present in 10 µm

Order Cocconeidales

Family Achnanthidiaceae

Genus *Achnanthidium*

71. ***Achnanthidium eutrophilum*** **(Lange-Bertalot) Lange-Bertalot (Plate 3.6; Fig. K)**

https://diatoms.org/species/achnanthidium_eutrophilum

Valves linear-elliptic, 17.3 µm long and 4.6 µm wide with slightly cunate apex. Striae radiate; 12-13 striae are present in 10 µm. Central striae more distant and distinct from the rest.

72. ***Achnanthidium latecephalum*** **H.Kobayasi (Plate 3.6; Fig. L)**

https://diatoms.org/species/achnanthidium_latecephalum

Valves small and linear-lanceolate, 14 µm long and 5 µm wide; apices sub-capitate.

73. ***Achnanthidium minutissima*** **(Kützing) Czarnecki (Plate 3.7; Fig. A)**

Taylor et al. 2007, pl. 24

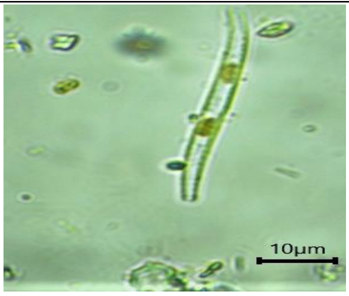
Valves clavate, 23.5 µm long and 6 µm wide. Striae radiate, 12 striae are present in 10 µm.

74. ***Achnanthidium nanum*** **M.H.Novais& I. Jüttner (Plate 3.7; Fig. B)**

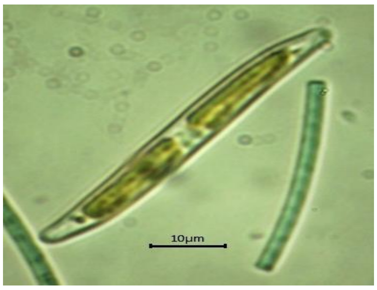
https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=4297; Novaiset al. 2015, pg.121, Fig. 175–258

A.Hantzschia amphioxys (Ehrenberg) Grunow

B. *Hantzschia* spp. Grunow

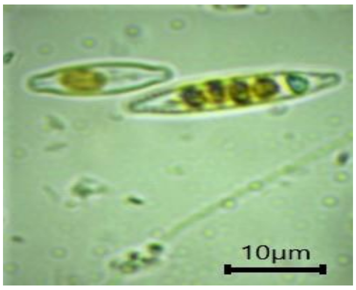


C. *Nitzschia clausii* Hantzschi



D. *Nitzschia nana* Grunow

E. *Nitzschia linearis* W.Smith

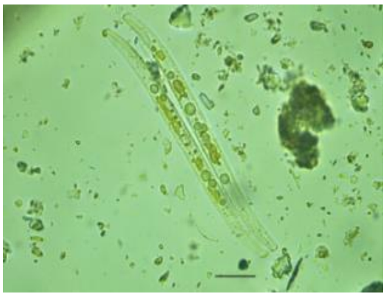


F. *Nitzschia Palea* (Kützing) W.Smith

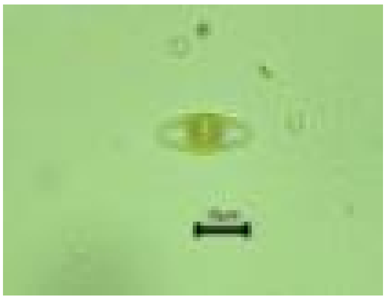
G. *Nitzschia recta* Hantzsch

H. *Nitzschia sigma* (Kützing) W. Smith

I. *Nitzschia sigmoidea* (Nitzsch) W. Smith



J. *Nitzschia vermicularis* (Kützing) Hantzsch



K. *Achnanthidium eutrophilum* (Lange-Bertalot) Lange-Bertalot

L. *Achnanthidium latecephalum* H. obayasi

Plate-3.6 (Scale bar: 10 μm)

Valves small, elliptic in shape, 12.5 µm long and 4.08 µm wide with broadly rounded apices.

75. ***Achnanthidium neotropicum*** **Krahn & C.E.Wetzel in Krahn & al.(Plate 3.7; Fig. C)**

Krahn et al. pg.91, Fig.3-35, 86-88

Valves 17.05 µm long and 2.5 µm wide, rectangular shape and bend in the mid region.

76. ***Achnanthidium*** **sp. Kiitzing (Plate 3.7; Fig. D)**

https://diatoms.org/genera/achnanthidium

Valves elliptic, 25.5 µm long and 8.3 µm wide, apices broadly rounded. Not protracted.

Family Achnanthidiaceae

Genus ***Lemnicola***

77. ***Lemnicola hungarica (*****Grunow) Round and Basson (Plate 3.7; Fig. E)**

Leira et al. 2017, pg. 9, Fig 4:c

Valves linear elliptic, tapering towards apices which are subrostrate, valves 33.5 µm long and 13 µm wide.

Family Achnanthidiaceae

Genus ***Planothidium***

78. ***Planothidium lanceolatum*** **(Brébisson ex Kützing) Lange-Bertalot (Plate 3.7; Fig. F)**

https://diatoms.org/species/planothidium_lanceolatum

Valves are lanceolate to elliptic with rounded apex; 25.4 µm long and 8.2 µm wide. Striae radiate and 12 striae are present in 10 µm.

Order Cocconeidales

Family Cocconeidaceae

Genus *Cocconeis*

79. *Cocconeis pediculus* Ehrenberg (Plate3.7; Fig.G)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=3340;https://diatoms.org/species/cocconeis_pediculus

Valves broadly elliptic, 14.7 µm long and 18.3 µm wide with pointed apices.

80. *Cocconeis placentula* var *euglypta* Ehrenberg (Plate 3.7; Fig. H)

Morales and Vis, 2007, pg. 126, Fig. 89-90

Valves are elliptic to linear-elliptic, 29.3 µm long and 17.08 µm wide. The areolae form slightly irregular and curved longitudinal lines.

81. *Coconeis* sp. Ehrenbergii (Plate 3.7; Fig. I)

https://diatoms.org/genera/cocconeis

Valves small, elliptic, 19 µm long and 10.5 µm wide with pointed ends.

Order Cymbellales

Family Cymbellaceae

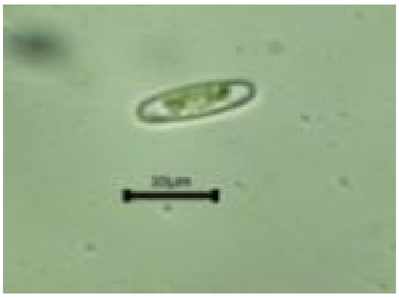
Genus *Brebissonia*

82. *Brebissonia lanceolata* (C. Agardh) Mahoney & Reimer (Plate 3.7; Fig. J)

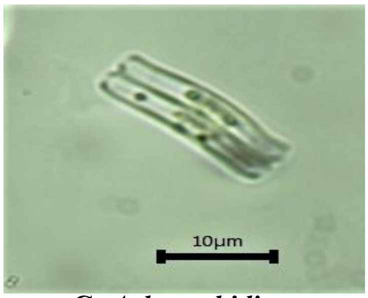
https://diatoms.org/species/brebissonia_lanceolata;Das and Adhikary, 2014, Pg. 258, pl. 19: Fig. 27

Valves are long, slender and lanceolate, 134.8 µm long and 15.4 µm wide; apices broadly rounded and 3 µm wide. Striae radiate throughout; 9-10 striae are present in 10 µm.

A. *Achnanthidium minutissima* (Kützing) Czarnecki

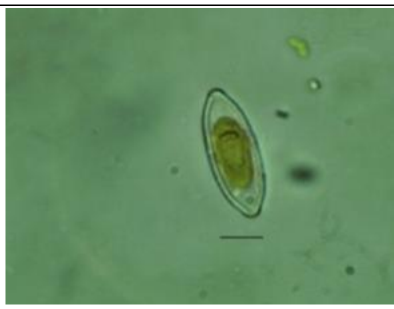


B. *Achnanthidium nanum* M.H.Novais & I. Jüttner

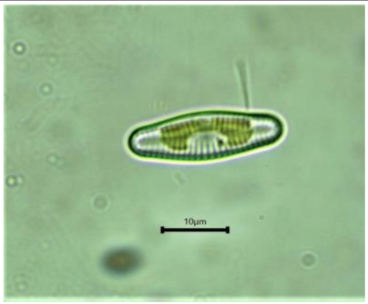


C. *Achnanthidium neotropicum* Krahn & C. E. Wetzel in Krahn & al.

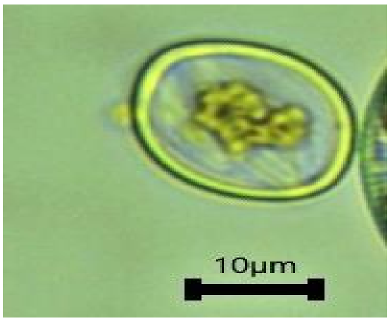
D. *Achnanthidium* sp. E. Kiitzing



E. *Lemnicola hungarica (*Grunow) Round and Basson

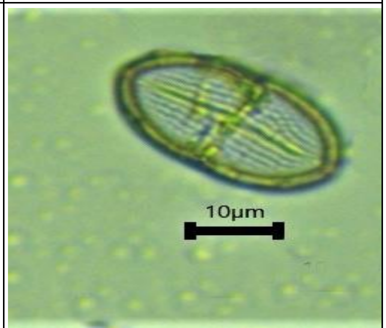


F. *Planothidium lanceolatum* (Brébisson ex Kützing) Lange-Bertalot



G.*Cocconeis pediculus* Ehrenberg

H. *Cocconeis placentula* var. *euglypta* Ehrenberg



I. *Coconeis* spp. Ehrenbergii

J. *Brebissonia lanceolata* (C. Agardh) Mahoney & Reimer

K. *Cymbella affiniformis* Krammer

L. *Cymbella aspera* (Ehrenberg) Cleve

Plate-3.7 (Scale bar: 10 µm)

Genus *Cymbella*

83. *Cymbella affiniformis* Krammer (Plate 3.7; Fig. K)

https://diatoms.org/species/cymbella_affiniformis

Valves are dorsiventral, 38 µm long and 13 µm wide. Apices subrostrate which is 4µm wide. Striae are slightly radiate; 10 striae are present in 10 µm.

84. *Cymbella aspera* (Ehrenberg) Cleve (Plate 3.7; Fig. L)

https://diatoms.org/species/cymbella_aspera; Bahls et al. 2018, pg., 155 pl. 118, Fig.13

Valves dorsiventral, with rounded apices, 76-197 µm long and 32-37 µm wide. Valves have arched dorsal margin and slightly covex ventral margin with slight buldge in mid region. Striae radiate throughout; 9 striae are present in 10 µm in mid region and 11 striae are present in apex region.

85. *Cymbella cymbiformis* Agardh (Plate 3.8; Fig. A)

Taylor et al. 2007, pl. 103

Valves dorsiventral, 115.5µm long and 25µm wide. Dorsal margin strongly arched and ventral margin almost straight, slightly buldge in mid region. Apices broadly rounded, not protracted. Striae radiate and 10 striae are present in 10 µm.

86. *Cymbella excisa* Kützing (Plate 3.8; Fig. B)

Solak et al. 2016, pg. 954: Fig. 1-4

Valves dorsiventral, 18.6 µm long and 9 µm wide. Strongly arched dorsal margin and convex ventral margin excised. Apex rounded, striae radiate; 14 striae are present in 10 µm.

87. *Cymbella fontinalis* Bahls (Plate 3.8; Fig. C)

https://diatoms.org/species/cymbella_fontinalis

Valves lanceolate, 41.7µm long and 13.9 µm wide with rounded apex. Dorsal margin strongly arched, Ventral margin slightly convex. Striae radiate and 8-9 striae are present in 10 µm.

88. ***Cymbella kappii*** **(Cholnoky) Cholnoky (Plate 3.8; Fig. D)**

Taylor et al. 2007, pl. 107

Valves dorsiventral, 31.8 µm long and 12.2 µm wide with strongly arched dorsal side and slightly convex ventral side. Striae radiate and 8 striae are present in 10 µm

89. ***Cymbella neocistula*** **Krammer (Plate 3.8; Fig. E)**

https://diatoms.org/species/cymbella_neocistula

Valves are dorsiventral, with broadly rounded apices, 94.3 µm long and 21.3 µm wide, dorsal margin strongly arched and the ventral margin is concave with slight protrusion in the mid region. Apex rounded, 8 µm wide. Striae radiate in the mid region and convergent towards the apices; 10-11 striae are present in 10 µm.

90. ***Cymbella neoleptoceros*** **Krammer (Plate 3.8; Fig. F)**

https://diatoms.org/species/cymbella_neoleptoceros;Kihara et al. 2009, pg. 33: Fig.38

Valves are dorsiventral, 55.7 µm and 12.9 µm wide with rounded apices; dorsal margin is convex and ventral margin is swollen in mid region. Striae radiate and8 striae are present in 10 µm.

91. ***Cymbella tumida*** **(Brébisson) Van Heurck (Plate 3.8; Fig. G)**

https://diatoms.org/species/cymbella_tumida

Valves 38 µm long and 13 µm wide; valves dorsiventral with narrow rostrate to subrostrate apices and apex is 4 µm. The dorsal side is strongly convex and the ventral side is slightly convex. Striae radiate and 10 striae are present in 10 µm.

92. ***Cymbella*** **sp. C. Agardh (Plate 3.8; Fig. H)**

https://diatoms.org/genera/cymbella

Valves dorsiventral, 0.7 µm long and 10.8 µm wide. Dorsal margin strongly arched and ventral margin almost straight, slight bulge in mid region. Striae radiate and 17 striae are present in 10 µm.

Genus *Cymbopleura amphicephala*

93. *Cymbopleura amphicephala* (Nageli ex Kützing) Krammer (Plate 3.8; Fig. I)

https://diatoms.org/species/cymbopleura_amphicephala; Bahls et al. 2018, pg. 44, pl.7: Fig. 10-11

Valves dorsiventral, linear-lanceolate, 30.8 µm long and 9 µm wide. Apex 2.4-2.6 µm wide having rostrate ends which are slightly bended towards the ventral side.

94. *Cymbopleura inaequalis* (Ehrenberg) Krammer (Plate 3.8; Fig. J)

https://diatoms.org/species/cymbopleura_inaequalis

Valves are elliptic-lanceolate and slightly dorsiventral having strongly arched margins, 93 µm long and 33 µm wide. Ends sub-capitate, Striae radiate; 8 striae near the valves centre and 10-12 straie present in 10 µm near the apices.

95. *Cymbopleura naviculiformis* (Auerswald ex Heiberg) Krammer (Plate 3.8; Fig. K)

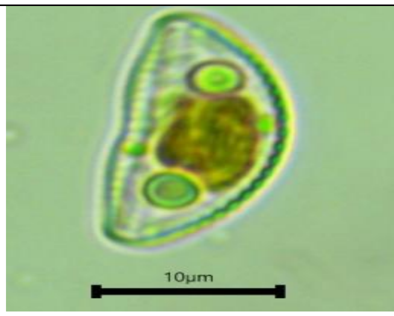
https://diatoms.org/species/cymbopleura_naviculiformis

Valves elliptic lanceolate, dorsiventral, 38-40 µm long, 11- 11.3 µm wide. Valves have strongly arched dorsal margin and a slightly convex to nearly flat ventral margin and a large rounded central area. Apices are rostrate to subcapitate and are 3.7-4.4 µm wide.

Genus *Oricymba*

96. *Oricymba subaequalis* Jüttner, Krammer, E.J.Cox, Van de Vijver & Tuji (Plate 3.8; Fig. L)

A. *Cymbella cymbiformis* Agardh



B. *Cymbella excisa* Kützing

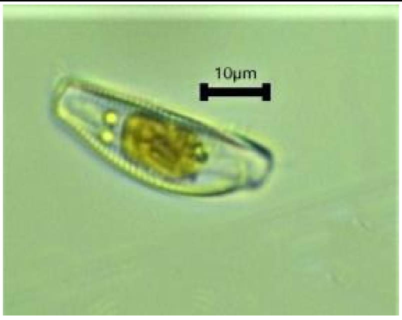
C. *Cymbella fontinalis* Bahls

D. *Cymbella kappii* (Cholnoky) Cholnoky

E. *Cymbella neocistula* Krammer

F. *Cymbella neoleptoceros* Krammer

G. *Cymbella tumidula* (Brébisson) Van Heurck

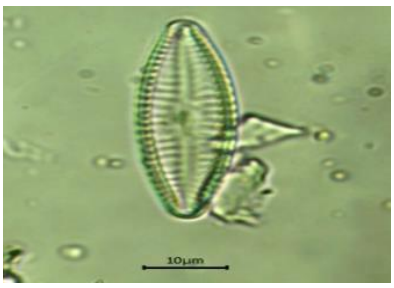


H. *Cymbella* spp. C. Agardh

I. *Cymbopleura amphicephala* (Nageli ex Kützing) Krammer

J. *Cymbopleura inaequalis* (Ehrenberg) Krammer

K. *Cymbopleura naviculiformis* (Auerswald ex Heiberg) Krammer



L. *Oricymba subaequalis* Jüttner, Krammer, E. J. Cox, Van de Vijver & Tuji

Plate-3.8 (Scale bar: 10 µm)

Jiittner et al. 2010, pg.411: Fig. 35-40

Valves lanceolate, dorsiventral, 39.8 µm long and 12.5 µm wide. Striae slightly radiate throughout; 7-8 striae are present in 10 µm.

Family Gomphonemataceae

Genus *Encyonema*

97. *Encyonema montana* Bahls (Plate 3.9; Fig. A)

https://diatoms.org/species/encyonema-montana

Valves have strongly arched dorsal side and slightly convex with a tumid center ventral side, 18.3 µm long and 7.3 µm wide. Striae radiate, 12 striae are present in 10 µm.

98. *Encyonema prostratum* (Berkeley) Kützing (Plate 3.8; Fig. B)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=3511

Valves are semi-lanceolate and dorsiventral, 36.1 µm long and 12.7 µm wide. Dorsal margin is strongly convex and ventral margin is slightly convex. Apex broadly rounded. Striae radiate and 11 striae are present in 10 µm.

99. *Encyonema silesiacum* (Bleisch) D.G. Mann (Plate 3.8; Fig. C)

Bahls et al, 2018, pl. 29: Fig. 1-6

Valves 23.9 µm long and 8.1-9µm wide having strongly arched dorsal side and almost flattened ventral side; apex rounded. Sriae radiate and 12- 14 striae are present in 10 µm.

100. *Encyonema sublungebertulotii* (Bleisch) D.G. Mann (Plate 3.8; Fig. D)

Cantonati and Lange-Bertalot, 2010, pg. 264:Fig.13-42

Valves dorsiventral, dorsal margin convex and ventral margin almost flattened, slightly convex in the mid region, 24.8 µm long and 10.6 µm wide. Striae parallel and slightly radiate in the mid region; 12 striae are present in 10 µm.

101. *Encyonema vulgare* Krammer (Plate 3.8; Fig. E)

Vouilloudet al. 2009, pg. 52:Fig. 21-26; Kihara et al. 2015, pg. 24: Fig. 62

Valves 33.7 µm long and 11 µm wide, Dorsal margin of valves convex and ventral margin almost flattened, slightly medial swelling in this side. Apices 2.9 µm wide, 10 striae are present in 10 µm, striae parallel.

Genus *Gomphoneis*

102. *Gomphoneis pseudo-okunoi* A. Tuji (Plate 3.8; Fig. F)

https://diatoms.org/species/gomphoneis_pseudookunoi

Valves clavate, rounded headpole, 26.1 µm long and 6.3 µm wide. Striae radiate and 12 striae are present in 10 µm.

Genus *Gomphonema*

103. *Gomphonema acuminatum* Ehrenberg (Plate3.8;Fig.G)

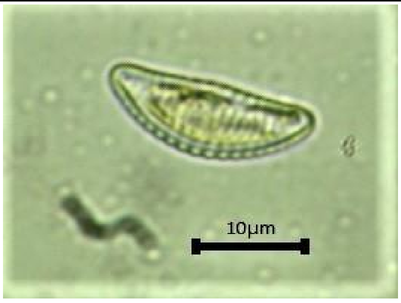
https://diatoms.org/species/gomphonema_acuminatum; Tiffany and Britton 1952, pg.72: Fig. 830

Valves clavate, 62 µm long and 16 µm wide with 2 constrictions along the margin; Valve broadens near the headpole forming sub capitate ends at the apex; footpole rounded. Striae radiate and 10 -12 striae are present in 10 µm.

104. *Gomphonema affine Kiitzing* (Plate 3.8; Fig. H)

Taylor et al. 2007, pl. 117

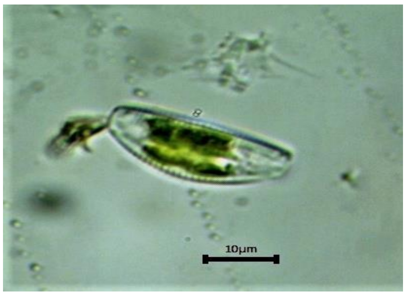
Valve lanceoate-clavate, heteropolar, 41-43 µm long and 9-10.1 µm wide with broadly rounded headpole; headpole is 3.8-4 µm and a narrower footpole is 3.3-3.5 µm wide. Striae radiate, not so evident; 11-12 striae are present in 10 µm.



A. ***Encyonema montana*** **Bahls**

B. *Encyonema prostratum* (Berkeley) Kützing

C. *Encyonema silesiacum* (Bleisch) D. G. Mann



D. *Encyonema sublungebertulotii* (Bleisch) D. G. Mann

E. *Encyonema vulgare* Krammer

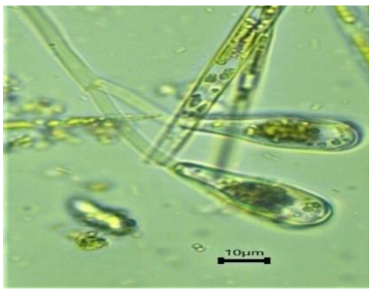
F.*Gomphoneis pseudo-okunoi* A. Tuji

G.***Gomphonema acuminatum*** **Ehrenberg**

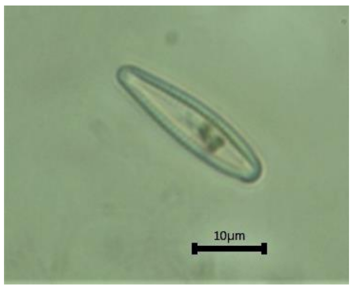
H. ***Gomphonema affine*** **Kiitzing**

I. ***Gomphonema gracile*** **Ehrenberg**

J. *Gomphonema lagenula* Kützing



K. *Gomphonema laticollum* E. Reichardt



L. *Gomphonema minutum* (C.Agardh) C. Agardh

Plate-3.8 (Scale bar: 10 μm)

105. *Gomphonema gracile* Ehrenberg (Plate 3.8; Fig. I)

Taylor et al. 2007, pl.125

Valves broadly lanceolate, 44.8 µm long and 10.2 µm wide, tapers towards both ends, apex rounded. Striae radiate, 12 striae are present in 10 µm.

106. *Gomphonema lagenula* Kützing (Plate 3.8; Fig. J)

Taylor et al. 2007, pl. 123

Valves elliptic lanceolate, 28.5 µm long and 10.2 µm wide with capitate apices.

107. *Gomphonema laticollum* E. Reichardt (Plate 3.8; Fig. K)

Taylor et al. 2007, pl. 120

Valves heteropolar, 34.5 µm long and 12.7 µm wide. Apices are broadly rounded with slight constriction below headpole.

108. *Gomphonema minutum* (C. Agardh) C. Agardh (Plate 3.8; Fig. A)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=2836; Bahls et al. 2018, pg. 48, pl. 8: Fig.8

Valves clavate, broadly rounded apex and tapering pool at the other end; valves 23.5 µm long and 6 µm wide. 12 striae are present in 10 µm.

109. *Gomphonema pumilum* var. *elegans* E. Reichardt& Lange-Bertalot (Plate 3.10; Fig. A)

Morales and Vis, 2007, pg.126: Fig. 204-212

Valves are clavate, 26.6 - 30.5 µm long and 5.5- 6.1 µm wide. Striae radiate and 12 striae are present in 10 µm.

110. *Gomphonema truncatum Ehrenberg* (Plate 3.10; Fig. B)

https://diatoms.org/species/gomphonema_truncatum

Valves heteropolar in girdle view, 42.60 µm long; valves are 19.3 µm wide at the wider end and 5 µm at the other end. Striae are weakly radiate throughout; 10-11 striae are present in 10 µm.

111. *Gomphonema ventricosum W. Gregory* (Plate 3.10; Fig. C)

https://diatoms.org/species/gomphonema_ventricosum

Valves are lanceolate-clavate, broadest at the center with rounded headpole and footpole; valves 37.2 µm long and 7.7 µm wide in mid region. Striae radiate and 11 striae are present in 10 µm.

112. *Gomphonema vibrio* Ehrenberg (Plate 3.10; Fig. D)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=4611; Jiitner et al. 2018, pg.3: Fig.17

Valves long, almost rectangular that tapers at one end; valves 71.2 µm long and 8.9 µm wide on one side and 5 µm wide in the narrower end.

Genus *Placoneis*

113. *Placoneis clementioides* (Hustedt) E.J. Cox (Plate 3.10; Fig. E)

http://www.algaterra.org/ATDB/Types/TypesMain.cfm?NameId=10916 /

Valves are elliptic-lanceolate in shape, 28.1 µm long and 10.8 µm wide with rostrate ends.

114. *Placoneis*spp. Mereschkowsky (Plate 3.10; Fig. F)

https://diatoms.org/genera/placoneis

Valves linear- elliptic, 24.8 µm long and 8.9 µm wide; apices are cunate and 3.7 µm wide.

Family Rhoicospheniaceae

Genus *Rhoicosphenia*

115. *Rhoicosphenia abbreviata* (C. Agardh) Lange-Bertalot (Plate 3.10; Fig. G)

https://diatoms.org/species/rhoicosphenia_abbreviata

Valves curved wedge-shaped in girdle view, 16.4 µm long and 4.4 µm wide. The narrow end of the cell is attached to larger algae.

Family Eunotiaceae

Genus *Eunotia*

Order Eunotiales

Genus *Eunotia*

116. *Eunotia bilunaris* (Ehrenberg) Schaarschmidt (Plate 3.10; Fig. H)

Leira et al. 2017, pg.8: Fig. 3a; Taylor et al. 2007, pl.20

Valves curved, slightly tapers at the ends, rounded apex, 30-50 µm long and 4- 5.5 µm wide; 18-19 striae are present in 10 µm.

117. *Eunotia epithemioides* Hustedt (Plate 3.10; Fig. I)

Cavalcante et al. 2014, pg. 5, Fig. 16-35

Valves rectangular in lateral view, 75.9 µm long and 22.3 µm wide; undulations are present at both sides of the valve. Striae slightly radiate; 12 striae are present in 10 µm.

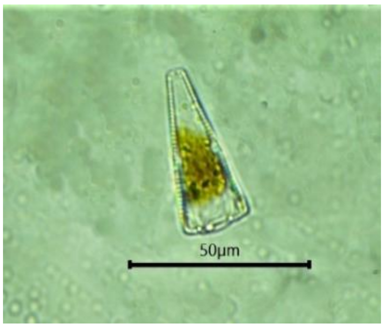
118. *Eunotia implicate* Norpel, Alles & Lange-Bertalot (Plate 3.10; Fig. J)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=2540; Leira et al. 2007, pg.11: Fig. 3f

Valves slightly arched with 2 weak undulations in dorsal margin, apices rounded and slighltly arched towards the dorsal margin; ventral margin is slightly concave, valves rectangular in girdle view, 49- 55 µm long and 9.2 µm wide in valve view and 15-19.3 µm wide in girdle view. Striae almost parallel, 8 striae are present in 10 µm.

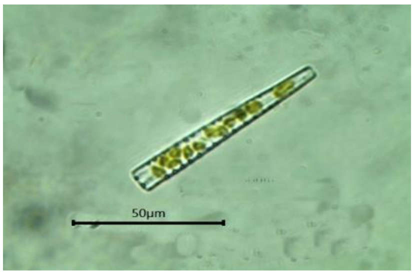
119. *Eunotia naegelii* Migula (Plate 3.10; Fig. K)

A. *Gomphonema pumilum* var. *elegans* E. Reichardt & Lange-Bertalot



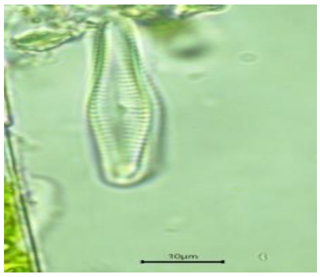
B. *Gomphonema truncatum* Ehrenberg

C. *Gomphonema ventricosum* W. Gregory

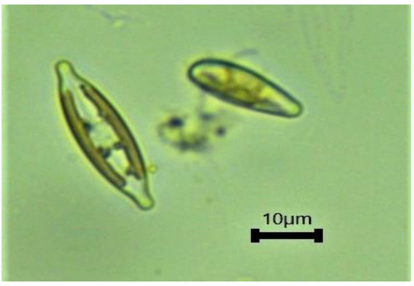


D.*Gomphonema vibrio* Ehrenberg

E. *Placoneis clementioides* (Hustedt) E. J. Cox

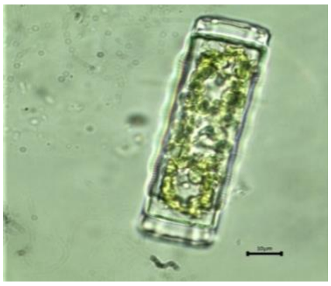


F. *Placoneis* spp. Mereschkowsky



G. *Rhoicosphenia abbreviata* (C. Agardh) Lange-Bertalot

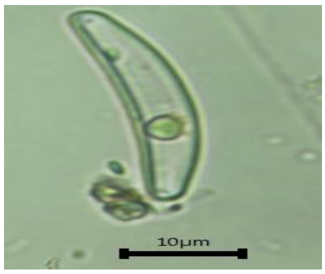
H. *Eunotia bilunaris* (Ehrenberg) Schaarschmidt



I. *Eunotia epithemioides* Hustedt

J. *Eunotia implicate* Norpel, Alles & Lange-Bertalot

K. *Eunotia naegelii* Migula



L. *Eunotia novaecaledonica* Gerd Moser

Plate-3.8 (Scale bar: 10 μm)

Glushchenko and Kulikovskiy, 2017, pg. 133, pl.2: Fig. 1-10; Kihara et al. 2009, pg. 95: Fig. 41

Valves 120.8 µm long and 3.7 µm wide with curved dorsal side and concave ventral side; Apices slightly curved towards dorsal side.

120. *Eunotia novaecaledonica* Gerd Moser (Plate 3.10; Fig. L)

Glushchenko and Kulikovskiy, 2017, pg. 131, pl.1: Fig. 33-39

Valves are 30-117.2 µm long and 5 -6.4 µm wide; valves with curved dorsal side and almost flat ventral side; nodules present near the apices on the ventral side.

121. *Eunotia paratridentula* Lange-Bertalot & Kulikovskiy (Plate 3.11; Fig. A)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=2542; Bahls et al. 2018, pl. 39: Fig. 5-6

Valves are 14.3 µm long and 4.2µm wide, slightly arched and have subcapitate apex; dorsal margin have 3 undulations and ventral margin have 2 undulations.

122. *Eunotia perminuta* (Grunow) R.M. Patrick (Plate 3.11; Fig. B)

https://diatoms.org/species/eunotia_paratridentula

Valves dorsiventral with 4 undulations, 19 µm wide and 5.6 µm wide; Valves dorsal margin is convex and ventral margin is slightly concave.

123. *Eunotia rhomboidea*Hustedt (Plate 3.11; Fig. C)

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=2398

Valves rhomboid in girdle view, 21.6 µm long and 9.4 µm wide; one apex is wider than the other.

124. *Eunotia serra* Ehrenberg (Plate 3.11; Fig. D)

https://diatoms.org/species/eunotia_serra; Kihara et al. 2009, pg. 96, pl. 95: Fig. 47

Valves arched, 78-84 µm long and 15-17 µm wide, dorsal margin with 14-15 bluntly pointed and evenly spaced undulations; Striae radiate and 13 striae are present in 10 µm.

125. ***Eunotia tridentula*** **Ehrenberg (Plate 3.11; Fig. E)**

Faustino et al. 2016, pg. 9: Fig. 67

Valves slightly arched with rounded apex, 21.8 µm long and 3.7 µm wide. Dorsal margin has 3 weak undulations and ventral margin is slightly concave.

Subclass Fragilariophycidae

Order Fragilariales

Family Fragilariaceae

Genus *Fragilaria*

126. ***Fragillaria capucina*** **Desmazières (Plate 3.11; Fig. F)**

Tiffany and Britton, 1952, pg. 234, pl. 62: Fig. 699; Taylor et al. 2007, pl. 15

Valves rectangular in girdle view, 78.7 µm long and 7.8 µm wide in mid region. Cells joined along the length of the cells forming ribbon like colonies; Ends slightly undulated due to raised costae; Striae slightly radiate and 45 striae are present in 10 µm.

127. ***Fragilaria mazamaensis*** **(Sovereign) Lange-Bertalot (Plate 3.11; Fig. G)**

https://diatoms.org/species/synedra_mazamaensis

Valves are lanceolate, 23 µm long and 7.3 µm wide with capitate apices and slight swelling in the middle region.

128. ***Fragilaria rumpens*** **(Kützing) G.W.F. Carlson(Plate 3.11; Fig. H)**

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=2549; Tuji and Williams, 2006, pg. 99: Fig. 4-6

Valves lanceolate, 24-61 µm long and 3-6 µm wide in valve view and 8 µm wide in girdle view. Valves tapers towards both ends.

129. *Fragillaria vaucheriae*(Kützing) J.B. Petersen(Plate 3.11; Fig. I)

https://diatoms.org/species/fragilaria_vaucheriae

Valves are rectangular in girdle view, 20-22 µm long and 4.2-5.4 µm wide. Valve face flat or slightly undulated due to raised costae. The valves are attached to each other on the shell surface along the length of the cell to form a band-shaped colony

Genus *Odontidium*

130. *Odontidium hyemale* (Roth) Kützing (Plate 3.11; Fig. J)

https://diatoms.org/species/odontidium_hyemalis; Jüttneret al. 2015, pg. 9-12: Fig. 32-33

Valves are rectangular in girdle view, 35.4 µm long and 11.2 µm wide; valves almost parallel.

131. *Odontidium mesodon* (Ehrenberg) Kirch(Plate 3.11; Fig. K)

https://diatoms.org/species/odontidium_mesodon

Cell rectangular shape in girdle view, 16-16.5 µm long and 10-11 µm wide; prominent costae with punctuate striation between the costae.

Family Staurosiraceae

Genus *Staurosira*

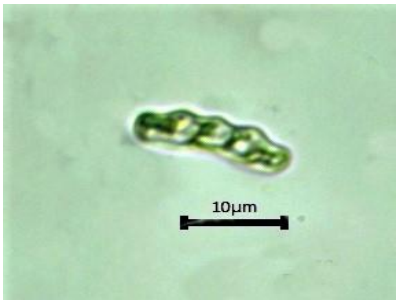
132. *Staurosira construens* Ehrenberg (Plate 3.11; Fig. L)

Taylor et al. 2007, pl. 17; https://diatoms.org/species/staurosira_construens

Valves cruciform, 22.2 µm long and 10 µm wide with rounded and sub capitate apex. Striae widely spaced.

Order Licmophorales

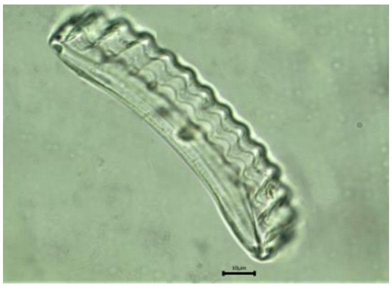
Family Ulnariaceae



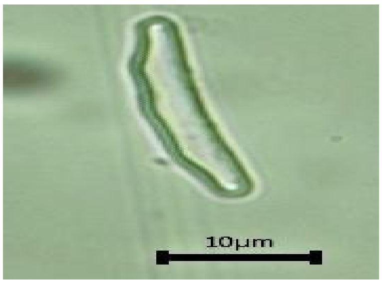
A. *Eunotia paratridentula* Lange-Bertalot & Kulikovskiy

B. *Eunotia perminuta* (Grunow) R.M.Patrick

C. *Eunotia rhomboidea* Hustedt

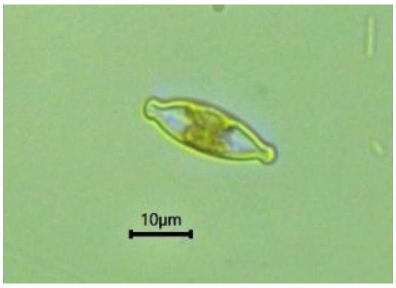


D. *Eunotia serra* Ehrenberg

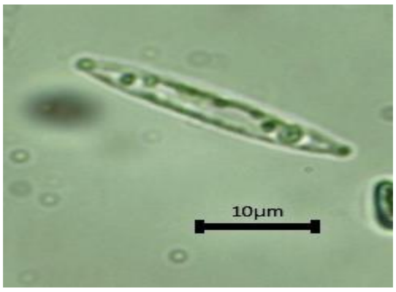


E. *Eunotia tridentula* Ehrenberg

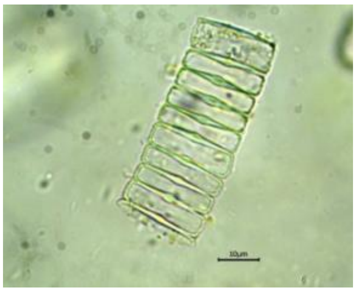
F. *Fragillaria capucina* Desmazières



G. *Fragilaria mazamaensis* (Sovereign) Lange-Bertalot

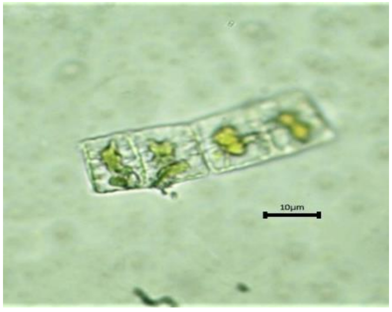


H. *Fragilaria rumpens* (Kützing) G. W. F. Carlson

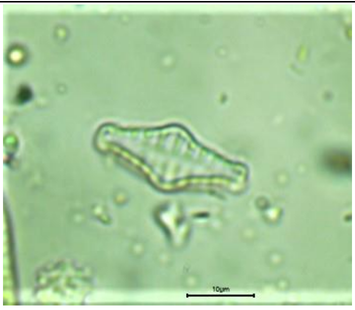


I. *Fragillaria vaucheriae* (Kützing) J. B. Petersen

J. *Odontidium hyemale* (Roth) Kützing



K. *Odontidium mesodon* (Ehrenberg) Kirch



L. *Staurosira construens* Ehrenbe rg

Plate-3.8 (Scale bar: 10 µm)

Genus *Hannaea*

133. *Hannaea inaequidentata* (Lagerstedt) Genkal & Kharitonov (Plate 3.12; Fig. A)

Lui and Williams, 2020, pg. 92: Fig. 40-69

Valves lanceolate, 52.07 µm long and 7.5 µm wide, slightly arcuate with capitate apices, ventral side have slight swelling and faint striae, 13 striae in 10 µm.

Order Licmophorales

Family Ulnariaceae

Genus *Ulnaria*

134. *Ulnaria acus (*Kützing) Aboal (Plate 3.12; Fig. B)

https://diatoms.org/species/ulnaria_acus

Valves long, narrow, lanceolate, 133.5 µm long and 4.8 µm wide. Apex 3.3 µm wide, 12 striae are present in 10 µm.

135. *Ulnaria biceps* (Kützing) Compère (Plate 3.12; Fig. C)

https://naturalhistory.museumwales.ac.uk/diatoms/Home.php/, Das and Adhikary, 2014, 218, 17:9

Cells are attached along the length of the cell forming a colony; valves rectangular in girdle view, 150-167µm long and 9-12 µm wide. Striae radiate and 12 striae are present in 10 µm.

136. *Ulnaria contracta* (Østrup) E.A. Morales& M.L. Vis (Plate 3.12; Fig. D)

https://diatoms.org/species/synedra_ulna_var._contracta

Valves linear, 104 µm long and 6µm wide; constricted central margin is visible apices sub-rostrate. Striae radiate and 9-10 striae are present in 10 µm.

137. *Ulnaria ulna* (Nitzsch) Compere (Plate 3.12; Fig. E)

https://www.inaturalist.org/taxa/496856-Ulnaria-ulna/browse_photos; https://www.biodiversidadvirtual.org/micro/Synedra-ulna-Ulnaria-ulna-img3885.html

Valves are linear, 160-170 µm long and 8-10.2 µm wide, not swollen in the middle. In valve view, we see the valve gradually tapering towards the apices and with slightly rounded apices, Striae are parallel throughout.

Order Mastogloiales

Family Achnanthaceae

Genus *Achnanthes*

138. *Achnanthes exigua*Grunow (Plate 3.12; Fig. F)

Das and Adhikary, 2014, pg., pl. 17: Fig. 35

Valves linear, elliptic in valves view, 37.3 µm long and 11 µm wide; 11 striae are present in 10 µm.

Family Mastogloiaceae

Genus *Mastogloia*

139. *Mastogloia smithii* var. *lacustris* Grunow (Plate 3.12; Fig. G)

Gaiser et al. 2010, pg. 106: Fig.4

Valves linear lanceolate, 46-50 µm long and 12.8-14.5 µm wide with subrostrate apices. Lateral margins not smooth, slightly undulated. 6-7 striae are present in 10 µm.

Order Naviculales

Suborder Neidiineae

Family Amphipleuraceae

Genus *Amphipleura*

140. *Amphipleura* sp. Kiitzing(Plate 3.12; Fig. H)

https://diatoms.org/genera/amphipleura

Valves narrow lanceolate, 138.3 µm long and 22.5 µm wide, apex rounded and 6.7 µm wide.

Genus *Frustulia*

141. *Frustulia* sp. Rabenhorst(Plate 3.12; Fig. I)

https://diatoms.org/genera/frustulia

Valves broad lanceolate, 100.6 µm long and 27.4 µm wide. Apices slightly protracted.

Genus *Diadesmis*

142. *Diadesmus confervacea* Kiitzing (Plate 3.12; Fig. J)

Taylor et al. 2007, pl. 58

Valves attached along the length of the cell forming long chains of colony; valves rectangular in valve view, 9.5-10.2 µm long and 5-5.6 µm wide.

143. *Diadesmis gallica* W. Smith (Plate 3.12; Fig. K)

Dahoumane, 2017, pg. 570: Fig. 10 a

Valves almost square in girdle view, 7.4-7.8 µm long and 6-6.2 µm wide. Cells attached along the length of the cell forming a chain.

Family Diploneidaceae

Genus *Diploneis*

144. *Diploneis calcilacustris* Lange-Bert. and Fuhrmann(Plate 3.12; Fig. L)

https://diatoms.org/species/diploneis-calcilacustris

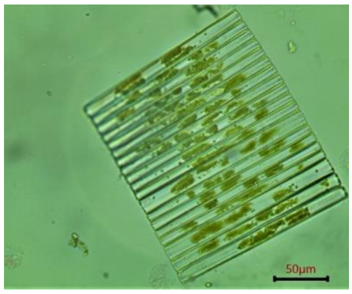
Valves elliptic, 24-47 µm long and 11-15 µm wide; having rounded ends. Striae radiate, 11-12 striae are present in 10 µm.

145. *Diploneis elliptica* (Kiitzing) Cleve(Plate 3.13; Fig. A)

https://diatoms.org/species/diploneis_elliptica

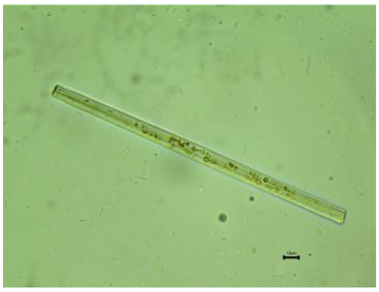
A. *Hannaea inaequidentata* (Lagerstedt) Genkal & Kharitonov

B. *Ulnaria acus* (Kützing) Aboal

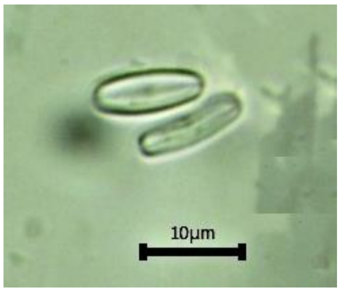


C. *Ulnaria biceps* (Kützing) Compère

D. *Ulnaria contracta* (Østrup) E.A.Morales & M.L.Vis



E. *Ulnaria ulna* (Nitzsch) Compere

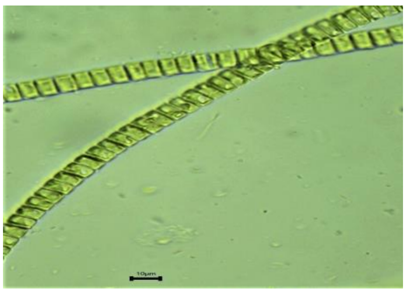


F. *Achnanthes exigua* Grunow

G. *Mastogloia smithii* var. *lacustris* Grunow

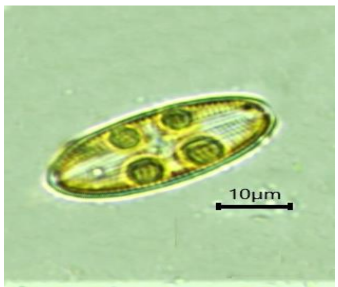
H. *Amphipleura* spp. Kiitzing

I. *Frustulia* spp. Rabenhorst



J. *Diadesmus confervacea* Kiitzing

K. *Diadesmis gallica* W.Smith



L. *Diploneis calcilacustris* Lange-Bert. and Fuhrmann

Plate-3.12 (Scale bar: Fig. A-B, D-L-10 µm; C-)

Valves elliptical with rounded apices, 67.1 µm long and 35.8 µm wide. Striae radiate throughout becoming strongly radiate at the apices, 6-7 striae are present in 10 µm. There is a prominent longitudinal centre line or rib, interrupted by an empty central area.

146. *Diploneis lusatica* Lange–Bertalot and Fuhrmann (Plate 3.13; Fig. B)

Lange–Bertalot and Fuhrmann, 2016, pg.163: Fig. 51-57

Valves are elliptic to oval with broad, round apices, 29.2 µm long and 20 µm wide. Striae radiate, 9 striae are present in 10 µm.

147. *Diploneis ovalis* (Hilse) Cleve(Plate 3.13; Fig. C)

https://diatoms.org/species/diploneis_ovalis1

Valves elliptical-ovoid shape, 22-25 µm wide and 33-39 µm long with round apices Longitudinal canal present along the central region of the cell. Striae radiate throughout and 9-11 striae are present in 10 µm.

148. *Diploneis puella* (Schumann) Cleve(Plate 3.13; Fig. D)

https://diatoms.org/species/diploneis-puella

Valves small, elliptical, 18.5 µm long and 10.3 µm wide with rounded apices. Striae radiate and 15-16 striae arepresent in 10 µm.

149. *Diploneis puellafallax* Lange-Bertalot & Fuhrmann (Plate 3.13; Fig. E)

https://diatoms.org/species/diploneis-puellafallax

Valves are linear elliptic, 21.2 µm long and11.1 µm wide. The raphe is straight having slightly expanded central area. Striae radiate and 12 sriae are present in 10 µm.

150. *Diploneis smithii* (Brebisson)Cleve(Plate 3.13; Fig. F)

Azovsky, 2013, pg. 504: Fig. 2a

Valves elliptic, 47.7 µm long and 26.1 µm wide,valves appear to be slightly turned.

Striae radiate and 8 striae are present in 10 µm.

151. ***Diploneis yatukaensis*** **Horikawa &H. Okuno (Plate 3.13; Fig. G)**

http://protist.i.hosei.ac.jp/PDB/Images/Heterokontophyta/Raphidineae/Diploneis/sp_2i.html

Valves are elliptic, 65.4 µm long and 35.06 µm wide. Striae are radiate throughout, strongly radiate towards the apices; 11-12 striae are present in 10 µm.

Family Naviculaceae

Genus *Caloneis*

152. ***Caloneis acuta*** **Z. Levkov & Metzeltin(Plate 3.13; Fig. H)**

http://symbiont.ansp.org/dntf/details.php?id=008098

Valves linear, 57.6 µm long and 12.2 µm wide; almost having parallel sides with tapering areas at the apex.

153. ***Caloneis silicula*** **(Grunow) T.Ohtsuja& Y.Fujita (Plate 3.13; Fig. I)**

Ohtsuka, 2002, pg. 26: Fig. 31

Valves linear, end cells rounded, central area has two small nodes the distal part of which curves towards each sides of the valve, 52.1 µm long and 10.2 µm wide.

154. ***Caloneis strelnikovae*** **Z. Levkov & D.M. Williams (Plate 3.13; Fig. J)**

Levkoz and Williams, 2014, pg. 152: Fig: 49-55

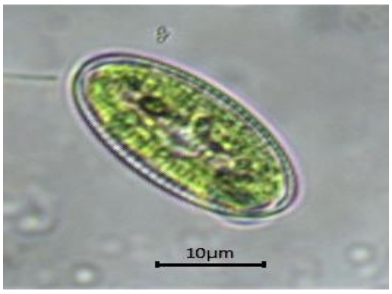
Valves have slightly convex sides and narrow tapering apex, 39.4 µm long and 13.3 µm wide.

Family Naviculaceae

Genus *Gyrosigma*

155. ***Gyrosigma acuminatum*****(Kützing) Rabenhorst(Plate 3.13; Fig. K)**

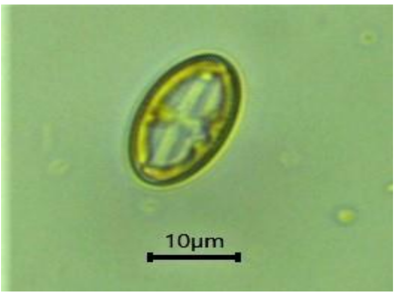
https://diatoms.org/species/gyrosigma_acuminatum; Taylor et al. 2007, pl. 35



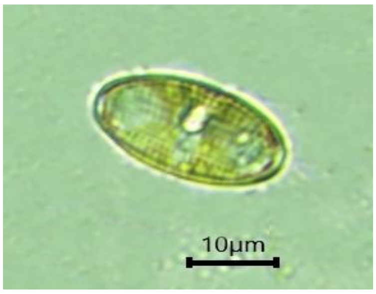
A. *Diploneis elliptica* (Kiitzing) Cleve

B. *Diploneis lusatica* Lange–Bertalot and Fuhrmann

C. *Diploneis ovalis* (Hilse) Cleve



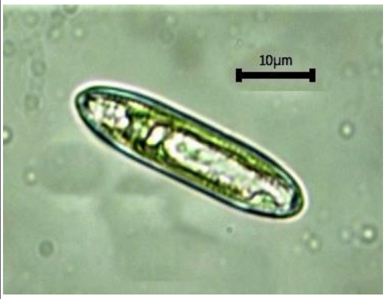
D. *Diploneis puella* (Schumann) Cleve



E. *Diploneis puellafallax* Lange-Bertalot & Fuhrmann

F. *Diploneis smithii* (Brebisson) Cleve

G. *Diploneis yatukaensis* Horikawa & H. Okuno



H. *Caloneis acuta* Z. Levkov & Metzeltin

I. *Caloneis silicula* (Grunow) T. Ohtsuja & Y. Fujita

J. *Caloneis strelnikovae* Z. Levkov & D. M. Williams

K. *Gyrosigma acuminatum* (Kützing) Rabenhorst

L. *Gyrosigma obtusatum* (Sullivant & Wormley) C. S. Boyer

Plate-3.13 (Scale bar:Fig. A-K- 10 µm; C-L 50 µm)

156. ***Gyrosigma obtusatum*** **(Sullivant & Wormley) C.S. Boyer(Plate 3.13; Fig. L)**

Sterrenburg, 1994, pg. 221: Fig. 13-15

Valves slightly sigmoid with slight attenuation towards the end having rounded ends; valves are 58 µm long and 13 µm wide.

157. ***Gyrosigma scalproides*** **(Rabenhorst) Cleve(Plate 3.14; Fig. A)**

Taylor, 2007, pl. 36

Valve is sigmoid, linear, 58 µm long and 9.6 µm wide. Apex with broadly rounded apices.

158. ***Gyrosigma*** **spp. Hassal(Plate 3.14; Fig. B)**

https://diatoms.org/genera/gyrosigma

Valves long, slender, spindle shape, 97.2 µm long and 5.4 µm wide. Valves attenuated towards acutely rounded apices

Family Naviculaceae

Genus *Navicula*

159. ***Navicula cryptocephaloides*** **Hustedt(Plate 3.14; Fig. C)**

https://diatoms.org/species/navicula_cryptocephaloides; Das and Adhikary, 2014, pg. 236, pl. 18: Fig. 18

Valves are lanceolate with rounded apex, 52 µm long and 15 µm wide. Straie radiate and widely spaced; 7-8 straie present in 10 µm.

160. ***Navicula erifuga*** **Lange-Bertalot in Krammer & Lange-Bertalot**

(Plate 3.14; Fig. D) Taylor, 2007, pl. 79; https://diatoms.org/species/navicula_erifuga

Valves are elliptic- lanceolate and apices are not protracted; 26.1 µm long and 5.8 µm wide.

161. ***Navicula lanceolata*** **Ehrenberg(Plate 3.14; Fig. E)**

https://diatoms.org/species/navicula_lanceolata

Valves lanceolate, with slightly subrostrate apices; 31 μm long and 8 μm wide.

162. ***Navicula peregrina*** **(Ehrenberg) Kützing (Plate 3.14; Fig. F)**

https://diatoms.org/species/navicula_peregrina

Valves lanceolate, 95.8 μm long and 21.1 μm wide with broadly rounded apex. Striae strongly radiate at the mid region and convergent at the apices; 7 striae are present in 10 μm**.**

163. ***Navicula radiosa*** **Kiitzing (Plate 3.14; Fig. G)**

https://diatoms.org/species/navicula_radiosa

Valves are lanceolate with brodly rounded apices, 57.9-59 μm long and 9-9.4 μm wide. Striae radiate in mid region and convergent towards the apices, 2 striae are present in 10 μm.

164. ***Navicula rhyncocephala*** **kibitzing(Plate 3.14; Fig. H)**

Taylor et al. 2007, pl. 71

Valves lanceolate, 45.5-73.6 μm long and 10.2-18 μm wide with slightly rostrate apices; apex 5-6.7 μm wide and 14 striae are present in 10 μm.

165. ***Navicula riediana*** **Lange-Bertalot and rumrich(Plate 3.14; Fig. I)**

Taylor et al. 2007, pl. 77

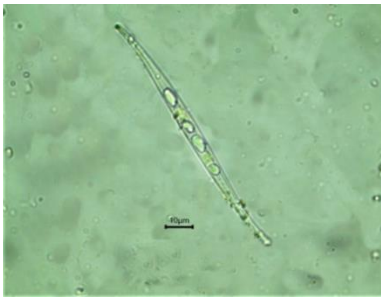
Valves are linear lanceolate, 45-50 μm long and 6.5-7.5 μm wide. Apices are weakly cunate.

166. ***Navicula rostellata*** **Kützing (Plate 3.14; Fig. J)**

https://diatoms.org/species/navicula_rostellata; Pandey et al. 2018, pg. 140: Fig. 8:d

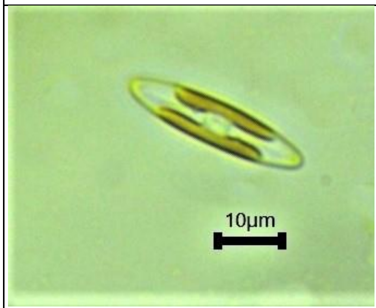
Valves linear lanceolate with subrostrate apices, 37.7 μm long and 11-12 μm wide; 10-11 striae are present in 10 μm

A. ***Gyrosigma scalproides*** **(Rabenhorst) Cleve**



B. ***Gyrosigma*** **spp. Hassal**

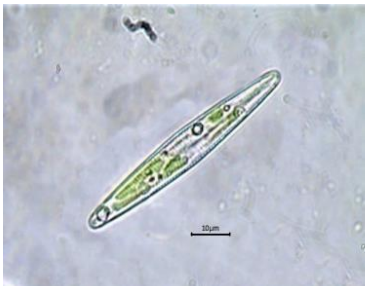
C. ***Navicula cryptocephaloides*** **Hustedt**



D. ***Navicula erifuga*** **Lange-Bertalot in Krammer & Lange-Bertalot**

E. ***Navicula lanceolata*** **Ehrenberg**

F. ***Navicula peregrina*** **(Ehrenberg) Kützing**



G. ***Navicula radiosa*** **Kiitzing**

H. ***Navicula rhyncocephala*** **Kibitzing**

I. ***Navicula riediana*** **Lange-Bertalot and Rumrich**

J. ***Navicula rostellata*** **Kützing**

K. ***Navicula symmetrica*** **R. M. Patrick**

L. ***Navicula veneta*** **Kiitzing**

Plate-3.14 (Scale bar: Fig. A, B, D-L- 10 µm; C-50-µm)

167. Navicula symmetrica R.M. Patrick (Plate 3.14; Fig. K)

https://diatoms.org/species/navicula_symmetrica; Taylor et al. 2007, pl. 81

Valves are linear lanceolate with narrow rounded apex, 36 µm long and 7.2 µm wide.

168. ***Navicula veneta*** **Kiitzing(Plate 3.14; Fig. L)**

Taylor et al. 2007, pl. 73

Valves linear-lanceolate, 10 µm long and 4.2 µm wide with sub rostrateapices.

169. ***Navicula viridula*** (Kützing) Ehrenberg **(Plate 3.15; Fig. A)**

https://diatoms.org/species/navicula_viridula

Valves are lanceolate to linear-lanceolate, narrow axial area with subrostrate apices, valves 27 µm long and 8.5 µm wide.

Family Naviculales incertae sedis

Genus *Kobayasiella*

170. ***Kobayasiella subtilissima***(Cleve) Lange-Bertalot**(Plate 3.15; Fig. B)**

https://diatoms.org/species/kobayasiella_subtilissima;Bahls et al. 2018, pl. 58: Fig.14-15

Valves are linear-lanceolate with capitate ends, 29.4 µm long and 7 µm wide.

Family Neidiaceae

Genus *Neidium*

171. ***Neidium affine*** (Ehrenberg) Pfitzer**(Plate 3.15; Fig. C)**

Silva-Lehmkuh et al, 2019: Fig. 3 AW-AX

Valves are linear elliptic, slightly convex lateral margins, 75.2 µm long and 23.6 µm wide with rostrate apices.

172. ***Neidium productum*** **(W. Smith) Cleve (Plate 3.15; Fig. D)**

Bahls et al. 2018, pg.106, pl. 69: Fig. 1

Valves linear elliptic, 61 µm long and 16 µm wide, apex subcapitate, 8 µm wide; 7 striae are present in 10 µm.

Suborder Sellaphorineae

Family Pinnulariaceae

Genus *Pinnularia*

173. ***Pinnularia appendiculata*** **(C. Agardh) Schaarschmidt (Plate 3.15; Fig. E)**

Ciniglia et al. 2007, pg. 33: Fig. 3 A-L

Valves linear-lanceolate, 37 µm long and 9 µm wide; valves gradually narrow toward the subcapitate apices.

174. ***Pinnularia borealis*** **Ehrenberg (Plate 3.15; Fig. F)**

https://diatoms.org/species/pinnularia_borealis; Taylor et al. 2007, pl. 87

Valves elliptic shape having broadly rounded apices, 31.7 µm long and 8.2 µm wide; Striae widely separated, radiate at the centre and convergent near the apices; 7 striae are present in 10 µm.

175. ***Pinnularia divergens*****W. Smith (Plate 3.15; Fig. G)**

Taylor et al. 2007, pl. 89

Valves linear, lanceolate, 49.7 µm long and 9.5 µm wide with weakly protracted apices. Striae radiate at the mid region and convergent towards the apices; 11 striae are present in 10 µm.

176. ***Pinnularia divergens var. mesoleptiformis*** **(Plate 3.15; Fig. H)**

Franca et al. 2017, pg. 31: Fig. 19

http://symbiont.ansp.org/dntf/details.php?id=047595

Valves linear-lanceolate with subcapitate apices with slightly triundultae sides; valves 143 µm long and 18.2 µm wide.

177. ***Pinnularia gigas*** **Ehrenberg (Plate 3.15; Fig. I)**

https://diatoms.org/species/pinnularia_gigas

Valves large, linear-elliptic, 43.5 µm wide and 249.2 µm long with broadly rounded apices and slightly convex sides. Striae radiate in the mid region and parallel towards the apices; 6-7 striae are present in 10 µm.

178. *Pinnularia latarea* Ohtsuka (Plate 3.15; Fig. J)

Kihara et al. 2015, pg. 30: Fig. 191

Valves linear, 47.9 µm long and 10.2 µm wide having capitates ends; apex 9.2 µm wide. Striae radiate throughout and convergent at the apices, 10-11 striae are present in 10 µm.

179. *Pinnularia sikkimensis* S.K. Das, Radhakrishnan, J.P. Kociolek&B. Karthick (Plate 3.15; Fig. K) Das et al. 2020, pg. 165: Fig. 2-21

Valves linear with slight triundulate margin, central undulation is slightly visible and lower than the other two. Valves 53.3 µm long and 10.7 µm wide, Apex are broadly rounded with strong capitate ends; apex 6.9 µm wide. Striae radiate in the central area and divergent at the apices.

180. *Pinnularia subanglica Krammer* (Plate 3.15; Fig. L)

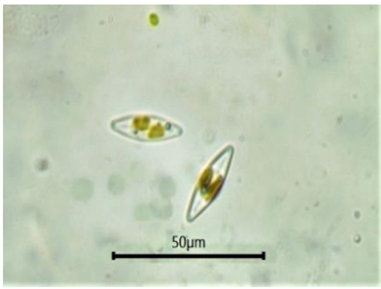
Kihara et al. 2015, pg. 31: Fig. 200

Valves linear, 42 µm long and 8.8 µm wide. Apices strongly capitates and 6.8 um wide; 14 striae are present in 10 µm.

181. *Pinnularia subgibba Krammer* (Plate 3.16; Fig. A)

Kiharaet al. 2015, pg.33: Fig. 209

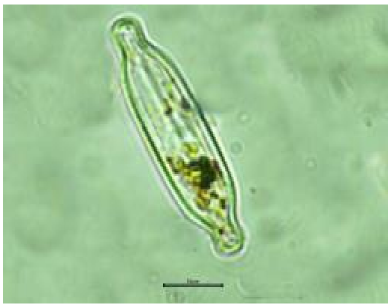
Valves linear, slightly convex sides, 80 -83 µm long and 9-11 µm wide; Apex rostrate, 12 µm wide; Striae radiate in the centre and convergent towards the apices, 9 striae are present in 10 µm.



A. *Navicula viridula* (Kützing) Ehrenberg

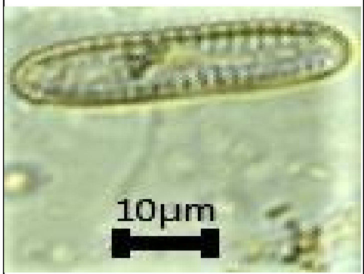
B. *Kobayasiella subtilissima* (Cleve) Lange-Bertalot

C. *Neidium affine* (Ehrenberg) Pfitzer



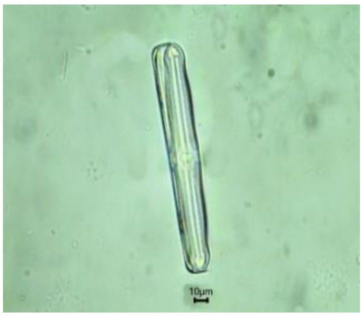
D. *Neidium productum* (W. Smith) Cleve

E. *Pinnularia appendiculata* (C. Agardh) Schaarschmidt



F. *Pinnularia borealis* Ehrenberg

G. *Pinnularia divergens* W. Smith



H. *Pinnularia divergens* var. *mesoleptiformis*

I. *Pinnularia gigas* Ehrenberg

J. *Pinnularia latarea* Ohtsuka

K. *Pinnularia sikkimensis* S. K. Das, Radhakrishnan, J. P. Kociolek & B. Karthick

L. *Pinnularia subanglica* Krammer

Plate-3.15 (Scale bar: Fig. A, B, D-L- 10 µm; C-50-µm)

182. ***Pinnularia viridiformis Krammer*** **(Plate 3.16; Fig. B)**

Taylor et al. 2007, pl. 91; Kihara et al, 2015, pg. 32: Fig. 207

Valve linear, slightly convex, 112 µm long and 19.6 µm wide with rounded ends. Striae radiate at the centre and slightly convergent towards the apices; 8 striae are present in 10 µm.

183. ***Pinnularia viridis*** **(Nitzsch) Ehrenberg (Plate 3.16; Fig. C)**

Kiharaet al. 2015, pg.32: Fig. 208; Taylor et al. 2007, pl. 92

Valves linear, oblong with slight medial swelling, 81-135 µm long and 19.6-29.4 µm wide; apex rounded and 18 µm wide; Striae radiate near the centre and convergent near the apices, 7-10 striae are present in 10 µm.

184. ***Pinnularia*** **sp. Ehrenberg (Plate 3.16; Fig. D)**

https://diatoms.org/genera/pinnularia

Valves linear-lanceolate, slightly tapers towards the apices which has slightly protracted apices. Valves are 41.6 µm long and 7 µm long wide; 12 striae are present in 10 µm.

Suborder Naviculineae

Family Pleurosigmataceae

Genus *Pleurosigma*

185. ***Pleurosigma*** **sp. W. Smith (Plate 3.16; Fig. E)**

https://diatoms.org/genera/pleurosigma

Valves linear- lanceolate, sigmoid, 70.4 µm long and 13.7 µm wide with acutely rounded apices.

Family Sellaphoraceae

Genus *Sellaphora*

186. ***Sellaphora seminulum*** **(Grunow) D. G. Mann(Plate 3.16; Fig. F)**

Wetze et al. 2015, pg.217: Fig. 158-171

Valves are broadly lanceolate, long and 4.5 µm wide with rostrate ends.

187. ***Sellaphora*** **sp. Mereschowsky(Plate 3.16; Fig. G)**

https://diatoms.org/genera/sellaphora

Valves linear elliptic, 18.9 µm long and 8.3 µm wide with broadly rounded apex. Apices not constricted.

Family Stauroneidaceae

Genus *Stauroneis*

188. ***Stauroneis anceps*** **Ehrenbergii (Plate 3.16; Fig. H)**

https://diatoms.org/species/stauroneis_anceps

Valves linear lanceolate, 71 µm long and 17 µm wide with narrow rostrate apices. Central canal is evident.

189. ***Stauroneis smithii*** **Grunow (Plate 3.16; Fig. I)**

Levkoz, 2016, pg. 168: Fig. 113

Valves linear-lanceolate, 24.4 µm long and 6.5 µm wide; valves have triundulate margins with acute subrostrate ends; middle undulation slightly wider than the other two.

190. ***Stauroneis*** **spp. 1 Ehrenberg(Plate 3.16; Fig. J)**

https://diatoms.org/genera/stauroneis

Valves broadly lanceolate, 127.4 µm long and 31.2 µm wide with only slightly protracted apices.

A. . *Pinnularia subgibba* Krammer

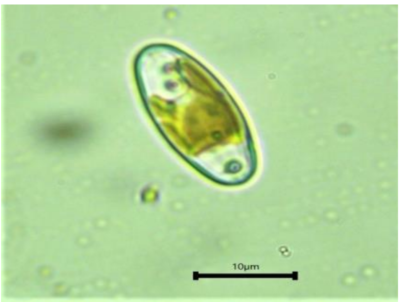
B. *Pinnularia viridiformis* Krammer

C. *Pinnularia viridis* (Nitzsch) Ehrenberg

D. *Pinnularia* spp.

E. *Pleurosigma* spp. W. Smith

F. *Sellaphora seminulum*

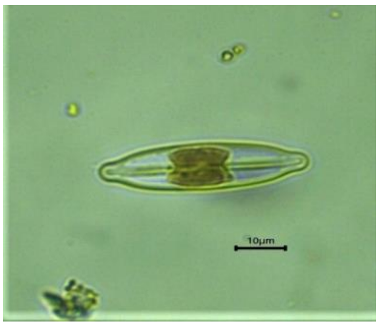


G. *Sellaphora* spp. Mereschowsky

H. *Stauroneis anceps* Ehrenbergii

I. *Stauroneis smithii* Grunow

J. *Stauroneis* spp. 1 Ehrenberg



K. *Stauroneis* spp. 2 Ehrenberg

L. *Epithemia sorex* Kützing

Plate-3.16 (Scale bar: Fig. A, B, D-L- 10 µm; C-50-µm)

191. ***Stauroneis*** **spp. 2 Ehrenberg (Plate 3.16; Fig. K)**

https://diatoms.org/genera/stauroneis

Valves lanceolate, 36-42.4 µm long and 10.8-11 µm wide with rostrate apices.

Order Rhopalodiales

Family Rhopalodiaceae

Genus *Epithemia*

192. ***Epithemia sorex*** **Kützing (Plate 3.16; Fig. L)**

Tiffany and Britton, 1952, pg. 281, pl. 75: Fig. 881

Valves are 42-55.8 µm long and 12-16.5 µm wide with rostrate apices wich is 6.4 µm wide. Dorsal side of valve convex, ventral side almost flattened. Striae radiate and6-7 striae are present in 10 µm.

Genus *Rhopalodia*

193. ***Rhopalodia gibba*** **(Ehrenberg) O. Müller (Plate 3.17; Fig. A)**

Taylor et al. 2007, pl. 132

Cells in girdle view, 60-77 µm long and 20-23 µm wide; central area of valves inflated, broad and flattened ends and apex are 6-8 µm wide. Striae parallel and 7 striae are present in 10 µm. Costae prominent and extend across the valve.

194. Rhopalodia gibberula (Ehrenberg) O. Müller (Plate 3.17; Fig. B)

Taylor et al. 2007, pl. 133

Valves are dorsiventral, 23-31.7 µm long and 10-12.2 µm wide. Dorsal margin is convex and ventral margin is straight, apices slightly curved; 15 striae are present in 10 µm and 5-6 fibulae are present in 10 µm.

Order Surirellales

Family Surirellaceae

Genus *Cymatopleura*

195. *Cymatopleura solea (*Brébisson) W. Smith (Plate 3.17; Fig. C)

Taylor et al, 2007, pl. 174

Valves are linear, 64.5 µm long and 14.3 µm wide with slight undulations at the sides. Apex slightly cunate and 7 fibulae present in10 µm.

Genus *Iconella*

196. *Iconella biseriata*(Brébisson) Ruck & Nakov (Plate 3.17; Fig. D)

Ohtsuka, 2002, pg. 51, pl. 256: Fig. 257

Valves are long-linear elliptic with tapering end on both ends; 149.5 µm long and 37.7 µm wide; 2-3 fibulae in 10µm.

197. *Iconella tchadensis* (Compère) C.Cocquyt& R.Jahn (Plate 3.17; Fig. E)

Jahn et al, 2017, pg.99: Fig. D

Valves are heteropolar, 89.3 µm long and 34.6 µm wide at the footpole and 10.6 µm wide at the headpole. Porca are radiate and regularly spaced.

Genus *Surirella*

198. *Surirella antioquiensis* Sala, Ramírez, Plata-Díaz & Vouillod (Plate 3.17; Fig. F)

Sala et al. 2013, pg. 21: Fig a-g

Valves lanceolate, 25.1 µm long and 13.3 µm wide with slight rostrate ends. Fibulae are radiate and moderately spaced.

199. *Surirella atomus* Hustedt (Plate 3.17; Fig. G)

https://diatoms.org/species/surirella_atomus

Valves are heteropolrar, 15 µm wide and 7.9 µm wide. Headpole broadly rounded and footpole narrow rounded; 10 fibulae in 10 µm

200. ***Surirella brebissonii*** **Krammer & Lange-Bertalot (Plate 3.17; Fig. H)**

https://diatoms.org/species/surirella_brebissonii

Valves are 29.6 µm long and 17.03 µm wide. Both headpole and footpole broadly rounded; large areolae present around the circumference of the valve.

201. ***Surirella capronioides*** **Gandhi(Plate 3.17; Fig. I)**

Karthick et al. 2014, pg. 87: Fig. 19-32

Valves heteropolar, ovate, 40 µm wide and 89 µm long; head pole rounded and foot pole narrowly rounded. Striae radiate and widely spcaed.

202. ***Surirella elegans*** **Ehrenberg (Plate 3.17; Fig. J)**

http://protist.i.hosei.ac.jp/PDB/Images/Heterokontophyta/Raphidineae/Surirella /elegans_03.html

Valves are heteropolar, linar elliptic, 169-230 µm long and 54.5- 56 µm wide. Apex ponited at footpole and rounded at headpole; fibulae density 2-3 in 10 µm.

203. ***Surirella linearis*** **f.** ***festetichii*** **(Pantocsek) Cleve-Euler (Plate 3.17; Fig. K)**

Bartozek et al. 2013, pg. 121:Fig. 142-143

Valves broad, linear and almost parallel in girdle view. Valvesare 190.2 µm long, headpole 50.4 µm wide and foot pole 46.7 µm wide; fibulae density is 3 in 10 µm.

204. ***Surirella roba*** **Leclercq (Plate 3.17; Fig. L)**

https://naturalhistory.museumwales.ac.uk/diatoms/browsespecies.php?-recid=3538; Leira et al. 2017, pg.8: Fig. 11 h

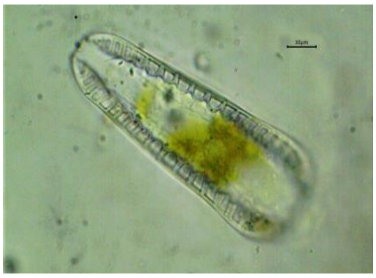
Valves isopolar, 44.3-96 µm long and 20.5-32 µm wide; symmetrical in valve view and almost rectangular in girdle view. Striae radiate throughout and 3 fibulae present in 10 µm

A. *Rhopalodia gibba* (Ehrenberg) O. Müller

B. *Rhopalodia gibberula* (Ehrenberg) O. Müller

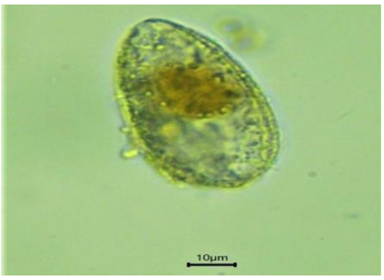
C. *Cymatopleura solea* (Brébisson) W. Smith

D. *Iconella biseriata* (Brébisson) Ruck & Nakov



E. *Iconella tchadensis* (Compère) C. Cocquyt & R. Jahn

F. *Surirella antioquiensis* Sala, Ramírez, Plata-Díaz & Vouillod



G. *Surirella atomus* Hustedt

H. *Surirella brebissonii* Krammer & Lange-Bertalot

I. *Surirella capronioides* Gandhi

J. *Surirella elegans* Ehrenberg

K. *Surirella linearis* f. *festetichii* (Pantocsek) Cleve-Euler

L. *Surirella roba* Leclercq

Plate-3.17 (Scale bar: Fig. B-L- 10 μm; A-50-μm)

205. ***Surirella robusta*** **Ehrenberg (Plate 3.18; Fig. A)**

http://protist.i.hosei.ac.jp/PDB/Images/Heterokontophyta/Raphidineae/Surirella/tenera_2.html

Valves in girdle view, broad, heteropolar, 69-86 µm wide and 131-210 µm long. Fibulae density is 2-3 in 10 µm.

206. ***Surirella tenera*** **W. Gregory (Plate 3.18; Fig. B)**

https://diatoms.org/species/surirella_tenera

Valves heteropolar, 80.8 µm long and 23.5 µm wide with broadly rounded headpole and a narrow rounded footpole; 3 fibulae are present in 10 µm.

207. ***Surirella*** **sp. Turpin (Plate 3.18; Fig. C)**

https://diatoms.org/genera/surirella

Valves ovate, headpole broadly rounded, footpole acutely rounded, 56-60.5 µm long and 23-25.7 µm wide at footpole and head pole 55 µm wide. Fibulae density is 4 in 10 µm.

Order Tabellariales

Family Tabellariaceae

Genus *Diatoma*

208. ***Diatoma vulgaris*** **Bory (Plate 3.18; Fig. D)**

Taylor et al. 2007, pl.9

Frustules are rectangular in girdle view, 52-54 µm long and 16-17.8 µm wide. Cells are joined along the full length of the cell.

209. ***Amphora coffeiformis*** **(C. Agardh) Kützing (Plate 3.18; Fig. E)**

Taylor et al, 2007, pl. 99 n

Valves in ventral view, linear elliptic with large protracted and almost flat apices, 57.1 µm long and 21.5 µm wide. Striae radiate; 11-12 striae are present in 10 µm.

210. ***Amphora copulata*** **(Kützing) Schoeman & R.E.M. Archibald (Plate 3.18; Fig. F)**

http://symbiont.ansp.org/dntf/images/cache/NSF%20cards_A/Amphora%20A-C/Amphora_0225.jpg

Valves semi elliptic to slightly crescent with convex dorsal margin and straight or slightly concave ventral margin. Valves 33 µm long and 9.8-10 µm wide; 11 striae are present in 10 µm.

211. ***Ampohora ovalis Kützing*** **(Plate 3.18; Fig. G)**

Tiffany and Britton 1952, pg. 274, pl. 73: Fig 855

Valves elliptic, 26.2 µm wide and 55 µm long having almost blunt end, apices 3.9 µm wide; Raphe linear and extending along the length of the cell; Striae slightly radiate centrally and becoming convergent towards the apices.

212. ***Amphora proteus*** **W. Gregory (Plate 3.18; Fig. H)**

Stepanek and Kociolek, 2014, pg. 187: Fig. 8A

Valves semi-lanceolate, semi-elliptic, 31.7 µm long and 14.5 µm wide. Striae radiate and 8 striae are present in 10 µm.

Subphylum Coscinodiscophytina

Class Coscinodiscophyceae

Subclass Melosirophycidae

Order Melosirales

Family Melosiraceae

Genus *Melosira*

213. ***Melosira varians*** **C. Agardh (Plate 3.18; Fig. I)**

https://diatoms.org/species/melosira_varians/; Tiffany and Britton, 1952, pg. 221, pl. 59: Fig. 673

Cylindrical cells joined end to end forming a long chain; Cells rectangular, 28-33 µm long and 12-19 µm wide. Numerous discoidal chloroplasts present inside the cell; areola absent.

214. *Melosira varians* var. *aequalis* (C. Agardh) Kützing (Plate 3.18; Fig. J)

Das and Adhikary, 2014, pg.207, pl. 16: Fig. 25

Cells form a colony of long chain, more or less square with constrictions at cross walls. Cells are 28-30 µm long and 24-33 µm wide. Numerous discoid shaped chloroplasts are present throughout the cell.

Phylum Ochrophyta

Class Xanthophyceae

Order Tribonematales

Family Tribonemataceae

Genus *Tribonema*

215. *Tribonema affine* (Kützing) G.S.West 1904 (Plate 3.18; Fig. K)

John et al. 2012, pg. 261, pl. 68: Fig. E

Filament without branching, cell cylindrical, 15.3 – 19.6 µm long and 5.3- 5.6 µm wide; cell wall "H" structure is evident; many disc-shaped chloroplasts are present and without pyrenoids.

216. *Tribonema bombycinum* (C. Agardh) Derbes & Solier (Plate 3.18; Fig. L)

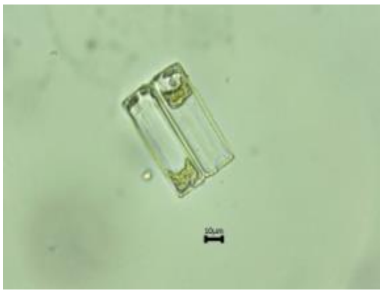
Prescott, 1951, pg. 367, pl. 96: Fig. 10

Filaments without branching, cells cylindrical, slight constriction at the crosswall, 28-33 µm long and 7-8 µm wide; 4-8 cloroplastsare present in each cell which are sometimes in contact forming 2-4 larger shaped plates.

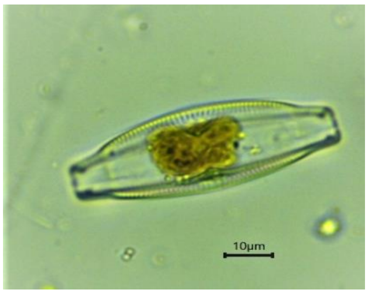
A. *Surirella robusta* Ehrenberg

B. *Surirella tenera* W. Gregory

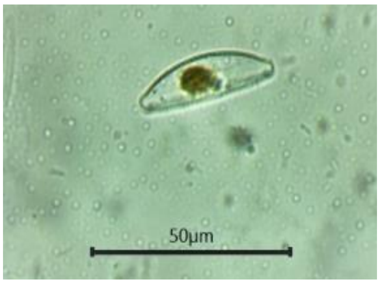
C. *Surirella* sp. Turpin



D. *Diatoma vulgaris* Bory

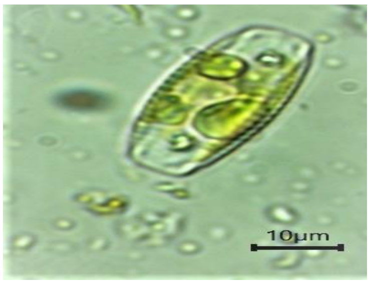


E. *Amphora coffeiformis* (C. Agardh) Kützing



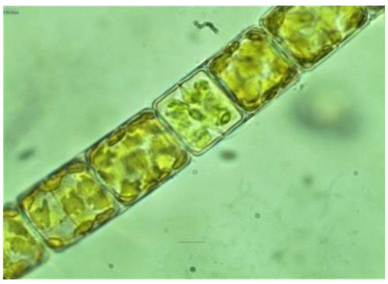
F. *Amphora copulata* (Kützing) Schoeman & R. E. M. Archibald

G. *Ampohora ovalis* Kützing



H. *Amphora proteus* W. Gregory

I. *Melosira varians* C. Agardh



J. *Melosira varians* var. *aequalis* (C. Agardh) Kützing

K. *Tribonema affine* (Kützing) G. S. West

L. *Tribonema bombycinum* (C. Agardh) Derbes & Solier

Plate-3.17 (Scale bar: Fig. B-L- 10 µm; A-50-µm)

217. ***Tribonema minus*** **(G.A. Klebs) Hazen (Plate 3.19; Fig. A)**

John et al. 2002, pg. 261, pl. 68: Fig. C

Filaments are unbranched, cells cylindrical, 22-25.2 µm long and 5-5.2 µm wide. Chloroplast many, scattered along the length of the cell.

218. ***Tribonema viride*** **Pascher (Plate 3.19; Fig. B)**

John et al. 2002, pg. 261, pl. 68: Fig. E

Filament without branching, 10- 10.3 µm wide and 27-32 µm long, cell body cylindrical and cell wall thin. Slight constriction is present in some areas of the cross wall; chloroplasts in contact with each other.

219. ***Tribonema vulgare*** **Pascher (Plate 3.19; Fig. C)**

John et al. 2002, pg. 261, pl. 68: Fig. B

Filaments without branching, cells cylindrical and sometimes swollen; 8-16.4 µm long and 4-6.8 µm wide. Chloroplast numerous and disc shaped.

Order Vaucheriales

Family Vaucheriaceae

Genus *Vaucheria*

220. ***Vaucheria aversa*** **Hassal (Plate 3.19; Fig. D)**

John et al. 2002, pg. 263, pl. 7: Fig. D

Filaments spasrsely branched, 40- 70 µm wide, monoecious, Antheridium short stalk, curved and directed towards the oogonia which is situated at the vicinity of the antheridiaum. Oogonium are sub-spherical in shape; 70-80 µm in diameter.

221. ***Vaucheria pseudogeminata*** **(Vaucher) De Candolle (Plate 3.19; Fig. E)**

John et al. 2002, pg. 266, pl. 72: Fig. F

Filaments spasrsely branched, 30-49 µm wide, monoecious, Antheridia and oogonia on special fruiting branches, stalk curved downwards between 2 oogonia, antheridia makinh 0.2- 0.8 turns, oogonia ovoid to kidney shape.

Phylum Charophyta

Class Charophyceae

Order Charales

Family Characeae

Genus *Chara*

222. *Chara braunii* Gmelin (Plate 3.19; Fig. F)

Prescott, 1951, pg. 336, pl. 81: Fig.1

Thallus robust and bright green in colour. Sex organs are monoecious, usually borne on the same node. Oogonia are 0.25–0. 8 mm in diameter and subtended by bracts which are shorter than matured fruit and antheridia 28- 0.3 mm in diameter.

Genus *Nitella*

223. *Nitella hyaline* (De Candolle) C. Agardh (Plate 3.19; Fig. G)

Romanov and Barinov, 2016, pg. 2018: Fig. 3-4

Thallus macroscopic, light to dark green colour, monoecious and without spine cells; thallus has nodes and internodes, branchlets with short sharp ends; bicelluate dactyls in which the end-cells are cuspidate or partite. Antheridia are solitary 300- 350 µm in diameter. Oogonia are solitary at the base of branchlets 250-290 µm long and 230-245 µm wide, fertile branches are trifurcate. Matured oogonia are dark brown colour with marked strips.

224. *Nitella* sp. C. Agardh (Plate 3.19; Fig. H)

Prescott, 1951, pg. 331

Thallus macroscopic, dieocious and light green in colour. Cell wall is smooth and without spines; branches with nodes and internodes, terminal branchlets forms bicellulate dactyls. Oogoniums are globose, 200- 280 µm in diameter and forms upto 2 in a bract.

Phylum Charophyta

Class Klebsormidiophyceae

Order Klebsormidiales

Family Klebsormidiaceae

Genus *Klebsormidium*

225. *Klebsormidium flaccidum (*Kützing) P.C.Silva, K.R.Mattox & W.H.Blackwell

(Plate 3.19; Fig. I)

John et al. 2002, pg. 449, pl. 115: Fig. J

Filaments are unbranched, slightly bent, cell body cylindrical, 7-15 µm long and 6-8 µm wide. Cell wall is smooth and thin. Each cells with a single parietal chloroplast that occupies about half the cell and often occurs alternating from side to side.

226. *Klebsormidium klebsii* (G.M. Smith) P.C.Silva, K.R.Mattox & W.H.Blackwell

(Plate 3.19; Fig. J)

John et al. 2002, pg. 449, pl.115: Fig.5

Filaments are unbranching, 6-7µm wide and 9-20 µm long. Cell body is cylindrical and without constrictions at cross walls. Cell wall is thin; chloroplast covers more than half of the cell.

Class Zygnematophyceae

Subclass Zygnematophycidae

Order Desmidiales

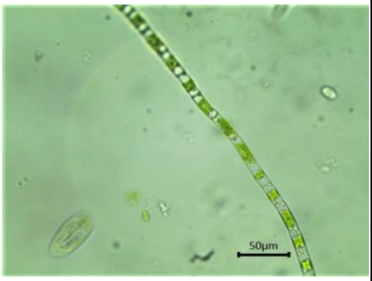
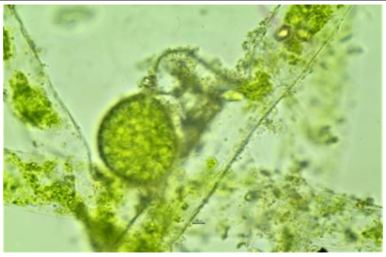
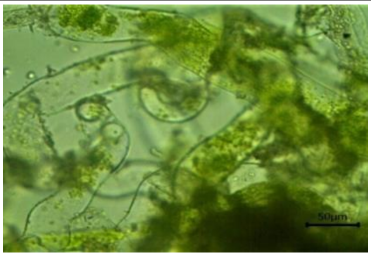
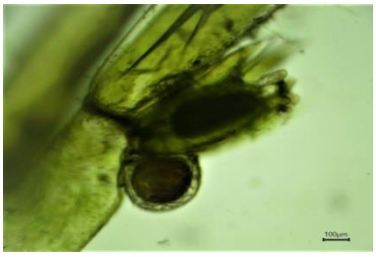
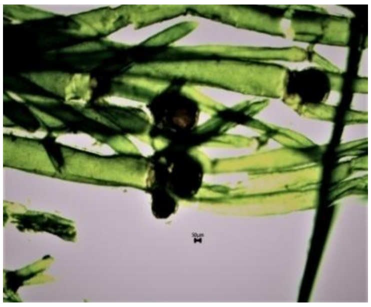
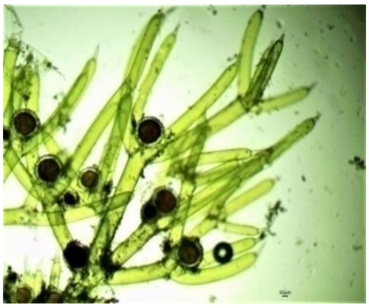
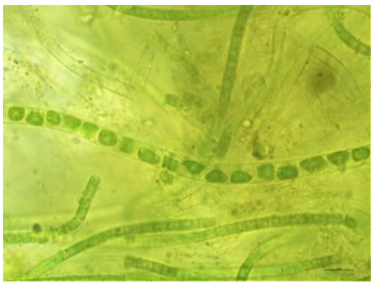
 **A. *Tribonema minus* (G. A. Klebs) Hazen**	 **B. *Tribonema viride* Pascher**	 **C. *Tribonema vulgare* Pascher**
 **D. *Vaucheria aversa* Hassal**	 **E. *Vaucheria pseudogeminata* (Vaucher) De Candolle**	 **F. *Chara braunii* Gmelin**
 **G. *Nitella hyaline* (De Candolle) C. Agardh**	 **H. *Nitella* sp. C. Agardh**	 **I. *Klebsormidium flaccidum* (Kützing) P. C. Silva, K. R. Mattox & W. H. Blackwell**
 **J. *Klebsormidium klebsii* (G.M.Smith) P. C. Silva, K. R. Mattox & W. H. Blackwell**	 **K. *Closterium abruptum* West**	 **L. *Closterium acerosum* A. M. Scott & Prescott**

Plate-3.19 (Scale bar: Fig. A-D, G, H- J, L- 10 µm; E, K- 50µm; F- 100 µm)

Family Closteriaceae

Genus *Closterium*

227. *Closterium abruptum* West (Plate 3.19; Fig. K)

John et al. 2002, pg. 518, pl. 130: Fig. S

Cells long, slightly curved, gradually tapers towards the apices which is broadly rounded; cells 98 µm long and 13 µm wide; apex is 5 um wide. Cell wall is smooth, chloroplast with 2-3 longitudinal ridges.

228. *Closterium acerosum* A.M. Scott& Prescott (Plate 3.19; Fig. L)

http://www.digicodes.info/Closterium_acerosum.ht ml; Prescott 1951, pg. 518: Fig. 130 E

Valves slightly curved, gradually attenuated toward the ends. Cells 287-411 µm long and 17.6-28 µm wide, slightly curved, tapers towards ends, apices 5 µm, longitudinal lines visible inside the cell and pores present at both ends.

229. *Closterium acerosum* var. *minus* Hantzsch (Plate 3.20; Fig. A)

Zongo et al. 2011, Pg. 257: Fig. 2 a-b

http://protist.i.hosei.ac.jp/PDB/Images/Chlorophyta/Closterium/acerosum/group_2/sp_8.html

Cells 250 µm long and 40µm wide, cell tapers towards both ends and slightly curved. Cell wall is smooth, longitudinal lines are visible inside the cell**.**

230. *Closterium acutum* var. *variabile* (Lemmermann) Willi Krieger (Plate3.20;Fig.B)

http://www.digicodes.info/Closterium_acutum_var_variabile.html;Prescott 1951, pg. 519: Fig. 129 F

Cell 235 µm long and 8 µm wide, curved and tapers at both end, apices 1.5 µm. Cell wall smooth, slight bulge in the mid region on ventral side of the cell.

231. ***Closterium dinae*** **Ehrenbergii ex Ralfs (Plate 3.20; Fig. C)**

John et al. 2002, pg. 521, pl. 129: Fig. J

Cells 170 µm long and 20 µm wide, curved and tapered towards both ends, apices 4 µm wide, mid-region of the cell is slightly tumid and pore visible at both the ends, Chloroplast has 8 pyrenoids along the length of the cell; cell wall smooth.

232. ***Closterium ehrenbergii*** **Meneghini ex Ralfs(Plate 3.20; Fig. D)**

John et al. 2002, pg. 521, pl. 130: Fig. B

Cell is large with mid-region swollen and slightly curved body; cell body 298 µm long and 60 µm wide. Cell slightly tapers towards the end with broadly rounded apex which is 7 µm wide. Apical pore is not observed, pyrenoids scattered in the chloroplast

233. ***Closterium idiosporum*** **West & G.S.West (Plate 3.20; Fig. E)**

John et al. 2002, pg. 129: Fig. G

Cells straight, spindle shaped, 170 µm long and 7 µm wide, attenuating towards the apices, apex 3.7 µm wide.

234. ***Closterium kuetzingii*** **Brebisson(Plate 3.20; Fig. F)**

http://www.digicodes.info/Closterium_kuetzingii.html: Prescott 1951, pg.523: Fig. 130N

Cells 310 µm long, slightly curved, tapering towards both ends, apices 2-4 µm; middle area of the cell broad with a width of 23 µm; chloroplast present in the broader region of the cell.

235. ***Closterium moniliferum*** **Ehrenberg ex Ralfs (Plate 3.20; Fig. G)**

http://www.digicodes.info/Closterium_moniliferum.html; Prescott 1951, pg. 542: Fig. 133 M

Cell broad, 300 µm long and 48 µm wide, slightly convex, slight bulge in the ventral side mid region on the, rounded tapering ends with a width of 13 µmm; Chloroplast having 3-4 longitudinal ridges; Cell wall smooth.

236. ***Closterium parvulum*** **Nageli (Plate 3.20; Fig. H)**

http://www.digicodes.info/Closterium_parvulum.html; John et al. 2012, pg. 525, pl.129: Fig. M

Cell body strongly curved with slight medial swelling, tapering and rounded ends; cell 157.5 µm long and 18.6 µm wide; faint longitudinal ridges of chloroplast visible

237. ***Closterium pseudolunula*** **O.Borge(Plate 3.20; Fig. I)**

Sahin and Akar, 2007, Pg. 1822, pl. 1: Fig. 9

Cell attenuated from the middle towards the poles, apices are rounded, 253.8 µm long and 39.6 µm wide. The cell wall is smooth and many pyrenoids are scattered.

238. ***Closterium rectimarginatum*** **A.M.Scott & Prescott (Plate 3.20; Fig. J)**

http://www.digicodes.info/Closterium_rectimarginatum.html

Valves straight, 124 µm long and 14 µm wide, attenuated towards the apices, apex 2.2 µm wide.

Family Desmidiaceae

Genus: ***Actinotaenium***

239. ***Actinotaenium silvae-nigrae*** **(Rabanus) Kouwets and Coesel (Plate 3.20; Fig. K)**

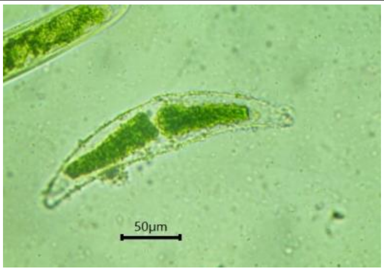
http://desmids.science4all.nl/?Desmid_pictures___Actinotaenium&pic=19&page=0

Cells cylindrical with broadly rounded apex, cells 44 µm long and 15 µm wide, constriction of cell not visible. Cell is wall smooth; asteroid chloroplast.

A. *Closterium acerosum* var. *minus* Hantzsch

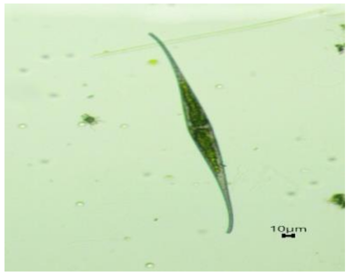
B. *Closterium acutum* var. *variabile* (Lemmermann) Willi Krieger

C. *Closterium dinae* Ehrenbergii ex Ralfs



D. *Closterium ehrenbergii* Meneghini ex. Ralfs

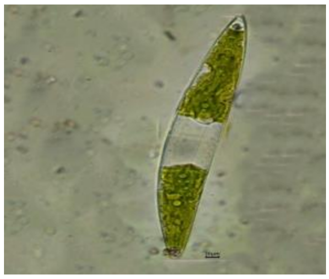
E. *Closterium idiosporum* West & G. S. West



F. *Closterium kuetzingii* Brebisson

G. *Closterium moniliferum* Ehrenberg ex Ralfs

H. *Closterium parvulum* Nageli



I. *Closterium pseudolunula* O. Borge

J. *Closterium rectimarginatum* A. M. Scott & Prescott.

K. *Actinotaenium silvae-nigrae* (Rabanus) Kouwets and Coesel

L. *Cosmarium abbreviatum* var. *minus* (West & G. S. West) Willi Krieger & Gerloff

Plate-3.20 (Scale bar: 10 µm)

Genus *Cosmarium*

240. *Cosmarium abbreviatum* var. *minus* (West & G.S.West) Willi Krieger & Gerloff (Plate 3.20; Fig. L)

Felisberto and Rodrigues, 2004, pg. 143: Fig. 2

Cell is trapeziform shape with a broad base, 14 µm long and 11 µm wide. Sinus linear, open and cell wall is smooth.Isthmus is deep and 3 µm wide.

241. *Cosmarium anceps*P. Lundell (Plate 3.21; Fig. A)

John et al. 2002, pg. 535, pl. 132: Fig. T

Cells are 26 µm long and 13 µm, sinus open.Cell wall smooth and the sides are slightly concave. Semi cells trapezium shape with slight constriction at the apices of the cells. Isthmus is 10 µm.

242. *Cosmarium blytii* Børgesen (Plate 3.21; Fig. B)

http://www.digicodes.info/Cosmarium_blyttii.html; John et al. 2012, pg. 536, pl. 134: Fig. R

Cells are 23-25 µm long and 18-22 µm wide. Sinus is deep, linear and closed for most parts. Lateral margins of the semi cells with 4 crenate each. Semi cells are semi-circular in shape with truncate apex.

243. *Cosmaarium botrytis* Meneghini ex Ralfs (Plate 3.21; Fig. C)

John et al. 2002, pg. 536, pl. 135: Fig. P

Cells are 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.

244. *Cosmarium caelatum* Ralfs (Plate 3.21; Fig. D)

John et al. 2002, pg. 536, pl. 134: Fig. A

Cells 42 µm long and 39 µm wide, semi cell aremore or less quadrate shape. Sinus open not very deep Isthmus 18 µm wide. Granules present thoughout the cell and 18 crenations in each semi cell, 6 in apex.

245. *Cosmarium contractum* var. *rotundatum* O. Borge (Plate 3.21; Fig. E)

John et al. 2002, pg. 538, pl. 132: Fig. P

Cells 32 µm long and 20 µm in wide, sinus deep and Isthmus 13 µm wide semi cells circular in shape with smooth walls

246. *Cosmarium crenatum* Ralfs ex Ralfs (Plate 3.21; Fig. F)

John et al. 2002, pg. 135, pl. 135: Fig. M

Semi cells rectangular pyramidal shape, 30 µm long and 22 µm wide with 4 crenations in the lateral side of each cell; size of the crenate increases as we move towards the apex. Sinus is slightly open and shallow; isthmus 8 µm wide.

247. *Cosmarium difficile* var. *dilatatum* O.Borge (Plate 3.21; Fig. G)

Aquinoet al. 2016, pg. 675: Fig. 9 a-c

Cells are 28.4 µm long and 15.6 µm wide, semi cells elliptic and smooth. Sinus is linear and closed Isthmus is deep, 4.16 µm wide.

248. *Cosmarium holmiense* var. *hibernicum* (West) Schmidle (Plate 3.21; Fig. H)

Sahin and Akar, 2018, Pg. 575: Fig. 3A

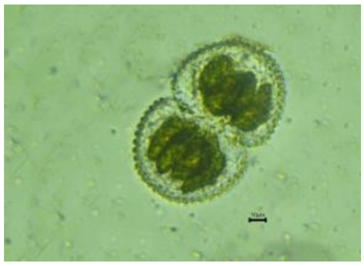
Cells are 46 µm long and 26 µm wide, semi cells trapezoid in shape with lateral sides of the semi cells slightly convex, sinus moderately deep and Isthmus 11 µm wide, cell wall smooth.

249. *Cosmarium impressulum* Elfving (Plate 3.21; Fig. I)

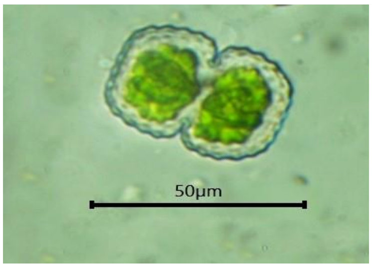
http://www.digicodes.info/Cosmarium_impressulum.html

A. *Cosmarium anceps* P. Lundell

B. *Cosmarium blytii* Børgesen

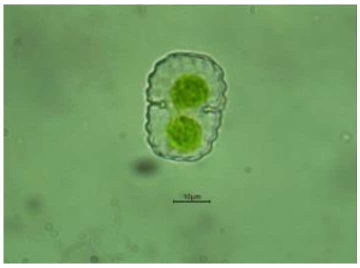


C. *Cosmaarium botrytis* Meneghini ex Ralfs



D. *Cosmarium caelatum* Ralfs

E. *Cosmarium contractum* var. *rotundatum* O. Borge

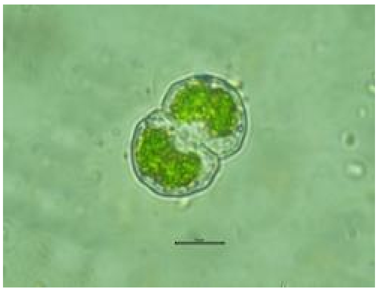


F. *Cosmarium crenatum* Ralfs ex Ralfs

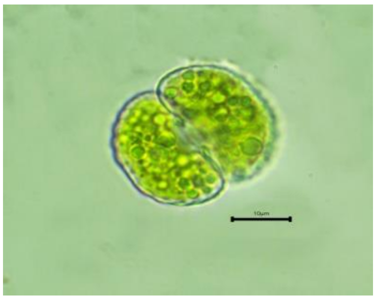
G. *Cosmarium difficile* var. *dilatatum* O. Borge

H. *Cosmarium holmiense* var. *hibernicum* (West) Schmidle

I. *Cosmarium impressulum* Elfving



J. *Cosmarium laeve* Rabenhorst



K. *Cosmarium ornatum* Ralfs ex Ralf

L. *Cosmarium speciosum* P. Lundell

Plate-3.21 (Scale bar: 10 µm)

Semi-cell arehemispherical, 22.4 µm long and 16.6 µm wide. Isthmus deep, closed; cell wall not smooth having slight undulations throughout the cell body.

250. *Cosmarium laeve* Rabenhorst (Plate 3.21; Fig. J)

http://www.digicodes.info/Cosmarium_laeve.html/; John et al. 2002, pg. 541, pl. 133: Fig. V

Cell is small, semi elliptical, 22 µm long and 16 µm wide. Apices are slightly depressed, crenations absent, sinus deep and isthmus is 7 µm wide.

251. *Cosmarium ornatum* Ralfs ex Ralf (Plate 3.21; Fig. K)

John et al. 2002, pg. 142, pl. 134: Fig. D

Cells granulated throght, almost as long as wide, 27 µm long and 24 µm wide. Semi cells are kidney shaped; sinus deeply constricted, linear and opening on the inside; isthmus 5 µm wide.

252. *Cosmarium speciosum* P.Lundell (Plate 3.21; Fig. L)

http://www.digicodes.info/Cosmarium_speciosum.h tml; Prescott 1951, pg. 546, pl. 135: Fig. F

Cell is slightly oblong to hemispherical shape,53 µm long and 34 µm wide.Sinus shallow and closed for most parts; isthmus 16 µm; each semi cell has 22 crenations (4 on the apex) which are not so evident.

253. *Cosmarium Scutiforme*Van Geest & Coesel (Plate 3.22; Fig. A)

http://www.digicodes.info/Cosmarium_scutiforme.html

Semi cells are Pyramidal with rounded ends, 30 µm wide and 47 µm long. Isthmus deep and mostly closed. About 20 crenations are present in each semi cells.

254. *Cosmarium* sp. Corda ex Ralfs (Plate 3.22; Fig. B)

John et al. 2002, pg. 532

Cells 43.2 µm long, semi cells differ in size 29 µm wide and 26.7 µm wide. Semi cells truncate shape, strongly undulated, 5-7 crenations at the sides and apex 12—13 um wide with 4-5 crenatiions. Sinus is deep and slightly open; isthmus 9.1 µm wide.

Genus *Docidium*

255. *Docidium undulatum* Bailey (Plate 3.22; Fig. C)

http://www.digicodes.info/Docidium_undulatum.html; John et al. 2012, pg. 551, pl.

144: Fig. H

Cell long, cylindrical,143 µm long and 10 µm wide with truncated ends; strong undulationare present throughout the outline of the cell; Constriction is towards one end of the cell.

Genus *Pleurotaenium*

256. *Pleurotaenium ehrenbergii* (Brebisson) de Bary (Plate 3.22; Fig. D)

John et al. 2002, pg. 562, pl. 131, Fig. G

Valves are 271.3 µm long and 15 µm wide; valves slightly taper towards the apices which are truncate, 10.2 µm wide and a prominent basal inflation with a distint constriction is present.

257. *Pleurotaenium trabecula* Nageli (Plate 3.22; Fig. E)

John et al. 2002, pg. 562, pl. 131, Fig. F

Cells are 527 µm long and 39 µm wide; semi cells have 2 basal inflations, slightly convex and with slight tapering towards the apex, apex flat and 26 µm wide.

Genus *Staurastrum*

258. *Staurastrum acutum* var. *varians* (Raciborski) Coesel & Meesters (Plate3.22; Fig.F)

http://desmids.science4all.nl/?Desmid_pictures Staurastrum&pic=0&page=0

Cell 38 µm long and 26-38.5 µm wide with deep median constriction. Semi cells transverely rounded and different in size, sinus deep and open. Chloroplast forms longitudinal ridges.

259. ***Staurastrum punctulatum (*****Brebisson) Rafls (Plate 3.22; Fig. G)**

John et al. 2002, pg.574, pl. 138: Fig. F

Cells hourglass shape, 38 µm long and 30 µm wide; sinus deep and wide; Semi cells ellipsoidal shape, isthmus 12 µm wide.

Genus *Hyalotheca*

260. ***Hyalotheca dissiliens*** **Brebisson ex Ralf (Plate 3.22; Fig. H)**

Prescott 1951, pg. 589, pl. 143:Fig. I; Tiffany and Britton 1952, pg. 56:Fig. 631

Cells cylindrical, 19-22 µm long and 26-32 µm wide; lateral side of the cell have medium constriction of 29 µm wide; mucilaginous sheath is present that covers the cell is almost half the size of the cell. Vertical view of semi cell is circular with 2 protruding papilla.

Genus *Euastrum*

261. ***Euastrum sublobatum*** **Brebisson ex Ralfs (Plate 3.22; Fig. I)**

http://protist.i.hosei.ac.jp/PDB/Images/Chlorophyta/Euastrum/sublobatum/sp_01.html

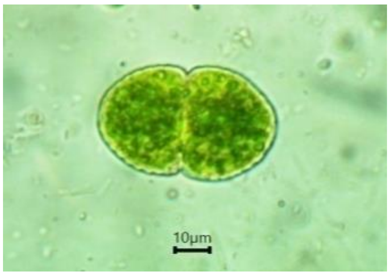
Cells 18 µm long and 13 µm wide, pyramidal in shape with flattened apices which is slightly constricted, lateral side of the semi cells lobed, sinus deep and wide, 1 chloroplast in each semi cell.

Family Peniaceae

Genus *Penium*

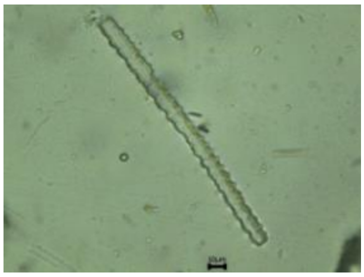
262. ***Penium margaritaceum*** **Brébisson in Ralfs (Plate 3.22; Fig. J)**

http://www.digicodes.info/Penium_margaritaceum .html/



A. *Cosmarium Scutiforme* Van Geest & Coesel

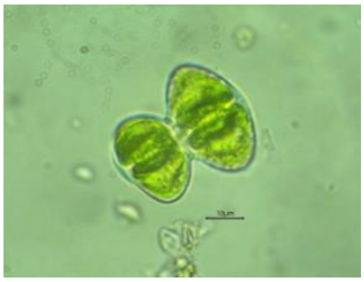
B. *Cosmarium* spp. Corda ex Ralfs



C. *Docidium undulatum* Bailey

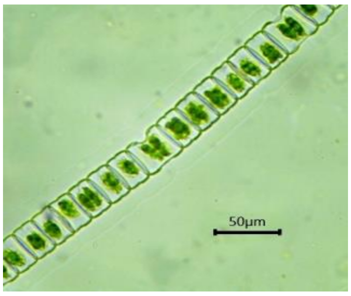
D. *Pleurotaenium ehrenbergii* (Brebisson) de Bary

E. *Pleurotaenium trabecula* Nageli



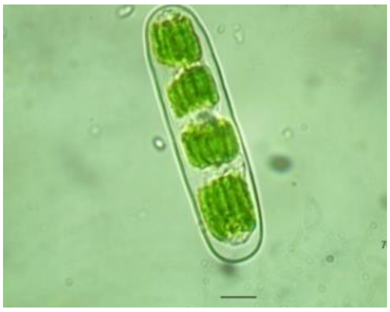
F. *Staurastrum acutum* var. *varians* (Raciborski) Coesel & Meesters

G. *Staurastrum punctulatum (*Brebisson) Rafls



H. *Hyalotheca dissiliens* Brebisson ex Ralf

I. *Euastrum sublobatum* Brebisson ex Ralfs



J. *Penium margaritaceum* Brébisson in Ralfs

K. *Cylindrocystis brebissonii* (Ralfs) De Bary

L. *Netrium digitus* (Brébisson ex Ralfs) Itzigsohn & Rothe

Plate-3.22 (Scale bar: Fig. A-G, I-L-10 µm; H- 50 µm)

Cells cylindrical, 71µm long and 17 µm wide with broadly rounded apex.Walls smooth; cells have 4 chloroplasts with 5 longitudinal ridges.

Order Zygnematales

Family Mesotaeniaceae

Genus *Cylindrocystis*

263. *Cylindrocystis brebissonii* (Ralfs) De Bary (Plate 3.22; Fig. K)

John et al. 2002, pg. 511, pl. 128: Fig. E

Cells are small, cylindrical with broadly rounded ends and without constriction. Cells are 23.1-42 µm long and 9.7- 14.2 µm wide. Chloroplast is somewhat star shape in young cells.

Genus *Netrium*

264. *Netrium digitus* (Brébisson ex Ralfs) Itzigsohn & Rothe (Plate 3.22; Fig. L)

John et al. 2002, pg. 513, pl. 128: Fig. R

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

Genus *Spirotaenia*

265. *Spirotaenia condensate* Brébisson (Plate 3.23; Fig. A)

John et al. 2002, pg. 515, pl. 128: Fig. D

Filaments unbranched;cells elongated, cylindrical with slight tapering at the end, apex broadly rounded, cells 159 µm long and 17 µm wide, chloroplast parietal, arranged with 11 turns, many pyrenoids scattered along the length of the cells, cell wall smooth.

Family Zygnemataceae

Genus *Spirogyra*

266. ***Spirogyra australica*** **Czurda (Plate 3.23; Fig. B)**

Stancheva et al. 2013, pg. 595: Fig. 3, K, L, O

Filaments unbranched; cells cylindrical, 55-90 µm long and 24-30 µm wide. Cell walls plane; chloroplast is single making 1.5-3 turns.

267. ***Spirogyra decimina*** **(O.F.Müller) Dumortier (Plate 3.23; Fig. C)**

John et al. 2002, pg. 496, pl. 12: Fig. J

Filaments unbranched; cells cylindrical, 40.3 µm wide and 50-120 µm long. Chloroplast 3 to 4 making 1-2.5 turns. Conjugation is lateral, conjugation tubes form from both gametangia. Zygospore enlarged ovoid, 41-55 µm wide and 63.3-80 µm long.

268. ***Spirogyra dubia*** **Kiitzing (Plate 3.23; Fig. D)**

John et al. 2002, pg. 496, pl. 124: Fig. A

Filaments unbranched; cells cylindrical, 180-255 µm long and 37- 50 µm wide. Chloroplast 2 to 3 and making 5-6 turns in a cell.

269. ***Spirogyra insignis*** **(Hassall) Kiitzing (Plate 3.23; Fig. E)**

John et al. 2002, pg. 497, pl. 125: Fig. J

Filaments unbranched; cells cylindrical, 44-50 µm wide and 50-90 µm long. Cell walls replicate. Chloroplast 4 to 5 making 0.5- 1.5 turns.

270. ***Spirogyra kundaensis*** **Singh (Plate 3.23; Fig. F)**

Das and Adhikary, 2014, pg. 83, pl. 5: Fig. 10

Filaments unbranched; cells cylindrical, slightly constricted, 70-120 µm wide and 120-200 µm long. Chloroplast 4 to 6 making 1- 2.5 turns in a cell.

271. ***Spirogyra mirabilis*** **(Hassel) Kiitzing (Plate 3.23; Fig. G)**

Takano et al. 2019, pg. 4: Fig. E

Filaments unbranched, cells 36 µm wide and 100-130 µm long, end walls plane. Chloroplst single and making 4-6 turns in a cell.

272. ***Spirogyra neglecta*** **(Hassall) Kützing (Plate 3.23; Fig. H)**

John et al. 2002, pg. 499, pl. 124: Fig. F

Filaments unbranched, 63 µm wide and 149 µm long, end walls plane. Chloroplast 3 and making 2-3 turns in a cell.

273. ***Spirogyra pratensis*** **Transeau (Plate 3.23; Fig. I)**

Prescott, 1951, pg.319, pl. 75: Fig. 4-6

Filaments unbranched, cells 25 -28 µm wide and 64-111 µm long cells walls with plane end walls. Chloroplast single or sometimes 2 making 3-6 turns.

274. ***Spirogyra reticulate*** **Nordstedt (Plate 3.23; Fig. J)**

John et al. 2002, pg. 502, pl.125: Fig. G

Filaments unbranched, cells **c**ylindrical, sometimes swollen, 92- 200 µm long and 39-46.9 µm wide. Chloroplast 2-3, 3-4.5 turns in a cell.

275. ***Spirogyra setiformis*** **(Roth) Kiitzing (Plate 3.23; Fig. K)**

John et al. 2002, pg. 502, pl. 125, Fig. C

Filaments unbranched; cells cylindrical, sometimes inflated, 100-220 µm long and 90-110 µm wide, end walls plane. Chloroplast 4-6 making 1-2 turns.

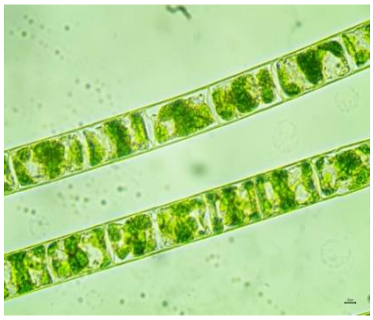
276. ***Spirogyra submargaritata*** **Godward (Plate 3.23; Fig. L)**

John et al. 2002, pg. 502, pl. 143, Fig. E

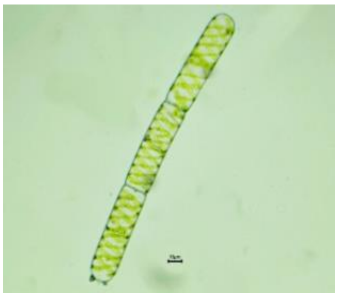
Filaments unbranched, cells cylindrical, 90-190 µm long and 90-100 µm wide.Cells sometimes with slight constrictions at cross walls. Chloroplast 5-8 making 0.3 -1 turn. Scalariform Conjugation is formed with tubes forming from both filaments. Zyospore are spherical to ellipsoidal shape and 70-105 µm in diameter.

A. ***Spirotaenia condensate*** **Brébisson**

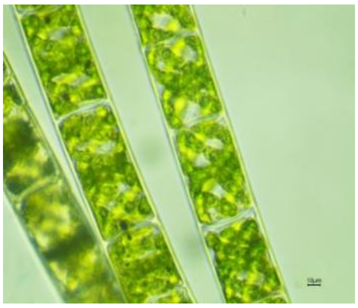
B. ***Spirogyra australica*** **Czurda**



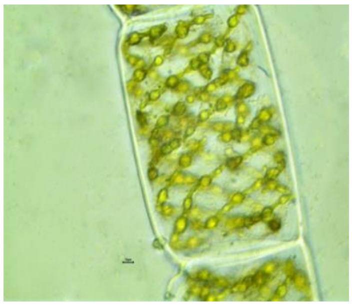
C. ***Spirogyra decimina*** **(O. F. Müller) Dumortier**



D. ***Spirogyra dubia*** **Kiitzing**

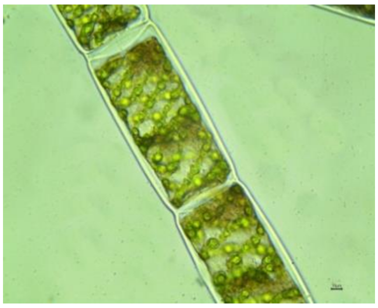


E. ***Spirogyra insignis*** **(Hassall) Kiitzing**



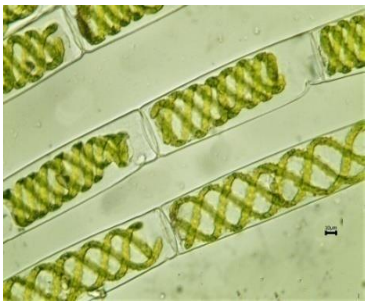
F. ***Spirogyra kundaensis*** **Singh**

G. ***Spirogyra mirabilis*** **(Hassel) Kiitzing**



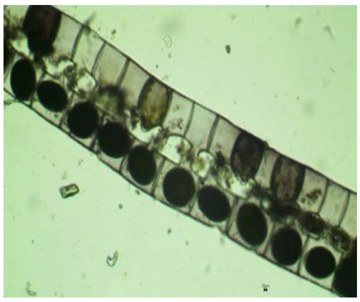
H. ***Spirogyra neglecta*** **(Hassall) Kützing**

I. ***Spirogyra pratensis*** **Transeau**



J. ***Spirogyra reticulate*** **Nordstedt**

K. ***Spirogyra setiformis*** **(Roth) Kiitzing**



L. ***Spirogyra submargaritata*** **Godward**

Plate-3.23 (Scale bar: 10 µm)

277. ***Spirogyra varians* (Hassall) Kiitzing (Plate 3.24; Fig. A)**

Stancheva et al. 2013, pg. 600, Fig. 7C-D

Filaments unbranched, cells 20-23 µm wide and 43-140 µm long, end walls plane. Chloroplast single making 1-4 turns.

278. ***Spirogya weberi* Kiitzing (Plate 3.24; Fig. B)**

John et al. 2002, pg. 505, pl. 122: Fig. E

Filaments unbranched, cells 160-174 µm long and 30-35 µm wide, end cells plane. Chloroplast single making 4-6 turns.

Genus*Mougeotia*

279. ***Mougeotia boodlei* (West & G.S West) Collins C. Agardh (Plate 3.24; Fig. C)**

John et al. 2002, pg. 483, pl. 121: Fig. I

Filaments unbranched, 25- 60 µm long and 8-17.2 µm wide. Cells are cylindrical with rounded ends; chloroplast single.

280. ***Mougeotia* sp. C. Agardh (Plate 3.24; Fig. D)**

John et al. 2002, pg. 481

Filaments are small, unbranched and cylindrical; 70-80 µm long and 8.6-9 µm wide.

Genus *Zygnema*

281. ***Zygnema* sp. C. Agardh (Plate 3.24; Fig. E)**

John et al. 2002, pg. 505

Filaments unbranched; cells cylindrical, 40- 80 µm long and 28- 30 µm wide. Chloroplast star shaped.

Phylum Chlorophyta

Subphylum Chlorophytina

Class Chlorophyceae

Order Chaetophorales

Family Aphanochaetaceae

Genus *Aphanochaete*

282. *Aphanochaete repens* A. Braun (Plate 3.24; Fig. F)

John et al. 2002, pg. 434, pl. 108: Fig. D

Cells irregularly inflated, sub-cylindrical with hairy projections that are 9-12 µm long; almost the whole length of the cells are attached to other algae, each cell size ranges from 8-19 µm long.

283. *Draparnaldia acuta* (C.Agardh) Kützing (Plate 3.24; Fig. G)

http://galerie.sinicearasy.cz/galerie/chlorophyta/chlorophyceae/vlaknite-filamentous/draparnaldia/draparnaldia-acuta; Tiffany and Britton 952, pg.69, pl. 11: Fig. 81

Filaments dark green in colour, profusely branched forming whorled fascicles, Cells barrel shape,30-100 µm wide; Main axis of secondary branches distinct, branches arising both alternating and opposite, tapering towards the apex; Chloroplast in the mid region of the cell.

Genus *Stigeoclonium*

284. *Stigeoclonium lubricum* (Dilwyn) Kiitzing (Plate 3.24; Fig. H)

John et al. 2002, pg. 463, pl. 111: Fig. K

Filaments dark green, profusely branched, 20-25 µm long and 9-13 µm wide. Secondary branches are short, blunt or acute; branching occurs mostly opposite and sometimes alternating.

285. *Steigoclonium tenue* (C. Agardh) Kützing (Plate 3.24; Fig. I)

John et al. 2002, pg.465, pl. 111, Fig. E.

Thallus light green in colour, filamentous, branched and attached to substratum

A. *Spirogyra varians* (Hassall) Kiitzing

B. *Spirogya weberi* Kiitzing

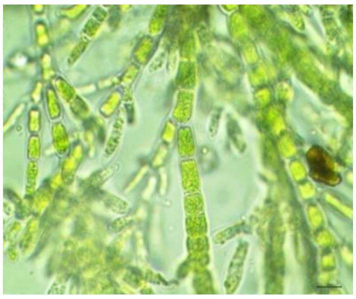
C. *Mougeotia boodlei* (West & G.S West) Collins C. Agardh

D. *Mougeotia* spp. C. Agardh

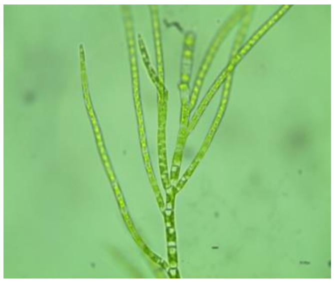
E. *Zygnema* spp. C. Agardh

F. *Aphanochaete repens* A. Braun

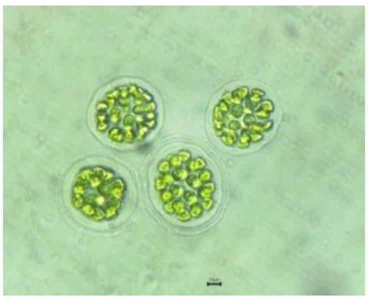
G. *Draparnaldia acuta* (C. Agardh) Kützing



H. *Stigeoclonium lubricum* (Dilwyn) Kiitzing



I. *Steigoclonium tenue* (C. Agardh) Kützing



J. *Eudorina elegans* Ehrenberg

K. *Oedogonium abbreviatum* (Hirn) Tiffany

L. *Oedogonium* spp. 1 Link ex Hern

Plate-3.24 (Scale bar: A-J, L-10 µm; K- 50 µm)

Branches arises both alternating and opposite. Cells 9-15 µm wide and 12-35 µm long, attenuated towards the apices.

286. ***Eudorina elegans*** **Ehrenberg (Plate 3.24; Fig. J)**

Tiffany and Britton 1952, pg. 17, pl.2: Fig.14

Colony ellipsoidal or spherical shaped; 50-76 µm wide and covered by a gelatinous envelope; Cells slightly spherical, 7-14 µm in diameter.

Order Oedogoniales

Family Oedogoniaceae

Genus *Oedogonium*

287. ***Oedogonium abbreviatum*** **(Hirn) Tiffany (Plate 3.24; Fig. K)**

Prescott, 1951, pg. 182, pl. 36: Fig. 15-16

Filaments unbranched, 19 µm wide, 15-16 µm long; Oogonium solitary, ovoid, globose, 3 0-34 µm wide and 28-31 µm long.

288. ***Oedogonium*** **sp.1 Link ex Hern (Plate 3.24; Fig. L)**

John et al. 2002, pg. 413

Filaments unbranched, cells cylindrical with slightly swollen base, 17-15 µm wide and 40-70 µm long. Apical cap is observed near the cells septum.

289. ***Oedogonium*** **sp. 2 Link ex Hern (Plate 3.25; Fig. A)**

John et al. 2002, pg. 413

Filaments unbranched; cells cylindrical with slightly swollen base, 19-25 µm wide and 38-45 µm long.

Order Sphaeropleales

Family Hydrodictyaceae

Genus *Hydrodictyon*

290. ***Hydrodictyon reticulatum*** **(Linnaeus) Bory (Plate 3.25; Fig. B)**

John et al. 2002, pg. 58, pl. 99: Fig. S

Coenobia macroscopic, free floating forming a net like mesh network. Cells cylindrical to oblong ovoid, yellowish green; 4-6 cells connected by their edges to their adjacent cells forming mostly 5-sided mesh.

Family Microsporaceae

Genus *Microspora*

291. *Microspora pachyderma* (Wille) Lagerheim (Plate 3.25; Fig.C)

Prescott. 1951, pg. 108, pl.8: Fig.3; John et al. 2012, pg.453, pl.1167: Fig. j

Filamentous, unbranched, cells cylindrical, 5-9 µm wide, walls thin and 1-2 times as long as wide. Cells mostly constricted at cross wall, H-shaped junction is not very evident.

292. *Microspora tumidula* Hazen (Plate 3.25; Fig. D)

Prescott, 1951, pg.108, pl. 8: Fig. 9; John et al. 2012, pg. 453, pl.116: Fig. N

Filaments unbranched; cells cylindrical, 7- 8.2 µm long and 7.8- 8.1 µm wide; constrictions in the cross-wall area not so evident.

Order Sphaeropleales

Family Scenedesmaceae

Genus *Acutodesmus*

293. *Acutodesmus acuminatus* (Lagerheim) P.M. Tsarenko (Plate 3.25; Fig. E)

Das ans Adhikary, 2014, pg. 263, pl-12: Fig. 49

Coenobia 4 celled, arranged linearly. Cells are 10.5- 15 µm long and 2-3.5 µm wide with pointed ends. Outer cell is crescent shape, curved outwards and having pointed ends.

Genus *Coelastrum*

294. *Coelastrum pseudomicroporum* Nägeli in A. Braun (Plate 3.25; Fig. F)

Das and Adhikary, 2014, pg. 152, pl. 12: Fig. 6

Colonies spherical; 8, 16 or 32 cells, Colony is 20 µm wide in diameter and each cell 7-9 µm in diameter; Cell wall smooth; Chloroplast parietal.

295. *Coelastrum* sp. Nageli (Plate 3.25; Fig. G)

John et al. 2002, pg.83: Fig. N

Colonies spherical with empty spaces and composes of spherical cells that are 2-3 µm µm in diameter and arranged in a single layer.

Genus *Desmodesmus*

296. *Desmodesmus abundans* (Kirchner) E.H. Hegewald (Plate 3.25; Fig. H)

Prescott, 1951, pg. 280, Pl. 63: Fig. 21

Coenobia 4 celled, short spines are present at both ends of the 2 outer cells, 3-3.2 µm long; cells are 7.2 – 8.5 µm long and 3.1-3.9 µm wide. Apices are broadly rounded.

297. *Desmodesmus perforates* (Lemmermann) E. Hegewald (Plate 3.25; Fig. I)

Das and Adhikary, 2014, pg. 157, pl. 12: Fig. 27

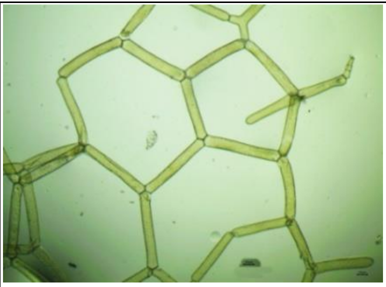
Coenobia 4 celled, 2.8– 3.2 µm wide and 10.8- 12.7 µm long. Cells elliptical, slits present in between 2 cells, outer cells have long spines 13-16 µm long.

298. *Desmodesmus subspicatus*(Chodat) E. Hegewald & A.W.F. Schmidt Big sample (Plate 3.25; Fig. J)

Lortou and Gkelis, 2019, pg.3: Fig. 1

Coenobia 4 celled, cell ellipsoidal cylindrical, rounded and slightly taper at the apices, 8.8-11.7 um long and 2.6-4 um wide. Cell Spines present at the 2 ends of outer and mid region of 2 cells.

A. *Oedogonium* sp. 2 Link ex Hern



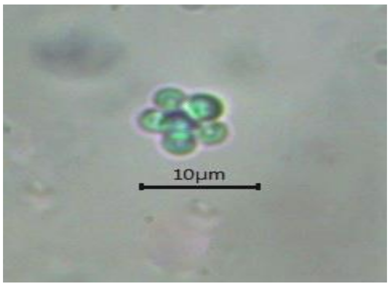
B. *Hydrodictyon reticulatum* (Linnaeus) Bory

C. *Microspora pachyderma* (Wille) Lagerheim

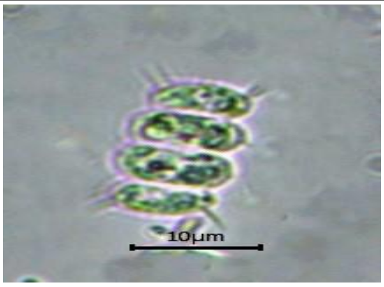
D. *Microspora tumidula* Hazen

E. *Acutodesmus acuminatus* (Lagerheim) P.M.Tsarenko

F. *Coelastrum pseudomicroporum* Nägeli in A. Braun



G. *Coelastrum* sp. Nageli

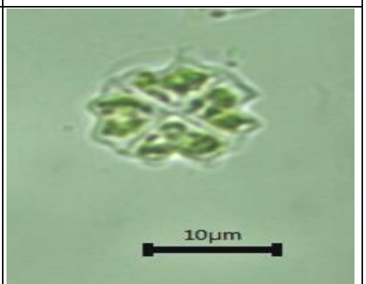


H. *Desmodesmus abundans* (Kirchner) E. H. Hegewald

I. *Desmodesmus perforates* (Lemmermann) E. Hegewald

J. *Desmodesmus subspicatus* (Chodat) E. Hegewald & A. W. F. Schmidt

K. *Pectinodesmus holtmannii* E.Hegewald, C. Bock & Krienitz



L. *Pediastrum tetras* (Ehrenberg) Ralfs

Plate-3.25 (Scale bar: 10 µm)

299. ***Pectinodesmus holtmannii*** **E. Hegewald, C. Bock & Krienitz (Plate 3.25; Fig. K)**

Hegewald*et al.* 2013, Pg. 151: Fig. 6

Cells spindle shape with long tapering ends, straight to slightly bent, 24-27µm long and 2.9-5 µm wide.

300. ***Pediastrum tetras*** **(Ehrenberg) Ralfs (Plate 3.25; Fig. L)**

http://protist.i.hosei.ac.jp/PDB/Images/Chlorophyta/Pediastrum/tetras/tetras20b .html; Rai and Misra, 2012, pg. 172: Fig.1-2

Coenobia quadrate-circular, 4 celled, 15-18 µm wide in diameter; Cells with concave lobes, 7-12 um wide.

Genus *Scenedesmus*

301. ***Scenedesmus acunae*** **Comas Gonzáles (Plate 3.26; Fig. A)**

Das and Adhikary, 2014, pg. 152, pl. 12: Fig. 32

Coenobia 4 celled, oblong-ellipsoid or long cylindrical, arranged in single linear series with broadly rounded ends; cell 5-7 µm length and 14.6-17 µm wide; cell wall smooth with no spines or hairs; Chloroplast single and parietal.

302. ***Scenedesmus costatus*** **Schmidle (Plate 3.26; Fig. B)**

John et al. 2002, pg. 392, pg. 96, pl. 96: Fig. K

Coenobia 4 celled, compacted and alternating in zig zag arrangement, cells 3.2-3.8 µm wide and 7-9.2 µm wide.

303. ***Scenedesmus raciborskii*****Woloszynska (Plate 3.26; Fig. C)**

John et al. 2002, pl. 97: Fig. F

Coenobia made up of 2 or 4 alternating cells; cells 19-20.9 µm long and 4.4-5.2 µm wide; cells without spines, slightly curved and have rounded ends.

304. ***Scenedesmus*** **sp. Meyen (Plate 3.26; Fig. D)**

John et al. 2002, pg. 385

Coenoia 4 celled, arranged linearly. Cells ovoid, smooth walled without spines, 8-12 µm long and 4-5.8 µm.

Genus *Tetradesmus*

305. *Tetradesmus dimorphus* (Turpin) MJ Wynne (Plate 3.26; Fig. E)

Jayalakshmi and John, 2020, pg.484, pl. 1: Fig. 16

Colonies usually 4 celled sometimes 8 celled, 11-13 µm long and 3-4.2 µm wide, cells fusiform and curved and with sharp apices.

Subphylum Chlorophytina

Class Trebouxiophyceae

Order Chlorellales

Family Chlorellaceae

Genus *Actinastrum*

306. *Actinastrum* sp. Lagerheim (Plate 3.26; Fig. F)

John et al. 2002, pg. 328

Coenobia consist of 3 cells which are spindle shape, elongated and radiating in different directions from the same centre. Cells are 24-26 um long and 2-3 um wide.

Genus *Chlorella*

307. *Chlorrella ellipsoidea* Gerneck (Plate 3.26; Fig. G)

John et al, 2002, pg. 335, pl. 82: Fig. E

Cell is ellipsoidal, 13.8 µm long and 6- 6.4 µm wide. Chloroplast is cup shape; pyrenoids large, 2-4 in number.

308. *Chlorella* sp. Beijerinck (Plate 3.26; Fig. H)

John et al. 2002, pg.335

Cell spherical to sub-spherical, 7-16 µm in diameter, mostly solitary, chloroplast covers most part of the cell.

Genus *Geminella*

309. *Geminella interrupta* (Turpin) Lagerheim (Plate 3.26; Fig. I)

John et al. 2002, pg. 440, pl. 114: Fig. A

Cells embedded in a transparent mucilaginous sheath, cells in pairs and large gaps present between the adjacent cells. Cells are cylindrical, 4-5 µm wide and 8-10 µm long.

310. *Geminella* sp. Turpin (Plate 3.26; Fig. J)

John et al. 2002, pg. 440

Filamentous, unbranched and covered with gelatinous sheath. Cell cylindrical, 7.4 - 8.4µm wide and 6-7.1 µm long.

Order Chlorellales

Family Oocystaceae

Genus *Oocystis*

311. *Oocystis irregularis* (Petkoff) Printz (Plate 3.26; Fig. K)

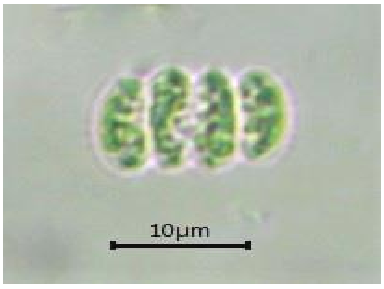
Dhande, 2012, Pg. 136: Fig. 14

Coenobia 4 celled, 30 µm in diameter and embedded in a mucilaginous with almost transparent sheath, cells ellipsoidal, 5 - 7 µm in diameter.

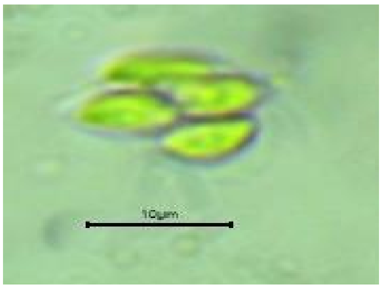
312. *Oocystis natans* G.M.Smith (Plate 3.26; Fig. L)

John et al. 2002, pg. 374, pl. 92: Fig. G

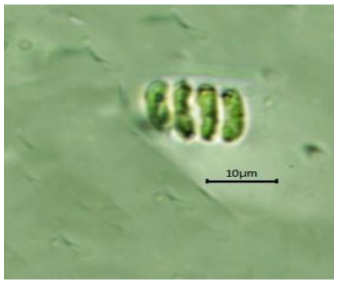
Coenobia ovoid to elliptic in shape, 8-16 celled in a colony, 23-28 µm long and 11-13.5 µm wide. Cells 4-5.6 µm long and 3.8-5 µm wide and ecch cell is in contact with mother cell wall.



A. ***Scenedesmus acunae*** **Comas Gonzáles**

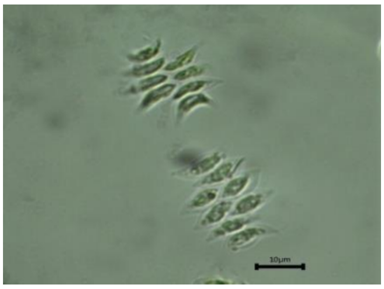


B. ***Scenedesmus costatus*** **Schmidle**

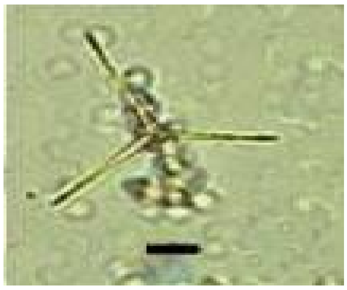


C. ***Scenedesmus raciborskii*** **Woloszynska**

D. ***Scenedesmus*** **sp. Meyen**



E. ***Tetradesmus dimorphus*** **(Turpin) MJ Wynne**

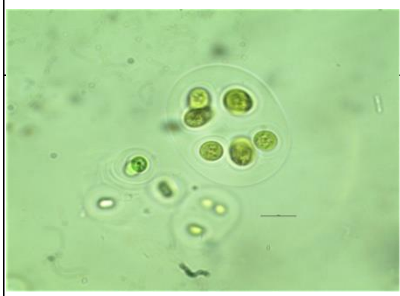


F. ***Actinastrum*** **sp. Lagerheim**

G. ***Chlorrella ellipsoidea*** **Gerneck**

H. ***Chlorella*** **spp. Beijerinck**

I. ***Geminella interrupta*** **(Turpin) Lagerheim**



J. ***Geminella*** **sp. Turpin**

K. ***Oocystis irregularis*** **(Petkoff) Printz**

L. ***Oocystis natans*** **G.M.Smith**

Plate-3.26 (Scale bar: 10 µm)

Order Prasiolales

Family Stichococcaceae

Genus *Stichococcus*

313. *Stichococcus bacillaris* Nageli (Plate 3.27; Fig. A)

John et al. 2002, pg. 461, pl. 113: Fig. F

Filaments made up of few cells, 5.4-7 µm wide and 10-14 µm long, Cells cylindrical with rounded ends.

Order Trebouxiophyceaeordo incertae sedis

Family Coccomyxaceae

Genus *Coccomyxa*

314. *Coccomyxa* sp. Schmidle (Plate 3.27; Fig. B)

John et al. 2002, pg. 339

Cells cylindrical, ellipsoidal-ovoid, 10-15 um long and 4-6 um wide with thin cell wall, mostly occurs singly.

Class Ulvophyceae

Order Cladophorales

Family Cladophoraceae

Genus *Cladophora*

315. *Cladophora glomerata* (Linnaeus) Kützing (Plate 3.27; Fig. C)

Prescott 1951, pg. 138, pl. 20: Fig. 8,9; Tiffany and Britton 1952, pg. 45, pl. 13: Fig. 93

Thallus is multicellular, dark green in colour, filamentous and branched with large cylindrical shape cells having rounded apices. Branches originate below the apex as a protrusion of a cell. Main branch 70-110 µm wide and length of the cells are 2-5 times as long as its width; branches 30-50 µm wide, 3-6 times as long as wide.

316. *Cladophora crispate* **(Roth) Kiitzing (Plate 3.27; Fig. D)**

Prescott, 1951, pg. 137, pl. 19: Fig. 9-11

Thallua branched filaments, 40-50 µm wide. Branched filaments cylindrical, 20-30 µm wide slightly attenuate at the apices. Chloroplast is reticulate with many pyrenoids.

Genus ***Rhizoclonium***

317. ***Rhizoclonium crassipellitum*** **West &G.S. West (Plate 3.27; Fig. E)**

Mridha et al. 2017, pg. 1294: Fig. 1: A

Filaments unbranched, 14-15.2 µm wide and 28- 48 µm long. Cells cylindrical, slightly inflated in some areas and chloroplast is reticulate.

318. ***Rhizoclonium hieroglyphicum*** **(C. Agardh) Kützing (Plate 3.27; Fig. F)**

John et al. 2002, pg. 470, pl. 117: Fig. O

Filaments unbranched, mostly longer than wide, 33- 89.8 µm long and 24 – 50.9 µm wide. Cells mostly cylindrical, swollen cells are sometimes present. Chloroplasts reticulate; cell walls thin; akinetes are club-shaped or barrel-like with thick cell walls.

319. ***Rhizoclonium riparium*** **(Roth) Harvey (Plate 3.27; Fig. G)**

Khaing, 2020, pg. 305: Fig. 2

Filaments are unbranched, yellowish green to green in colour. Cells are cylindricall, 50-53 µm long and 23-24 µm wide, chloroplast reticulate; cell wall 1.5-2 µm wide.

Order Trentepohliales

Family ***Trentepohliaceae***

320. *Trentopohlia* **sp. Martius (Plate 3.27; Fig. H)**

Prescott, 1951, pg. 133

Filaments are sparsely branched, 16-22 µm wide and 20-39 µm long. Cells are orange to rusty red in colour, cylindrical, sometimes swollen. Gametangia globose, 20-35 µm in diameter, forms on the lateral side of the cell.

Order Ulotrichales

Family Ulotrichaceae

Genus *Ulothrix*

321. *Ulothrix tenerrima* (Kützing) Kützing (Plate 3.27; Fig. I)

John et al. 2002, pg. 467, pl. 115: Fig. L

Filaments unbranched, 10.8 µm wide and 4-4.8 µm long, yellowish green colour and without gelatinous sheath.

322. *Ulothrix zonata* (F. Weber& Mohr) Kützing (Plate 3.27; Fig. J)

John et al. 2002, pg. 467, pl. 116: Fig. C

Filamentous, unbranched, without gelatinous sheath,15-30 µm long and 16-17 µm wide. Cells cylindrical, slightly swollen and having slight constriction at cross walls.

Phylum Glaucophyta

Class Glaucophyceae

Order Glaucocystales

Family Glaucocystaceae

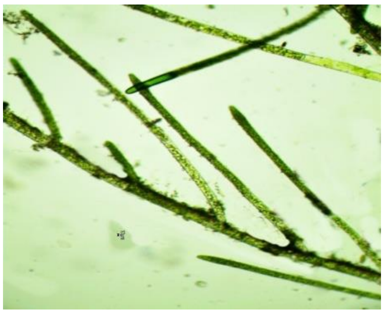
Genus *Glaucocystis*

323. *Glaucocystis* sp. Itzigsohn (Plate 3.27; Fig. K)

http://protist.i.hosei.ac.jp/PDB/Images/Others/Glaucocystis/; Prescott, 1952, pg. 473

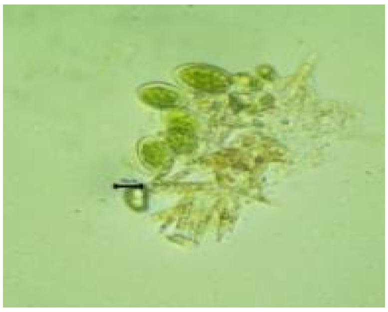
Cells are spherical to ellipsoidal shaped, mostly embedded in mucilaginous sheath, sometimes free, 9- 17 µm long and 8- 8.8 µm wide.

A. ***Stichococcus bacillaris*** **Nageli**

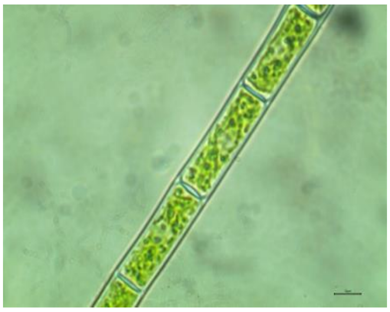


B. ***Cladophora crispate*** **(Roth) Kiitzing**

C. ***Cladophora glomerata*** **(Linnaeus) Kützing**



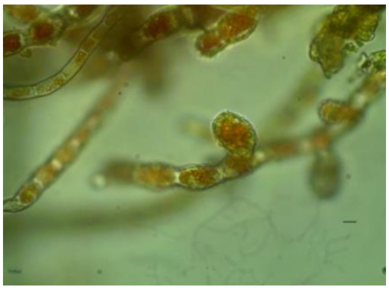
D. ***Coccomyxa*** **spp. Schmidle**



E. ***Rhizoclonium crassipellitum*** **West & G. S. West**

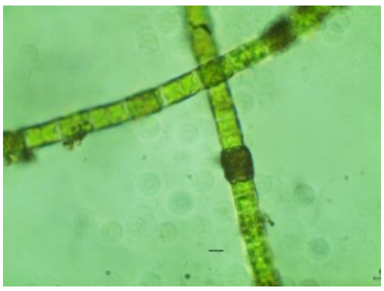
F. ***Rhizoclonium hieroglyphicum*** **(C. Agardh) Kützing**

G. ***Rhizoclonium riparium*** **(Roth) Harvey**



H. ***Trentopohlia*** **sp. Martius**

I. ***Ulothrix tenerrima*** **(Kützing) Kützing**



J. ***Ulothrix zonata*** **(F.Weber& Mohr) Kützing**

K. ***Glaucocystis*** **sp. Itzigsohn**

L. ***Batrachospermum*** **spp. Roth**

Plate-3.27 (Scale bar: 10 µm)

Phylum Rhodophyta

Subphylum Eurhodophytina

Class Florideophyceae

Subclass Nemaliophycidae

Order Batrachospermales

Family Batrachospermaceae

Genus *Batrachospermum*

324. *Batrachospermum* sp. Roth (Plate 3.27; Fig. L)

John et al. 2002, pg. 131

Filaments are macroscopic beaded in appearance, mucilaginous and green in colour. Branches of limited and unlimited growth are formed where the branched of limted growth forms spherical to barrel shaped whorled fascicle which are 120-150 µm in diameter. From the lower side of the cell, rhizoid like filaments and covers the axial filament which produces small fascicle branches. Antheridia are spherical, formed at the tip of the branches and occurs single or in pairs. Carpogonia are developed in the inner part of the whorled branch.

Phylum Euglenozoa

Infraphylum Dipilida

Class Euglenophyceae

Subclass Euglenophycidae

Order Euglenida

Family Euglenidae

Subfamily Eugleninae

Genus *Euglena*

325. *Euglena acus* Ehrenberg (Plate 3.28; Fig. A)

John et al. 2002, pg. 148, pl. 34: Fig. A

Cells elongate, slightly bent, 132.4 µm long and 11.6 µm wide. Anterior end trunctae and posterior end tapers into a long slender tail. Numerous disc shape chloroplast are present. Paramylon bodies are long and rod shaped and numerous.

326. *Euglena mutabilis* F.Schmit (Plate 3.28; Fig. B)

John et al. 2002, pg.155, pl. 37: Fig. O

Valves curved, slender, 83 µm long and 10 µm wide, cylindrical shape with tapering ends forming a short tail like structure at footpole and slightly truncate headpole.

327. *Euglena oxyuris* Schmarda (Plate 3.28; Fig. C)

John et al. 2002, pg. 155, pl. 34: Fig. F

Cells long, slightly twisted, 174.1 µm long and 30.7 µm wide. Anterior end rounded and posterior tapering into a tail like structure. Numerous discoid chloroplasts and two ovoid shaped paramylon are present.

Family Phacidae

Genus *Lepocinclis*

328. *Lepocinclis fusiformis* (H.J.Carter) Lemmermann (Plate 3.28; Fig. D)

Das and Adhikary, 2014, pg. 1197, pl. 15: Fig. 18; John et al. 2002, pg. 159, pl. 38: Fig. I

Cell lemon shape having pointed posterior end and almost blunt anterior end with an opening. Cell 15-19 µm long and 11-13 µm wide.

329. *Lepocinclis ovum* var. *dimidio-mino*(Deflandre) Conrad (Plate 3.28; Fig. E)

Valadez, 2010, pg 315: Fig 31-32.

Body ovoid to cylindrical with spirally striated pellicle, 15.6 µm long and 10.8 µm wide and numerous disc shape chloroplast are present.

330. *Phacus caudatus* Hübner (Plate 3.28; Fig. F)

John et al. 2012, pg. 164, pl.40: Fig. B; Das and Adhikary, 2014, pg. 193, pl. 15: Fig. 5

Cells 37.6 µm long and 17.3 µm wide, oval–like, flattened and elongates into a sharp hyaline tail, slightly bent toward the ventral.

331. *Phacus pleuronectes* (O.F. Müller) Nitzsch ex Dujardin (Plate 3.28; Fig. G)

John et al. 2002, pg. 167, pl. 40: Fig. E

Cell is broadly ovoid, 49.6 µm wide and 64 µm long and slightly asymmetrical. Anterioir end broadly rounded with a deep apical furrow and posterior side ending with a short tail which is curved to one side. Numerous disc shape chloroplast are present.

A. ***Euglena acus*** **Ehrenberg**

B. ***Euglena mutabilis*** **F.Schmit**

C. ***Euglena oxyuris*** **Schmarda**

D. ***Lepocinclis fusiformis*** **(H. J. Carter) Lemmermann**

E. ***Lepocinclis ovum*** **var.** ***dimidio-mino*** **(Deflandre) Conrad**

F. ***Phacus caudatus*** **Hübner**

G. ***Phacus pleuronectes*** **(O. F. Müller) Nitzsch ex Dujardin**

Plate-3.28 (Scale bar: 10 µm)

Table 3.1: Systematic arrangement of the algae taxa

Empire	King dom	Phyllum	Class	Order	Family	Genus	Algal taxa
Prokaryota	Eubacter	Cyanobacteria	Cyanophyceae	Chroococcales	Aphanothecaceae	*Aphanothece* (2)	*Aphanothece conglomerate* *Aphanothece stagnina*
						Gloeothece	*Gloeothece tepidariorum*
					Chroococcaceae	*Clorococcus* (3)	*Chrococcus minor* *Chrococcus* spp.1 *Chrococcus* spp.2
					Microcystaceae	*Gloeocapsa* (4)	*Gloeocapsa nigrescens* *Gleocapsa novacekii* *Gloeocapsa* spp. 1 *Gloeocapsa* spp. 2
				Nostocales	Calothricaceae	*Calothrix* (4)	*Calothrix braunii* *Calothrix marchica* var. *intermedia* *Calothrix paietina* *Calothrix* sp.
					Hapalosiphonacae	*Westelliopsis*	*Westelliopsis* sp.
					Nostocaceae	*Cylindrospermum* (2)	*Cylindrospermum majus* *Cylindrospermum stagnale*
						Anabaena (3)	*Anabaena iyengarii* *Anabaena laxa* *Anabaena variabilis*
						Nostoc (3)	*Nostoc ellipsosporum* *Nostoc* spp.1 *Nostoc* spp.2
					Nostochopsidaceae	*Nostochopsis*	*Nostochopsis lobata*

					Tolypothrichaceae	*Tolypothrix* (2)	*Tolypothrix byssoidea* *Tolypothrix distorta*
					Stigonemataceae	*Stigonema* (2)	*Stigonema tomentosum* *Steigonema* sp.
				Oscillatoriales	Coleofasciculaceae	*Geitlerinema*	*Geitlerinema splendidum*
					Oscillatoriaceae	*Cyanotheceae*	*Cyanotheceae ruginosa*
						Lyngbya (3)	*Lyngbya* spp.1 *Lyngba* spp.2 *Lyngba* spp.3
						Oscillatoria (13)	*Oscillatoria agardhi* *Oscillatoria agardhi* var. *isothrix* *Oscillatoria brevis* *Oscillatoria chlorina* *Oscillatoria curviceps* *Oscillatoria limosa* *Oscillatoria perornata* *Oscillatoria princeps* *Oscillatoria raoi* *Oscillatoria rubescens* *Oscillatoria subbrevis* *Oscillatoria tenuis* *Oscillatoria vizagapatensis*
						Phormidium (5)	*Phormidium ambiguum* *Phormidium favosum* *Phormidium pachydermaticum* *Phormidium stagnina* *Phormidium* sp.

				Spirulinales	Spirulinaceae	*Glaucospira*	*Glaucospira agilssima*
						Spirulina (2)	*Spirulina nodosa* *Spirulina laxissima*
				Synechococcales	*Merismopodiaceae*	*Aphanocapsa* (2)	*Aphanocapsa grevillei* *Aphanocapsa* sp.
						Merismopodia	*Merismopodia elegans*
					Pseudanabaenaceae	*Pseudanabaena*	*Pseudanabaena catenata*
						Lemmermaniella	*Lemmermaniella terrestris*
					Synechococcalesfamilaincertaesedis	*Schizothrix*	*Schizothrix telephoroides*
Eukaryota	Chromistae	Baccillariophyta	Baccillariophyceae	Bacillariales	Bacillariaceae	*Hantzschia* (2)	*Hantzschia amphioxys* *Hantzschia* sp.
						Nitzschia (8)	*Nitzschia clausii* *Nitzschia linearis* *Nitzschia nana* *Nitzschia palea* *Nitzschia recta* *Nitzschia sigma* *Nitzschia sigmoidea* *Nitzschia vermicularis*
				Cocconeidales	Achnanthidiaceae	*Achnanthidium* (6)	*Achnanthidium eutrophilum* *Achnanthidium latecephalum* *Achnanthidium minutissima* *Achnanthidium nanum* *Achnanthidium neotropicum* *Achnanthidium* sp.
						Lemnicola	*Lemnicola hungarica*

						Planothidium	*Planothidium lanceolatum*
					Cocconeidaceae	*Cocconeis* (3)	*Cocconeis pediculus* *Cocconeis placentula* var. *euglypta* *Coconeis* sp.
				Cymbellales	Cymbellaceae	*Brebissonia*	*Brebissonia lanceolata*
						Cymbella (10)	*Cymbella affiniformis* *Cymbella aspera* *Cymbella cymbiformis* *Cymbella excisa* *Cymbella fontinalis* *Cymbella kappii* *Cymbella neocistula* *Cymbella neoleptoceros* *Cymbella tumidula* *Cymbella* sp.
						Cymbopleura (2)	*Cymbopleura amphicephala* *Cymbopleura inaequalis*
						Cymbopleura	*Cymbopleura naviculiformis*
						Oricymba	*Oricymba subaequalis*
					Gomohonemataceae	*Encyonema* (5)	*Encyonema montana* *Encyonema prostratum* *Encyonema silesiacum* *Encyonema sublungebertulotii* *Encyonema vulgare*
						Gomphoneis	*Gomphoneis pseudo-okunoi*
						Gomphonema (10)	*Gomphonema acuminatum* *Gomphonema affine* *Gomphonema gracile*

							Gomphonema lagenula *Gomphonema laticollum* *Gomphonema minutum* *Gomphonema pumilum* var. *elegans* *Gomphonema truncatum* *Gomphonema ventricosum* *Gomphonema vibrio*
						Placoneis (2)	*Placoneis clementioides* *Placoneis* sp.
					Rhoicospheniaceae	*Rhoicosphenia*	*Rhoicosphenia abbreviata*
				Eunotiales	Eunotiaceae	*Eunotia* (10)	*Eunotia bilunaris* *Eunotia epithemioides* *Eunotia implicate* *Eunotia naegelii* *Eunotia novaecaledonica* *Eunotia paratridentula* *Eunotia perminuta* *Eunotia rhombiodea* *Eunotia serra* *Eunotia tridentula*
				Fragillariales	Fragillariaceae	*Fragillaria* (2)	*Fragillaria capucina* *Fragilaria mazamaensis* *Fragilaria rumpens* *Fragillaria vaucheriae*
						Odontidium (2)	*Odontidium hyemale* *Odontidium mesodon*
					Staurosiraceae	*Staurosira*	*Staurosira construens*

				Licmophorales	Ulnariaceae	*Hannaea*	*Hannaea inaequidentata*
						Ulnaria (4)	*Ulnaria acus* *Ulnaria biceps* *Ulnaria contracta* *Ulnaria ulna*
				Mastogloiales	Achnanthaceae	*Achnanthes*	*Achnanthes exigua*
					Mastogloiaceae	*Mastogloia*	*Mastogloia smithii* var. *lacustris.*
				Naviculales	Amphipleuraceae	*Amphipleura*	*Amphipleura* sp.
						Frustulia	*Frustulia* sp.
					Diadesmidaceae	*Diadesmis*	*Diadesmus confervacea* *Diadesmis gallica*
					Diploneidaceae	*Diploneis* (8)	*Diploneis calcilacustris* *Diploneis elliptica* *Diploneislusatica* *Diploneis ovalis* *Diploneis puella* *Diploneis puellafallax* *Diploneis smithii* *Diploneis yatukaensis*
					Naviculaceae	*Caloneis* (3)	*Caloneis acuta* *Caloneis silicula* *Caloneis strelnikovae*
						Gyrosigma (4)	*Gyrosigma acuminatum* *Gyrosigma obtusatum* *Gyrosigma scalproides* *Gyrosigma* sp.
						Navicula (11)	*Navicula cryptocephaloides* *Navicula erifuga* *Navicula lanceolata*

							Navicula peregrina *Navicula radiosa* *Navicula rhyncocephala* *Navicula riediana* *Navicula rostellata* *Navicul asymmetrica* *Navicula veneta* *Navicula viridula*
					Naviculalesincert aesedis	*Kobayasiella*	*Kobaya siellasubtilissima*
					Neidiaceae	*Neidium* (2)	*Neidium affine* *Neidium productum*
					Pinnulariaceae	*Pinnularia* (12)	*Pinnularia appendiculata* *Pinnularia borealis* *Pinnularia divergens* *Pinnularia divergens* var. *mesoleptiformis* *Pinnularia gigas* *Pinnularia latarea* *Pinnularia sikkimensis* *Pinnularia subanglica* *Pinnularia subgibba* *Pinnularia viridiformis* *Pinnularia viridis* *Pinnularia* sp.
					Pleurosigmatacea	*Pleurosigma*	*Pleurosigma* sp.
					Sellaphoraceae	*Sellaphora* (2)	*Sellaphor aseminulum* *Sellaphora* sp.
					Stauroneidaceae	*Stauroneis* (4)	*Stauroneis anceps* *Stauroneis smithii*

							Stauroneis spp. 1 *Stauroneis* spp. *2*
				Rhopalodiales	Rhopalodiaceae	*Epithemia*	*Epithemia sorex*
						Rhopalodia (2)	*Rhopalodia gibba* *Rhopalodia gibberula*
				Surirellales	Surirellaceae	*Cymatopleura*	*Cymatopleura solea*
						Iconella (2)	*Iconella biseriata* *Iconella tchadensis*
						Surirella (10)	*Surirella antioquiensis* *Surirella atomus* *Surirella brebissonii* *Surirella capronioides* *Surirella elegans* *Surirella linearis* *Surirella roba* *Surirella robusta* *Surirella tenera* *Surirella* sp.
				Tabellariales	Tabellariaceae	*Diatoma*	*Diatoma vulgaris*
				Thalassiophysales	Catenulaceae	*Amphora* (4)	*Amphora coffeiformis* *Amphora copulata* *Ampohora ovalis* *Amphora proteus*
			Coscinodiscophyceae	Melosirales	Melosiraceae	*Melosira* (2)	*Melosira varians* *Melosira varians* var. *aequalis*

		Ochrophyta	Xanthophyceae	Tribonemales	Tribonemataceae	*Tribonema* (5)	*Tribonema affine* *Tribonema bombycinum* *Tribonema minus* *Tribonema viride* *Tribonema vulgare*
				Vaucheriales	Vaucheriaceae	*Vaucheria* (2)	*Vaucheria aversa* *Vaucheria pseudogeminata*
	Plantae	Charophyrta	Charophyceae	Charales	Charophyceae	*Chara*	*Chara braunii*
						Nitella (2)	*Nitella hyaline* *Nitella* sp.
			Klebsormidiophyceae	Klebsormidiales	Klebsormidiaceae	*Klebsormidium* (2)	*Klebsormidium flaccidum* *Klebsormidium klebsii*
			Zygnematophyceae	Desmidiales	Closteriaceae	*Closterium* (12)	*Closterium abruptum* *Closterium acerosum* *Closterium acerosum* var. *minus* *Closterium acutum* var. *variabile* *Closterium dinae* *Closterium ehrenbergii* *Closterium idiosporum* *Closterium kuetzingii* *Closterium moniliferum* *Closterium parvulum* *Closterium pseudolunula* *Closterium rectimarginatum*

					Desmidiaceae	*Actinotaenium*	*Actinotaenium silvae-nigrae*
						Cosmarium (15)	*Cosmarium abbreviatum* var. *minus* *Cosmarium anceps* *Cosmarium blytii* *Cosmaarium botrytis* *Cosmarium celatum* *Cosmarium contractum* var. *rotundatum* *Cosmarium crenatum* *Cosmarium difficile* var. *dilatatum* *Cosmarium holmiense*var. *hibernicum* *Cosmarium impressulum* *Cosmarium laeve* *Cosmarium ornatum* *Cosmarium scutiforme* *Cosmarium speciosum* *Cosmarium* sp.
						Docidium	*Docidium undulatum*
						Pleurotaenium (2)	*Pleurotaenium ehrenbergii* *Pleurotaenium trabecula*
						Staurastrum (2)	*Staurastrum acutum* var. *varians* *Staurastrum punctulatum*
						Hyalotheca	*Hyalotheca dissiliens*
						Euastrum	*Euastrum sublobatum*
					Peniaceae	*Penium*	*Penium margaritaceum*
				Zygmatales	Mesotaeniaceae	*Cylindrocystis*	*Cylindrocystis brebissonii*
						Netrium	*Netrium digitus*

						Spirotaenia	*Spirotaenia condensate*
					Zygnemataceae	*Spirogyra* (13)	*Spirogyra australica* *Spirogyra decimina* *Spirogyra dubia* *Spirogyra insignis* *Spirogyra kundaensis* *Spirogyra mirabilis* *Spirogyra neglecta* *Spirogyra pratensis* *Spirogyra reticulate* *Spirogyra setiformis* *Spirogyra submargaritata* *Spirogyra varians* *Spirogya weberi*
						Mougeotia (2)	*Mougeotia boodlei* *Mougeotia* sp.
						Zygnema	*Zygnema* sp.
			Chlorophyceae	Chaetophorales	Aphanochaetaceae	*Aphanochaete*	*Aphanochaete repens*
					Chaetophoraceae	*Draparnaldia*	*Draparnaldia acuta*
						Stigeoclonium (2)	*Stigeoclonium lubricum* *Steigoclonium tenue*
				Chlamydomonadales	Volvocaceae	*Eudorina*	*Eudorina elegans*
				Oedogoniales	Oedogoniaceae	*Oedogonium* (4)	*Oedogonium abbreviatum* *Oedogonium* sp.1 *Oedogonium* sp. 2
				Sphaeropleales	Hydrodictyaceae	*Hydrodictyon*	*Hydrodictyon reticulatum*

					Microsporaceae	*Microspora*	*Microspora pachyderma* *Microspora tumidula*
					Scenedesmaceae	*Acutodesmus*	*Acutodesmus acuminatus*
						Coelastrum (2)	*Coelastrum pseudomicroporum* *Coelastrum* sp.
						Desmodesmus (3)	*Desmodesmu sabundans* *Desmodesmus perforatus* *Desmodesmus subspicatus*
						Pectinodesmus	*Pectinodesmus holtmannii*
						Pediastrum	*Pediastrum tetras*
						Scenedesms (4)	*Scenedesmus acunae* *Scenedesmus costatus* *Scenedesmus raciborskii* *Scenedesmus* sp.
						Tetradesmus	*Tetradesmus dimorphus*
						Actinastrum	*Actinastrum* sp.
			Trebouxiophyceae	Chlorellales	Chlorellaceae	*Chlorella* (2)	*Chlorella ellipsoidea* *Chlorella* sp.
						Geminella (2)	*Geminella interrupta* *Geminella* sp.
					Ocystaceae	*Oocystis* (2)	*Oocystis irregularis* *Oocystis natans*
				Prasiolales	Stichococcaceae	*Stichococcus*	*Stichococcus bacillaris*
				Trebouxiophyceaeordoincertaesedis	Coccomyxaceae	*Coccomyxa*	*Coccomyxa* sp.

			Ulvophyceae	Cladophorales	Cladophoraceae	*Cladophora* (2)	*Cladophora glomerata* *Cladophora crispate*
						Rhizoclonium (3)	*Rhizoclonium crassipellitum* *Rhizoclonium hieroglyphicum* *Rhizoclonium riparium*
				Trentepohliales	Trentopohliaceae	*Trentopohlia*	*Trentopohlia* sp.
				Ulotricales	Ulotrichaceae	*Ulothrix* (2)	*Ulothrix tenerrima* *Ulothrix zonata*
		Glaucophyta	Glaucophyceae	Glaucocystales	Glaucocystaceae	*Glaucocystis*	*Glaucocystis* sp.
		Rhodophyta	Florideophyceae	Batrachospermales	Batrachospermaceae	*Batrachospermum*	*Batrachospermum* sp.
		Euglenozoa	Euglenophyceae	Euglenida	Euglenidae	*Euglena* (3)	*Euglena acus* *Euglena mutabilis* *Euglena oxyuris*
					Phacidae	*Lepocinclis* (2)	*Lepocinclis fusiformis* *Lepocinclis ovum* var. *dimidio-mino*
						Phacus (2)	*Phacus caudatus* *Phacus pleuronectes*

Table 3.2: List of algal taxa with the collection details, different parameters and mode of occurrences

Algal Taxa	Place of collection	Date of collection	Collection number	Habitat	Mode of occurrence	G.P.S co-ordinates	Altitude (masl)
Aphanothece conglomerate	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483
Aphanothece stagnina	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Epilithic	25˚45'22.3"N 94˚13' 21.0"E	1091
	Tsieyama	04-09-2017	NU-BOT-KVP-125	Constructed pond	Eilithic	25˚67'12.3"N 94˚07' 37.1"E	1478
	Kenuozou	23-05-2018	NU-BOT-KVP-221	Moist soil	Epiphytic	25˚41'03.7"N 94˚ 06'47.6"E	1422
Gloeothece tepidariorum	Kenuozou	24-05-2018	NU-BOT-KVP-222	Moist soil	Epiphytic	25˚41'03.7"N 94˚06'47.6"E	1422
Chrococcus minor	Khonoma	24-01-2018	NU-BOT-KVP-154	Small stream	Epilithic	25˚39'22.6" N 94˚01'17.2" E	1523
	Jakhama	12-07-2018	NU-BOT-KVP-261	Constructed water tank	Planktonic	25˚35'07.4"N 94˚08' 06.6"E	1609
	Ehennu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0"N 94˚16' 12.2"E	1196
Chrococcus spp.1	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483
Chrococcus spp.2	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483
Gloeocapsa nigrescens	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483

Gleocapsa novacekii	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3”N 94˚02'46.4”E	2489
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Epilithic	25˚35'13.4”N 94˚02'50.0”E	2443
Gloeocapsa spp. 1	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3”N 94˚02'46.4”E	2489
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Epilithic	25˚35'13.4”N 94˚02'50.0”E	2443
Gloeocapsa spp. 2	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-223	Moist wall	Epilithic	25˚40' 7.3"N 94˚06' 45.7"E	1484
Calothrix braunii	Kenuozou	23-05-2018	NU-BOT-KVP-221	Moist soil	Epiphytic	25˚41' 3.7"N 94˚06' 47.6"E	1422
	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-223	Moist wall	Epilithic	25˚40'57.3"N 94˚ 06'45.7"E	1484
	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist rock	Epilithic	25˚35'08.6"N 94˚07' 12.1"E	1658
Calothrix marchica var. *intermedia*	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epilithic	25˚39'85.3"N 94˚11' 14.6"E	1529
Calothrix parietina	New Teroguunyu	05-09-2017	NU-BOT-KVP-134	Pond	Planktonic	25˚52'39.9" N 94˚11' 11.3"E	1323
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4”N 94˚02'50.0”E	2483
	Jakhama	12-07-2018	NU-BOT-KVP-261	Constructed water tank	Planktonic	25˚35'07.4"N 94˚08' 06.6"E	1609
Calothrix sp.	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epilithic	25˚39'85.3"N 94˚11' 14.6"E	1529

	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4”N 94˚02'50.0”E	2483
Westelliopsis sp.	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Epiphytic	25˚58'50.2"N 94˚14' 05.4"E	1239
Cylindrospermum majus	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epipytic	25°50'51.9"N 94°11' 32.5"E	1319
	Tuophema	15-03-2018	NU-BOT-KVP-183	small stream	Epilithic	25°51'38.2"N 94°10' 16.1"E	1440
	Mphie	23-05-2018	NU-BOT-KVP-230	Rice field	Epilithic	25°38'33.2"N 94° 09'13.0"E	1139
	Khuzama	07-07-2018	NU-BOT-KVP-231	Moist wall	Epilithic	25°31'98.3"N 94° 07'97.8"E	1701
Cylindrospermum stagnale	Zhadima	03-04-2017	NU-BOT-KVP-108	Drain	Epilithic	25°47'48.0"N 94°03'54.3"E	1345
Anabaena iyengarii	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07' 12.1"E	1658
Anabaena laxa	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Epilithic	25°55'34.0"N 94° 13'42.5"E	1283
	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Planktonic	25˚43'34" N 94˚0' 8.6" E	1002
Anabaena variabilis	Kenuozou	23-05-2018	NU-BOT-KVP-220	Constructed pond	Epilithic	25°41'00.7"N 94°06' 49.1"E	1476
	Jakhama	12-07-2018	NU-BOT-KVP-255	Small stream	Epilithic	25˚35'05.0"N 94˚07' 02.0"E	1652
Nostoc ellipsosporum	Jakhama	12-07-2018	NU-BOT-KVP-253	Moist rock	Epilithic	25˚35'07.2"N 94˚07' 13.4"E	1655
Nostoc spp.1	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Epilithic	25˚45'22.3"N	1091

						94˚13' 21.0"E	
	Kikha,Kohima village	03-04-2017	NU-BOT-KVP-104	Moist wall	Epilithic	25˚44'27.1"N 94° 5' 22.7"E	1516
	Tsieyama,Jotsoma village	04-09-2017	NU-BOT-KVP-125	Constructed pond	Epilithic	25˚40'23.3"N 94˚4' 32.1"E	1478
	Jotsoma village	04-09-2017	NU-BOT-KVP-223	Constructed pond	Epilithic	25˚40'26.7"N 94˚03' 56.2"E	1426
	Kenuozou	23-05-2018	NU-BOT-KVP-221	Moist soil	Epiphytic	25˚41'03.7"N 94˚ 06'47.6"E	1422
Nostoc spp.2	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-223	Moist wall	Epilithic	25°40'57.3"N 94°06'45.7"E	1484
Nostochopsis lobata	Kenuozou	23-05-2018	NU-BOT-KVP-221	Moist soil	Epiphytic	25°41'03.7"N 94°06' 47.6"E	1422
Tolypothrix byssoidea	Khonoma	21-01-2018	NU-BOT-KVP-157	Moist wall	Epilithic	25˚39'85.3"N 94˚1' 14.6"E	1529
Tolypothrix distorta	Jakhama	12-07-2018	NU-BOT-KVP-255	Stream	Epilithic	25˚35'05.0"N 94˚07' 02.0"E	1652
Stigonema tomentosum	Dzükou	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3”N 94˚02'46.4”E	2489
	Dzükou	04-04-2019	NU-BOT-KVP-281	Depression spring	Epiphytic	25˚33'15.5"N 94˚03'50.7"E	2443
Steigonema sp.	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07' 12.1"E	1658
Geitlerinema splendidum	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13' 42.5"E	1283
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Epiphytic	25°54'55.0"N 94°12' 13.8"E	1268

Cyanotheceae ruginosa	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Lyngbya spp. 1	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Epiphytic	25˚67'12.3"N 94˚07' 37.1"E	1572
	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epilithic	25°50'51.9"N 94°11' 32.5"E	1319
Lyngbya spp.2	Tsiesera	19-03-2018	NU-BOT-KVP-256	Constructed pond	Epilithic	25˚44'27.1"N 94° 5' 22.7"E	1420
Lyngbya spp.3	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07' 12.1"E	1658
Oscillatoria agardhi	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3"N 94˚11' 10.4"E	1361
	Meriema	19-03-2018	NU-BOT-KVP-196	River	Epilithic	25°43'14.7"N 94°6' 3.4"E	1213
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	Kenuozou	23-05-2018	NU-BOT-KVP-220	Constructed pond	Epiphytic	25°41'00.7"N 94°06' 49.1"E	1476
	Jakhama	12-07-2018	NU-BOT-KVP-257	Rice field	Epiphytic	25˚35'10.5" N 94˚07' 28.3"E	1626
	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7"N 94˚07' 04.6"E	1601
	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Floating	25˚43'34" N 94˚0' 8.6" E	1002
Oscillatoria agardhii var.*isothrix*	Ginri	08-06-2019	NU-BOT-KVP-287	Rice field	Epilithic	25°55'30.0"N 94°13' 40.5"E	1083

Oscillatoria brevis	Kikha	03-04-2017	NU-BOT-KVP-104	Pond	Epilithic	25˚41'53.1"N 94°06' 08.7"E	1351
	Zhadima	03-04-2017	NU-BOT-KVP-108	Drain	Epilithic	25° 47' 8.0"N 94° 03' 4.3"E	1345
	Jotsoma village	04-09-2017	NU-BOT-KVP-127	Constructed pond	Epilithic	25˚40'22.7"N 94˚04' 0.1"E	1470
	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3"N 94˚11' 10.4"E	1361
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-213	Moist soil	Epilithic	25° 40' 5.8"N 94° 07' 6.2"E	1399
	Khuzama	07-07-2019	NU-BOT-KVP-235	Moist rock	Epilithic	25˚32'21.3"N 94˚08' 19.7"E	1657
	Jakhama	12-07-2018	NU-BOT-KVP-253	Moist rock	Epilithic	25˚35'07.2"N 94˚07' 13.4"E	1655
	Chunlikha	18-10-2018	NU-BOT-KVP-246	Pond	Epiphytic	25˚58'48.5"N 94˚14' 11.3"E	1263
	Züzha River, Peducha	02--02-2019	NU-BOT-KVP-273	Pond	Epilithic	25˚43'58"N 94˚0'7.0"E	882
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Epiphytic	25˚33'15.5"N 94˚03'50.7"E	2443
Oscillatoria chlorina	Zhadima	03-04-2017	NU-BOT-KVP-102	Rice field	Epiphytic	25°48'23.1"N 94°03' 42.8"E	1281
	Ginri	08-06-2019	NU-BOT-KVP-287	Rice field	Epilithic	25°55'30.0"N 94°13' 40.5"E	1083
Oscillatoria curviceps	Zhadima	03-04-2017	NU-BOT-KVP-102	Rice field	Epiphytic	25°48'23.1"N 94°03' 42.8"E	1281
Oscillatoria	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Epilithic	25˚42'18.6" N	1456

limosa						94˚10'42.5" E	
	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Epilithic	25˚67'12.3"N 94˚07'37.1" E	1572
	Jotsoma village	04-09-2017	NU-BOT-KVP-128	Rice field	Epiphytic	25˚40'28.6" N 94˚4' 31.4" E	1414
	L'Khel, Kohima village	05-09-2017	NU-BOT-KVP-140	Pond	Epilithic	25˚54'40.0"N 94˚07'22.7" E	1222
	Kigwema	29-01-2018	NU-BOT-KVP-165	Drain	Epilithic	25˚36'12.0" N 94˚07' 99.4"E	1567
	Yikhanu	18-10-2018	NU-BOT-KVP-241	Pond	Epilithic	25˚58'29.3" N 94˚16'21.6" E	1185
	Jakhama	12-07-2018	NU-BOT-KVP-253	Moist rock	Epilithic	25˚35'07.2" N 94˚07'13.4" E	1655
Oscillatoria perornata	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Epilithic	25˚45'22.3" N 94˚13' 21.0"E	1091
	Kijümetouma	04-04-2017	NU-BOT-KVP-119	Moist soil	Epilithic	25˚43'57.0" N 94˚11'54.7" E	1309
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epiphytic	25°44'36.8"N 94° 5' 23.9"E	1406
Oscillatoria princeps	Tsieyama,Jotsoma village	04-09-2017	NU-BOT-KVP-125	Constructed pond	Epiphytic	25˚67'12.3" N 94˚07' 37.1"E	1478
	New Teroguunyu	05-09-2017	NU-BOT-KVP-136	Small water spring	Epilithic	25˚52'32.1" N 94˚10' 06.4"E	1391
	Khonoma	24-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚39'21.3" N 94˚01'18.1" E	1510
	Khonoma	24-01-2018	NU-BOT-KVP-159	Drain	Epilithic	25˚37'46.0" N 94˚01' 5.4" E	2051

	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11' 32.5"E	1391
	Rüsoma	04-04-2017	NU-BOT-KVP-110	Rice field	Planktonic	25˚42'51.3" N 94˚08'13.5" E	1456
Oscillatoria raoi	Rüsoma	04-04-2017	NU-BOT-KVP-224	Rice field	Epiphytic	25˚42'51.3" N 94˚08'13.5" E	1456
	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11' 10.4"E	1361
	Nerhema	11-09-2017	NU-BOT-KVP-138	Drain	Epilithic	25˚46'38.3" N 94˚07'04.0" E	1448
	Dzüleke	24-01-2018	NU-BOT-KVP-160	River	Epiphytic	25˚63'05.1" N 93˚97'10.1" E	1989
	Tuophema	14-03-2018	NU-BOT-KVP-178	Rice field	Epiphytic	25°51'50.0"N 94°10'.5" E	1275
	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1401
	Khonoma	19-03-2018	NU-BOT-KVP-157	Moist wall	Epiphytic	25°39'85.3"N 94° 1' 14.1"E	1529
	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Epilithic	25° 32' 05" N 94° 08' 10"E	1710
	Jakhama	12-07-2018	NU-BOT-KVP-253	Moist wall	Epilithic	25˚35'07.2"N 94˚07'13.4" E	1655
	Zunpha	08-06-2019	NU-BOT-KVP-122	Stream	Epilithic	25°55'07.0"N 94°12' 05.3"E	1136
Oscillatoria rubescens	Khonoma	02-06-2017	NU-BOT-KVP-297	Constructed pond	Epilithic	25˚39'85.3" N 94˚1'14.6" E	1529
Oscillatoria	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Epilithic	25˚67'12.3" N	1572

subbrevis						94˚07'37.1" E	
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-217	Constructed pond	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-219	Dain	Epilithic	25°40'57.7"N 94°06' 47.3"E	1478
	Jakhama	12-07-2018	NU-BOT-KVP-258	Rice field	Epiphytic	25˚35'13.1" N 94˚07'29.9" E	1599
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Construted pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
Oscillatoria tenuis	Zhadira	03-04-2017	NU-BOT-KVP-108	Drain	Epilithic	25°47'48.0"N 94°03' 54.3"E	1345
	Kijümetouma	04-04-2017	NU-BOT-KVP-115	Temporary pool	Planktonic	25˚45'26.4" N 94˚13'20.0" E	1085
	Khonoma	24-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚39'21.3" N 94˚01'18.1" E	1510
	Kigwema	29-01-2018	NU-BOT-KVP-172	Small stream	Epilithic	25˚36'6.2" N 94˚6' 32.7" E	1629
	Kigwema	29-01-2018	NU-BOT-KVP-173	Small stream	Epilithic	25˚35'50.2" N 94˚06'45.3" E	1800
	Meriema	19-03-2018	NU-BOT-KVP-187	Constructed pond	Epiphytic	25°42'53.7"N 94° 5' 10.3" E	1391
	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Epilithic	25° 42' 55.6N 94° 5' 25.7" E	1417
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-207	Constructed pond	Epilithic	25° 40' 55" N 94° 07' 00"E	1489
	Peducha	02-02-2019	NU-BOT-KVP-278	Fish pond	Epiphytic	25˚44'4" N 93˚59' 36" E	878

Oscillatoria vizagapatensis	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist rock	Epilithic	25˚35'08.6" N 94˚07'12.1" E	1668
	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epilithic	25˚43'33.8" N 94˚8' 27.2" E	1369
Phormidium ambiguum	Tsokeda	08-06-2019	NU-BOT-KVP-175	Drain	Epilithic	25°55'54.0"N 94°13' 25.5"E	1124
Phormidium favosum	Tuophema	14-03-2018	NU-BOT-KVP-183	Small stream	Epilithic	25°51'38.2"N 94°10' 16.1"E	1440
Phormidium pachydermaticum	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-209	Constructed pond	Epilithic	25°41'02.6"N 94°06' 48.1"E	1465
	Kandinu	18-10-2018	NU-BOT-KVP-243	Snail	Epizoic	25˚59'23.3" N 94˚14' 24.0"E	1249
Phormidium stagnina	Zhadima	03-04-2017	NU-BOT-KVP-101	Temporary pool	Epiphytic	25°47'21."N 94° 03'56.2"E	1407
Phormidium sp.	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphytic	25˚59'10.2" N 94˚14'10.6" E	1182
Glaucospira agilssima	Tsokeda	08-06-2019	NU-BOT-KVP-289	Drain	Epilithic	25°55'54.0"N 94°13' 25.5"E	1124
Spirulina nodosa	Kenuozou	23-05-2018	NU-BOT-KVP-220	Constructed pond	Epilithic	25°41'00.7"N 94°06' 49.1"E	1476
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Epiphytic	25°32'20.2"N 94°08' 24.9"E	1638
Spirulina laxissima	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-217	Constructed pond	Planktonic	25°41'02.3"N 94°06' 48.1"E	1464
Aphanocapsa grevillei	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Aphanocapsa	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed	Planktonic	25˚43'36.9" N	1342

sp.				pond		94˚8' 45.7" E	
Merismopodia elegans	Mphie	23-05-2018	NU-BOT-KVP-212	Rice field	Planktonic	23°39'23.2"N 94°11' 08.6"E	1155
Pseudanabaena catenata	Kigwema	29-01-2018	NU-BOT-KVP-164	Pond	Epiphytic	25˚36'21.0"N 94˚07'42." E	1602
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epiphytic	25°44'36.8"N 94° 5' 23.9"E	1406
Lemmermaniella terrestris	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Planktonic	25°50'53.0"N 94°10' 43.7"E	1437
Schizothrixtelephoroides	Nerhema	11-09-2017	NU-BOT-KVP-141	Drain	Epilithic	25˚46'42.3" N 94˚07'06.0" E	1436
Hantzschia amphioxys	P’ Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
	P’ Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Epilithic	25° 32' 05" N 94° 08' 10"E	1710
	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7" N 94˚07'04.6" E	1601
Hantzschia sp.	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13' 42.5"E	1064
Nitzschia clausii	New Teroguunyu	05-09-2017	NU-BOT-KVP-136	Small water spring	Epilithic	25˚52'32.1" N 94˚10'06.4" E	1391
	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11' 32.5"E	1319
	P’ Khel, Kohima village	23-05-2018	NU-BOT-KVP-209	Constructed pond	Planktonic	25°41'02.6"N 94°06' 48.1"E	1465

	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-214	Moist soil	Epilithic	25°41'03.4"N 94°07' 09.0"E	1414
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
	Chunlikha	18-10-2018	NU-BOT-KVP-247	Drain	Epilithic	25˚48'49.2" N 94˚14'13.8" E	1268
	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
	Ginri	08-06-2019	NU-BOT-KVP-287	Rice field	Epiphytic	25°55'30.0"N 94°13' 40.5"E	1083
Nitzschia nana	Yikhanu	18-10-2018	NU-BOT-KVP-239	Small stream	Epiphytic	25˚58'34.2" N 94˚16'26.2" E	1136
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13' 42.5"E	1283
	Dzükentun River	08-06-2019	NU-BOT-KVP-292	River	Epilithic	25°54'10.0"N 94°13' 21.4"E	916
Nitzschia linearis	Meriema	19-03-2018	NU-BOT-KVP-196	River	Epilictic	25°43'14.7"N 94° 6' 3.4" E	1213
	Yikhanu	18-10-2018	NU-BOT-KVP-239	Small stream	Epiphytic	25˚58'34.2" N 94˚16'26.2" E	1136
Nitzschia palea	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Planktonic	25˚45'22.3" N 94˚13' 21.0"E	1091
	Jotsoma	04-09-2017	NU-BOT-KVP-128	Rice field	Epiphytic	25˚40'28.6" N 94˚4' 31.4" E	1414

	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilictic	25°44'36.8"N 94° 5' 23.9"E	1401
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08' 19.7"E	1657
	Jakhama	12-07-2018	NU-BOT-KVP-153	Moist rock	Epilictic	25˚35'07.2" N 94˚07'13.4" E	1655
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilictic	25˚35'05.0" N 94˚07'02.0" E	1652
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0" E	2488
	Peducha	02-02-2019	NU-BOT-KVP-278	Fish pond	Epiphytic	25˚44'4" N 93˚59' 36" E	878
Nitzschia recta	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1401
Nitzschia sigma	Dzüzha river, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57" N 94˚0' 9.0" E	1029
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58" N 94˚0'7.0" E	882
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Epiphytic	25°54'55.0"N 94°12' 13.8"E	1268
Nitzschia sigmoidea	Zhadima	03-04-2017	NU-BOT-KVP-107	Fish pond	Epiphytic	25°48'23.7"N 94°03' 29.0"E	1286
	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1401
Nitzschia	New	05-09-2017	NU-BOT-KVP-133	Small water	Epilithic	25˚52'49.3" N	1361

vermicularis	Teroguunyu			spring		94˚11'10.4" E	
	Kigwema	29-01-2018	NU-BOT-KVP-172	Small stream	Epilithic	25˚36'6.2" N 94˚6' 32.7" E	1629
	Jakhama	12-07-2018	NU-BOT-KVP-260	Pond	Planktonic	25˚35'05.7" N 94˚07'04.6" E	1601
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483
Achnanthidium eutrophilum	Noumvürü, Peducha	02-02-2019	NU-BOT-KVP-276	Stream	Epilithic	25˚44'4" N 94˚59' 25" E	945
Achnanthidium latecephalum	Yikhanu	18-10-2018	NU-BOT-KVP-239	Small stream	Epiphytic	25˚58'34.2" N 94˚16'26.2" E	1136
	Dzüzha river, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57" N 94˚0' 9.0" E	1029
Achnanthidium minutissima	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Epilithic	25˚45'22.3" N 94˚13'21.0" E	1091
	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-122	Constructed pond	Planktonic	25˚40'45.0" N 94˚06'39.7" E	1511
	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Khonoma	24-01-2018	NU-BOT-KVP-156	Constructed pond	Planktonic	25˚39'85.3" N 94˚1'14.6" E	1529
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-209	Constructed pond	Planktonic	25°41'02.6"N 94°06' 48.1"E	1465
	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Planktonic	24°40'57.6"N 94°06' 44.2"E	1483
	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Epilithic	25°32' 05" N 94°08' 10"E	1710

	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed pond	Epilithic	25˚43'36.9" N 94˚8' 45.7" E	1342
	Noumvürü, Peducha	02-02-2019	NU-BOT-KVP-276	Stream	Epilithic	25˚44'4" N 94˚59' 25" E	945
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Epiphytic	25°54'55.0"N 94°12' 13.8"E	1268
Achnanthidium nanum	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Epilithic	25˚43'57.0" N 94˚11' 54.7"E	1504
	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Planktonic	25˚35'06.8" N 94˚78'03.2"E	1595
	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5"N 94˚52'03.6"E	2639
Achnanthidium neotropicum	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2483
	Dzükou River	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4" E	2489
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13' 16.3"E	917
Achnanthidium sp.	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36" N 94˚8' 44.0" E	1347
Lemnicola	Khonoma	24-01-2018	NU-BOT-KVP-159	Small	Epilithic	25˚62'95.0" N	2015

hungarica				stream		94˚01' 81.7"E	
Planothidium lanceolatum	Dzüzha River	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57"N 94˚0' 9.0" E	1029
Cocconeis pediculus	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0" E	658
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
Cocconeis placentulavar.euglypta	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
Coconeis sp.	Meriema	19-03-2018	NU-BOT-KVP-196	River	Epilithic	25°43'14.7"N 94°6' 3.4" E	1213
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0" E	660
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Brebissonia lanceolata	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Planktonic	25˚45'22.3" N 94˚13'21.0" E	1091
	Rüsoma	04-04-2017	NU-BOT-KVP-112	Small stream	Epilithic	25˚45'21.8" N 94˚10'44.7" E	1253
	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Constructed pond	Epilithic	25˚43'57.0" N 94˚11'54.7" E	1504
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilithic	25˚32'21.3" N 94˚08'19.7" E	1657
	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Epilithic	25˚31'46.0" N 94˚7' 46.7" E	1731
	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0" N	1171

						94˚16'24.0" E	
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Planktonic	25˚59'35.3" N 94˚15'23.6" E	1245
	Rüsoma	31-01-2019	NU-BOT-KVP-267	Pond	Epilithic	25˚44'46.9" N 94˚8' 46.7" E	1344
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0" E	658
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.25N 94˚03'50.77'E	2458
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Cymbella affiniformis	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
Cymbella aspera	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Epilithic	25˚45'22.3" N 94˚13'21.0" E	1091
	Zhadima	03-04-2017	NU-BOT-KVP-102	Rice field	Epiphytic	25°48'23.1"N 94°03' 42.8"E	1281
	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Epilithic	25˚46'34.3" N 94˚07'00.4" E	1412
	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3" N 94˚7' 11.6" E	1586
	Kigwema	30-01-2018	NU-BOT-KVP-169	Small stream	Epilithic	25˚35'55.4" N 94˚6' 47.7" E	1586
	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Panktonic	25°50'51.9"N 94°11' 32.5"E	1319

	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25°50'53.0"N 94°10'43.7" E	1437
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-215	Temporary pool	Epiphytic	25°41'04.5"N 94°07' 09.4"E	1416
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0" E	658
	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Floating	25˚43'34"N 94˚0' 8.6" E	1002
	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5" E	1064
Cymbella cymbiformis	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36"N 94˚8' 44.0" E	1347
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
Cymbella excisa	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0" E	660
	Dzükentun River	08-06-2019	NU-BOT-KVP-292	River	Epilithic	25°54'10.0"N 94°13'21.4" E	916
Cymbella fonti nalis	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
Cymbella kappii	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Planktonic	24°40'57.6"N 94°06' 44.2"E	1483
Cymbella neocistula	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
Cymbella neoleptoceros	Khonoma	24-01-2018	NU-BOT-KVP-154	Small stream	Epilithic	25˚39'22.6" N 94˚01'17.2" E	1523
	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5"N	2639

						94˚52'03.69'E	
Cymbella tumidula	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Epilithic	25˚43'57.0" N 94˚11'54.7" E	1504
	Rüsoma	04-04-2017	NU-BOT-KVP-110	Rice field	Planktonic	25˚42'51.3" N 94˚08'13.5" E	1456
	Rüsoma	05-04-2017	NU-BOT-KVP-112	Smal stream	Epilithic	25˚45'21.8" N 94˚10'44.7" E	1253
	Chedema	04-04-2017	NU-BOT-KVP-106	Moist soil	Epilithic	25˚40'20.8" N 94˚09'46.9" E	1539
	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epiphytic	25˚39'85.2" N 94˚11'41.1" E	1529
	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0" N 93˚59'06.3" E	2052
	Meriema	19-03-2018	NU-BOT-KVP-197	River	Epiphytic	25°43'17.9"N 94° 5' 55.2" E	1200
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Epilithic	25˚31'46.0" N 94˚7' 46.7" E	1731
	Rüsoma	31-01-2019	NU-BOT-KVP-267	Pond	Planktonic	25˚44'46.9" N 94˚8' 46.7" E	1344
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0" E	660
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283

Cymbella sp.	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed pond	Epilithic	25˚43'36.9" N 94˚8' 45.7" E	1342
Cymbopleura amphicephala	Jotsoma	04-09-2017	NU-BOT-KVP-128	Rice field	Epiphytic	25˚40'28.6" N 94˚4' 31.4" E	1414
	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Planktonic	24°40'57.6"N 94°06' 44.2"E	1483
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
Cymbopleura inaequalis	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3" N 94˚7' 11.6" E	1586
Cymbopleura naviculiformis	Dzüleke River	14-03-2018	NU-BOT-KVP-162	River	Epiphytic	25˚38'24.0" N 93˚59'06.4" E	1939
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-213	Pond	Planktonic	25°40'45.8"N 94°07' 26.2"E	1399
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
Oricymba subaequalis	Jakhama	07-07-2018	NU-BOT-KVP-254	Temporary pool	Epiphytic	25˚35'09.0" N 94˚07'12.0" E	1650
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Epiphytic	25°54'55.0"N 94°12'13.8" E	1268
Encyonema montana	Zunpha	08-06-2019	NU-BOT-KVP-296	Stream	Epiphytic	25°55'07.0"N 94°12'05.3" E	1136
Encyonema prostratum	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
Encyonema	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed	Epiphytic	25°54'55.0"N	1268

silesiacum				pond		94°12'13.8" E	
Encyonema sublungebertulotii	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5"N 94˚52'03.6"E	1639
Encyonema vulgare	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1369
	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Epilithic	25°31'98.3"N 94°07' 97.8"E	1701
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2"N 94˚03'50.7"E	2458
Gomphoneis pseudo-okunoi	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5" N 94˚52'03.6" E	1639
Gomphonema acuminatum	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Planktonic	25°42'55.6"N 94° 5' 25.7" E	1417
Gomphonema affine	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08'19.7" E	1657
	Kijümetouma	04-04-2017	NU-BOT-KVP-119	Pond	Epilictic	25˚43'57.0" N 94˚11'54.7" E	1309
	Tuophema	14-03-2018	NU-BOT-KVP-182	Temporary roadside pool	Planktonic	25°51'35.2"N 94°10'15.9" E	1451
	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Planktonic	25°42'55.6"N 94° 5' 25.7" E	1417

	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-213	Pond	Planktonic	25°40'45.8"N 94°07' 26.2"E	1399
	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0" N 94˚16'24.0" E	1171
	Kandinu	18-10-2018	NU-BOT-KVP-244	Fish Pond	Epilithic	25˚59'30.2" N 94˚15'22.9" E	1236
	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphythic	25˚59'10.2" N 94˚14'10.6" E	1182
Gomphonema gracile	Dzüzha River, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57"N 94˚0' 9.0" E	1029
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2"N 94˚03'50.7" E	2458
	Dzükentun River	08-06-2019	NU-BOT-KVP-192	River	Epilithic	25°54'10.0"N 94°13'21.4" E	916
Gomphonema lagenula	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-219	Drain	Epilithic	25°40'57.7"N 94°06' 47.3"E	1478
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Epilithic	25°32'20.2"N 94°08' 24.9"E	1638
	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7" N 94˚07'04.6" E	1601
Gomphonema laticollum	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
Gomphonema minutum	Chedema	04-04-2017	NU-BOT-KVP-106	Fish pond	Planktonic	25˚40'20.8" N 94˚09'46.9" E	1539
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N	2458

						94˚03'50.7" E	
Gomphonema pumilum var. *elegans*	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5" N 94˚52'03.6" E	1639
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
Gomphonema truncatum	Rüsoma	04-04-2017	NU-BOT-KVP-110	Rice field	Planktonic	25˚42'51.3" N 94˚08'13.5" E	1456
	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-122	Constructed pond	Planktonic	25˚40'45.0" N 94˚06'39.7" E	1511
	Meriema	19-03-2018	NU-BOT-KVP-188	Constructed pond	Epiphytic	25°42'54.2"N 94° 5' 9.2" E	1395
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3" N 94˚14'24.0" E	1249
Gomphonema ventricosum	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Planktonic	25°42'55.6"N 94° 5' 25.7" E	1417
Gomphonema vibrio	Khonoma	29-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚39'21.3" N 94˚1' 18.1" E	1522
Placoneis clementioides	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5" E	1283
Placoneis sp.	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Planktonic	25˚59'35.3" N 94˚15'23.6" E	1245
Rhoicosphenia abbreviata	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Planktonic	25°42'55.6"N 94° 5' 25.7" E	1417
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'6"N 94˚8' 44.0" E	1347
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0" E	658

Eunotia bilunaris	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Chunlikha	18-10-2018	NU-BOT-KVP-246	Pond	Epiphytic	25˚58'48.5" N 94˚14'11.3" E	1263
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36"N 94˚8' 44.0" E	1347
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4" E	2489
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
Eunotia epithemioides	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5" N 94˚52'03.6" E	2639
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
Eunotia implicate	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
Eunotia naegelii	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
Eunotia novae caledonica	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
	Dzükou valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Eunotia	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression	Planktonic	25˚33'13.4" N	2451

paratridentula				spring		94˚03'54.8" E	
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Eunotia perminuta	Jakhama	12-07-2018	NU-BOT-KVP-153	Moist rock	Epilithic	25˚35'07.2" N 94˚07'13.4" E	1655
Eunotia rhombiodea	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0" N 94˚16'24.0" E	1171
Eunotia serra	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Eunotia tridentula	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Fragillaria capucina	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
	Kigwema	29-01-2018	NU-BOT-KVP-165	Drain	Epilithic	25˚36'12.0" N 94˚07'99.4" E	1568
	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7" N 94˚07'04.6" E	1601
	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5" N 94˚52'03.6" E	1639

	Dzükou River	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
Fragilaria mazamaensis	Dzüzha River, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57"N 94˚0' 9.0" E	1029
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Fragilaria rumpens	Noumvürü, Peducha	02-02-2019	NU-BOT-KVP-276	Stream	Epilithic	25˚44'4"N 94˚59' 25" E	945
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08'19.7" E	1657
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0" E	2488
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Planktonic	25˚43'29.0" N 94˚8' 29.7" E	1398
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0" E	660
	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5" E	1283
Fragillaria vaucheriae	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Odontidium hyemale	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Odontidium mesodon	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Kigwema	29-01-2018	NU-BOT-KVP-173	Small	Epilithic	25˚35'50.2" N	1800

				stream		94˚06'45.3" E	
	Khonoma	29-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚65'59.4" N 94˚02'17.1" E	1522
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Epilithic	25˚33'13.4" N 94˚03'54.8" E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
Staurosira construens	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
Hannaea inaeq uidentata	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5" N 94˚52'03.6" E	1639
Ulnaria acus	Kijümetouma	04-04-2017	NU-BOT-KVP-119	Pond	Epilictic	25˚43'57.0" N 94˚11'54.7" E	1309
	Rüsoma	05-04-2017	NU-BOT-KVP-112	Smal stream	Epilithic	25˚45'21.8" N 94˚10'44.7" E	1253
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-207	Constructed pond	Epiphytic	25° 40' 55" N 94° 07' 00"E	1489
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3" N 94˚14'24.0" E	1249
	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1369
	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed pond	Epilithic	25˚43'36.9" N 94˚8' 45.7" E	1342

	Rüsoma	31-01-2019	NU-BOT-KVP-267	Pond	Epilithic	25˚44'46.9" N 94˚8' 46.7" E	1344
	Dzüzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
Ulnaria biceps	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
	Mphie	23-05-2018	NU-BOT-KVP-212	Rice field	Epiphytic	23°39'23.2"N 94°11' 08.6"E	1155
Ulnaria contracta	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphytic	25˚59'10.2" N 94˚14'10.6" E	1182
Ulnaria ulna	Kijümetouma	04-04-2017	NU-BOT-KVP-119	Pond	Epilictic	25˚43'57.0" N 94˚11'54.7" E	1309
	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Epiphytic	25˚42'18.6" N 94˚10'42.5" E	1456
	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Kigwema	30-01-2018	NU-BOT-KVP-169	Small stream	Epilithic	25˚35'55.4" N 94˚6' 47.7" E	1586
	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Planktonic	25°42'55.6"N 94° 5' 25.7" E	1417
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epilithic	25°44'36.8"N 94°5' 23.9"E	1406
	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Planktonic	24°40'57.6"N 94°06' 44.2"E	1483
	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphytic	25˚59'10.2" N 94˚14'10.6" E	1182
	Rüsoma	31-01-2019	NU-BOT-KVP-264	Small	Epilithic	25˚43'32.0" N	1398

				stream		94˚8' 24.7" E	
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0" E	660
	Dzükentun, River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3" E	917
Achnanthes exigua	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
Mastogloia smithii var.*lacustris.*	Nerhema	11-09-2017	NU-BOT-KVP-241	Drain	Epilithic	25˚46'42.3" N 94˚07'06.0" E	1437
Amphipleura sp.	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Frustulia sp.	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
Diadesmus confervacea	Yikhanu	18-10-2018	U-BOT-KVP-241	Pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1185
	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1369
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36"N 94˚8' 44.0" E	1347
	Dzükentun River	08-06-2019	NU-BOT-KVP-192	River	Epilithic	25°54'10.0"N 94°13'21.4" E	916
Diadesmis gallica	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
Diploneis calcilacustris	Nerhema	11-09-2017	NU-BOT-KVP-139	Pond	Planktonic	25˚46'38.3" N 94˚07'04.0" E	1432
	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed	Planktonic	25˚35'06.8" N	1595

				pond		94˚078'03.2'E	
Diploneis elliptica	Kijümetouma	04-04-2017	NU-BOT-KVP-119	Pond	Epilictic	25˚43'57.0" N 94˚11'54.7" E	1309
	Nerhema	11-09-2017	NU-BOT-KVP-141	Drain	Epilithic	25˚46'42.3" N 94˚07'06.0" E	1437
	Tuophema	14-03-2018	NU-BOT-KVP-183	Small stream	Epilithic	25°51'38.2"N 94°10'16.1" E	1440
	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary pool	Epilithic	25°54'41.0"N 94°12'23.1" E	1282
Diploneis lusatica	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Diploneis ovalis	Zhadima	03-04-2017	NU-BOT-KVP-102	Rice field	Epiphytic	25°48'23.1"N 94°03' 42.8"E	1281
	Meriema	19-03-2018	NU-BOT-KVP-187	Constructed pond	Planktonic	25°42'50.5"N 94° 5' 44.3" E	1391
	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epilithic	25°42'50.5"N 94° 5' 44.3" E	1399
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Diploneis puella	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
Diploneis puellafallax	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
Diploneis smithii	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5" E	1064

Diploneis yatukaensis	Tsiesera	19-03-2018	NU-BOT-KVP-204	Constructed pond	Epilithic	25˚44'27.1"N 94° 5' 22.7" E	1420
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Caloneis acuta	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Caloneis silicula	Nerhema	11-09-2017	NU-BOT-KVP-141	Drain	Epilithic	25˚46'42.3" N 94˚07'06.0" E	1437
	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5" E	1064
Caloneis strelnikovae	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Gyrosigma acuminatum	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3" N 94˚7' 11.6" E	1586
	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilictic	25°44'36.8"N 94° 5' 23.9"E	1401
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-216	Rice field	Epiphytic	25° 38' 47" N 94° 09' 38"E	1160
	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Epilithic	25˚31'46.0" N 94˚7' 46.7" E	1731
	Zunpha	08-06-2019	NU-BOT-KVP-296	Stream	Epiphytic	25°55'07.0"N 94°12'05.3" E	1136
	Tseminyu	08-06-2019	NU-BOT-KVP-291	Constructed	Epiphytic	25°55'34.0"N	1283

	village			pond		94°13'42.5" E	
	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
Gyrosigma obtusatum	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
Gyrosigma scalproides	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
	Zunpha	08-06-2019	NU-BOT-KVP-296	Stream	Epiphytic	25°55'07.0"N 94°12'05.3" E	1136
Gyrosigma sp.	Tuophema	14-03-2018	NU-BOT-KVP-175	- Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
Navicula cryptocephaloides	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3" N 94˚11'10.4" E	1361
	Rüsoma	05-04-2017	NU-BOT-KVP-112	Smal stream	Epilithic	25˚45'21.8" N 94˚10'44.7" E	1253
	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0" N 93˚59'06.3" E	2052
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-207	Constructed pond	Epiphytic	25° 40' 55" N 94° 07' 00"E	1489
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0" N 94˚16'24.0" E	1171
	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphythic	25˚59'10.2" N 94˚14'10.6" E	1182

Navicula erifuga	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1369
Navicula lanceolata	Hebenji	05-09-2017	NU-BOT-KVP-137Epiphytic	Small water spring	Epilithic	25˚52'28.4" N 94˚10'80.7" E	1461
	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
Navicula peregrine	Dzüzha River, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57"N 94˚0' 9.0" E	1029
Navicula radiosa	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epilithic	25°42'50.5"N 94°5' 44.3" E	1399
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3" E	917
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Epiphytic	25°54'55.0"N 94°12'13.8" E	1268
Navicula rhyncocephala	Kijümetouma	04-04-2017	NU-BOT-KVP-117	Constructed pond	Epiphytic	25˚46'06.3" N 94˚13'47.2" E	1068
	Jakhama	12-07-2018	NU-BOT-KVP-255	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
	Dzükou River	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4" E	2489
	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0" E	2488
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Planktonic	25°55'34.0"N 94°13'42.5" E	1283
	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary pool	Epilithic	25°54'41.0"N 94°12'23.1" E	1282
	Tseminyu	08-06-2019	NU-BOT-KVP-291	Constructed	Epiphytic	25°55'34.0"N	1283

	village			pond		94°13'42.5" E	
	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary pool	Epilithic	25°54'41.0"N 94°12'23.1" E	1282
Navicula riediana	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0" N 94˚16'24.0" E	1171
Navicula rostellata	Meriema	19-03-2018	NU-BOT-KVP-196	River	Epilictic	25°43'14.7"N 94° 6' 3.4" E	1213
Navicula symmetrica	Zhadima	03-04-2017	NU-BOT-KVP-107	Fish pond	Epiphytic	25°48'23.7"N 94°03' 29.0"E	1286
Navicula veneta	Kijümetouma	04-04-2017	NU-BOT-KVP-117	Constructed pond	Epiphytic	25˚46'06.3" N 94˚13'47.2" E	1068
	Rüsoma	04-04-2017	NU-BOT-KVP-110	Rice field	Planktonic	25˚42'51.3" N 94˚08'13.5" E	1456
	Chedema	04-04-2017	NU-BOT-KVP-106	Moist soil	Epilithic	25˚40'20.8" N 94˚09'46.9" E	1539
	Vety colony, Tseminyu	05-09-2017	NU-BOT-KVP-130	Smll water spring	Epilithic	25˚55'20.4" N 94˚13' 7.9" E	1291
	Khonoma	29-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚39'21.3" N 94˚1' 18.1" E	1522
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3" E	917
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Epiphytic	25°31'98.3"N 94°07' 97.8"E	1701
	Chunlikha	18-10-2018	NU-BOT-KVP-247	Drain	Epilithic	25˚48'49.2" N	1268

						94˚14'13.8" E	
	Rüsoma	31-01-2019	NU-BOT-KVP-264	Small stream	Epilithic	25˚43'32.0" N 94˚8' 24.7" E	1398
	Dzüzha River, Peducha	02-02-2019	NU-BOT-KVP-275	River	Epilithic	25˚43'57"N 94˚0' 9.0" E	1029
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
	Ginri	08-06-2019	NU-BOT-KVP-287	Rice field	Epiphytic	25°55'30.0"N 94°13'40.5" E	1083
Navicula viridula	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0" N 94˚01'81.7" E	2015
	Dzükentun River	08-06-2019	NU-BOT-KVP-192	River	Epilithic	25°54'10.0"N 94°13'21.4" E	916
Kobayasiella subtilissima	Vety colony, Tseminyu	05-09-2017	NU-BOT-KVP-130	Smll water spring	Epilithic	25˚55'20.4" N 94˚13' 7.9" E	1291
Neidium affine	New Teroguunyu	05-09-2017	NU-BOT-KVP-134	Pond	Planktonic	25˚52'39.9" N 94˚11'11.3" E	1323
	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3" N 94˚07'06.0" E	1438
Neidium productum	Kijümetouma	04-04-2017	NU-BOT-KVP-115	Temporary pool	Planktonic	25˚45'26.4" N 94˚13'20.0" E	1085
	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0" N 93˚59'06.3" E	2052
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	- Epilithic	25°32'20.2"N 94°08' 24.9"E	1638
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36"N 94˚8' 44.0" E	1347

Pinnularia appendiculata	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
	Zunpha	08-06-2019	NU-BOT-KVP-296	Stream	Epiphytic	25°55'07.0"N 94°12'05.3" E	1136
Pinnularia borealis	Khonoma	29-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚39'21.3" N 94˚1' 18.1" E	1522
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4" N 94˚03'54.8" E	2451
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
Pinnularia divergens	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Epiphytic	25˚42'18.6" N 94˚10'42.5" E	1456
	Seikhazou, Kohima village	03-04-2017	NU-BOT-KVP-103	Pond	Planktonic	25˚40'29.4" N 94˚06' 54.5" E	1507
	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Epilithic	25˚46'34.3" N 94˚07'00.4" E	1412
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Epilithic	25˚58'50.2" N 94˚14'05.4" E	1239
	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7" N 94˚07'04.6" E	1601
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
	Dzükentun River	08-06-2019	NU-BOT-KVP-292	River	Epilithic	25°54'10.0"N 94°13'21.4" E	916

	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
Pinnularia divergens var. *mesoleptiformis*	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25°50'53.0"N 94°10'43.7" E	1437
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
Pinnularia gigas	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36"N 94˚8' 44.0" E	1347
Pinnularia latarea	Yikhanu	18-10-2018	U-BOT-KVP-241	Pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1241
Pinnularia sikkimensis	New Teroguunyu	05-09-2017	NU-BOT-KVP-134	Pond	Planktonic	25˚52'39.9" N 94˚11'11.3" E	1323
	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epilithic	25°42'50.5"N 94°5' 44.3" E	1399
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3"N 94˚14'24.0" E	1249
Pinnularia subanglica	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Planktonic	25˚58'50.2"N 94˚14' 05.4"E	1239
Pinnularia subgibba	Jotsoma	04-09-2017	NU-BOT-KVP-128	Rice field	Epiphytic	25˚40'28.6" N 94˚4' 31.4" E	1414
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08' 19.7"E	1657
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Epilithic	25˚43'36" N 94˚8' 44.0" E	1347
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
Pinnularia	Vety colony,	05-09-2017	NU-BOT-KVP-130	Smll water	Epilithic	25˚55'20.4" N	1291

viridiformis	Tseminyu			spring		94˚13' 7.9" E	
	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3" N 94˚07'06.0" E	1438
	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-213	Pond	Planktonic	25°40'45.8"N 94°07' 26.2"E	1399
	Jakhama	12-07-2018	NU-BOT-KVP-153	Moist rock	Epilictic	25˚35'07.2" N 94˚07'13.4" E	1655
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Planktonic	25˚59'35.3" N 94˚15'23.6" E	1245
Pinnularia viridis	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
	Tuophema	14-03-2018	NU-BOT-KVP-178	Rice field	Planktonic	25°51'50.0"N 94°10'.5" E	1275
	Yikhanu	18-10-2018	NU-BOT-KVP-241	Pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1185
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3" N 94˚14'24.0" E	1249
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Planktonic	25˚58'50.2" N 94˚14'05.4" E	1239
	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1369
	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0" N 93˚59'06.3" E	2052

	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5" E	1283
Pinnularia sp.	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Pleurosigma sp.	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0" E	658
Sellaphora seminulum	Hebenji	05-09-2017	NU-BOT-KVP-137	Small water spring	Epilithic	25˚52'28.4" N 94˚10'80.7" E	1461
Sellaphora sp.	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
	Rüsoma	31-01-2019	NU-BOT-KVP-264	Small stream	Epilithic	25˚43'32.0" N 94˚8' 24.7" E	1398
	Kijümetouma	04-04-2017	NU-BOT-KVP-117	Constructed pond	Epiphytic	25˚46'06.3" N 94˚13'47.2" E	1068
	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Epilithic	25° 32' 05" N 94° 08' 10"E	1710
Stauroneis anceps	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25°50'53.0"N 94°10'43.7" E	1437
Stauroneis smithii	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
Stauroneis sp.1	Chunlikha	18-10-2018	NU-BOT-KVP-246	Pond	Epiphytic	25˚58'48.5" N	1263

						94˚14'11.3" E	
Stauroneis sp. *2*	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0" N 94˚07'02.0" E	1652
	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epiphytic	25˚39'85.2" N 94˚11'41.1" E	1529
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3" E	917
Epithemia sorex	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Planktonic	25˚45'22.3" N 94˚13'21.0" E	1091
	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Epilithic	25˚43'57.0" N 94˚11'54.7" E	1504
	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Epilithic	25˚46'34.3" N 94˚07'00.4" E	1412
	Meriema	19-03-2018	NU-BOT-KVP-188	Constructed pond	Epiphytic	25°42'54.2"N 94°5' 9.2" E	1395
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1406
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Epilithic	25˚58'50.2" N 94˚14'05.4" E	1239
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
Rhopalodia gibba	Nerhema	11-09-2017	NU-BOT-KVP-143	Pond	Epiphytic	25˚46'38.9" N 94˚07'01.0" E	1480
	Kigwema	29-01-2018	NU-BOT-KVP-172	Small stream	Epilithic	25˚36'6.2"N 94˚6' 32.7" E	1629
	Tuophema	14-03-2018	NU-BOT-KVP-180	Small stream	Epiphytic	25°51'12.2"N 94°10'26.0" E	1440

	Tuophema	14-03-2018	NU-BOT-KVP-183	Small stream	Epilithic	25°51'38.2"N 94°10'16.1" E	1440
	Meriema	19-03-2018	NU-BOT-KVP-188	Constructed pond	Epiphytic	25°42'54.2"N 94°5' 9.2" E	1395
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5" N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Planktonic	25˚33'18.1" N 94˚03'36.7" E	2448
Rhopalodia gibberula	Zhadima	03-04-2017	NU-BOT-KVP-107	Fish pond	Epiphytic	25°48'23.7"N 94°03' 29.0"E	1286
Cymatopleura solea	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0" E	882
Iconella biseriata	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3" N 94˚07'06.0" E	1438
Iconella tchadensis	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3" N 94˚07'06.0" E	1438
	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5" E	1283
Surirella antioquiensis	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5" E	1283
Surirella atomus	Jotsoma	04-09-2017	NU-BOT-KVP-126	Constructed pond	Epilithic	25˚40'26.7" N 94˚03'56.2" E	1426
	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7" N 94˚8' 45.3" E	1345
	Dzü River,	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N	660

	Rüsoma					94˚10'47.0" E	
Surirella brebissonii	Yikhanu	18-10-2018	U-BOT-KVP-241	Pond	Epiphytic	25˚43'33.8" N 94˚8' 27.2" E	1185
	Zhadima	03-04-2017	NU-BOT-KVP-107	Fish pond	Epiphytic	25°48'23.7"N 94°03' 29.0"E	1286
Surirella capronioides	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3" N 94˚7' 11.6" E	1586
Surirella elegans	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1406
	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary pool	Epilithic	25°54'41.0"N 94°12'23.1" E	1282
Surirella linearis	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
Surirella roba	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5" E	1319
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08'19.7" E	1657
	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Epilithic	25˚31'46.0" N 94˚7' 46.7" E	1731
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Epilithic	25°31'98.3"N 94°07' 97.8"E	1701
	Jakhama	07-07-2018	NU-BOT-KVP-255	Small stream	Epiphytic	25˚35'05.0" N 94˚07'02.0" E	1652

	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0" N 94˚16'12.2" E	1196
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3" E	917
Surirella robusta	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epilithic	25°44'36.8"N 94°5' 23.9"E	1406
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0" N 94˚8' 29.7" E	1398
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2.0"N 94˚10'47.0" E	660
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2" N 94˚03'50.7" E	2458
Surirella tenera	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Epiphytic	25˚42'18.6" N 94˚10'42.5" E	1456
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3" N 94˚08'19.7" E	1657
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epilithic	25˚43'29.0"N 94˚8' 29.7" E	1398
Surirella sp.	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3"N 94˚07'06.0" E	1438
	Rüsoma	31-01-2019	NU-BOT-KVP-262	Constructed water tank	Epiphytic	25˚43'33.8"N 94˚8' 27.2" E	1369
Diatoma vulgaris	Tsieyama, Jotsoma	04-09-2017	NU-BOT-KVP-125	Constructed pond	Epilithic	25˚67'12.3"N 94˚07'37.1" E	1478
	Meriema	19-03-2018	NU-BOT-KVP-191	Rice field	Planktonic	25°42'55.6"N 94° 5' 38.0" E	1384

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	P’ Khel, Kohima village	19-03-2018	NU-BOT-KVP-191	Rice field	Epilithic	25°42'55.6"N 94° 5' 38.0" E	1384
	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25˚58'29.3"N 94˚16'21.6" E	1437
	Yikhanu	18-10-2018	NU-BOT-KVP-241	Pond	Epilithic	25˚33'15.5" N 94˚03'50.7"E	1185
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Amphora coffeiformis	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0"E	882
Amphora copulata	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3"N 94˚07'06.0" E	1438
	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wll	Epilithic	25˚39'85.3"N 94˚01'14.1" E	1529
	Mphie	23-05-2018	NU-BOT-KVP-212	Rice field	Epiphytic	23°39'23.2"N 94°11' 08.6"E	1155
Ampohora ovalis	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epilithic	25°44'36.8"N 94° 5' 23.9"E	1406
	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Epilithic	25°31'98.3"N 94°07' 97.8"E	1701
	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5"E	1283
	Dzükentun River	08-06-2019	NU-BOT-KVP-293	River	Epilithic	25°54'10.0"N 94°13'16.3"E	917
Amphora	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N	1319

proteus						94°11'32.5"E	
Melosira varians	Chedema	04-04-2017	NU-BOT-KVP-106	Moist soil	Epilithic	25˚40'20.8"N 94˚09'46.9"E	1539
	Kigwema	29-01-2018	NU-BOT-KVP-166	Small stream	Epilithic	25˚36'15.0"N 94˚07'38.3"E	1621
	Kigwema	30-01-2018	NU-BOT-KVP-169	Small stream	Planktonic	25˚35'55.4"N 94˚6' 47.7"E	1586
	Kigwema	29-01-2018	NU-BOT-KVP-172	Small stream	Epilithic	25˚36'6.2"N 94˚6' 32.7"E	1629
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Planktonic	25°44'36.8"N 94°5' 23.9"E	1406
	Tsiesera	19-03-2018	NU-BOT-KVP-204	Constructed pond	Planktonic	25˚44'27.1"N 94° 5' 22.7"E	1420
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Planktonic	25˚58'50.2"N 94˚14'05.4"E	1239
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Planktonic	25˚43'29.0"N 94˚8' 29.7"E	1398
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0"E	658
	Dzükou River	04-04-2019	NU-BOT-KVP-283	River	Epilithic	25˚32'50.5"N 94˚52'03.6"E	1639
	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Planktonic	25°55'34.0"N 94°13'42.5"E	1283
Melosira varians var.*aequalis*	Zhadima	03-04-2017	NU-BOT-KVP-101	Temporary pool	Planktonic	25°47'21.1"N 94°03' 56.2"E	1407
	Zhadima	03-04-2017	NU-BOT-KVP-105	Fish pond	Planktonic	25°48'37.0"N 94°03' 28.3"E	1227

	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-208	Pond	Planktonic	25°40'55.0"N 94°05' 05.1"E	1492
	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epilithic	25˚39'85.2"N 94˚11'41.1"E	1529
Tribonema affine	Tsiesera	19-03-2018	NU-BOT-KVP-204	Constructed pond	Planktonic	25˚44'27.1"N 94°5' 22.7"E	1420
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Epiphytic	25˚33'13.4"N 94˚03'54.8"E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-282	Depression spring	Epiphytic	25˚33'18.1"N 94˚03'36.7" E	2448
Tribonema bombycinum	Meriema	19-03-2018	NU-BOT-KVP-187	Constructed pond	Planktonic	25°42'50.5"N 94°5' 44.3"E	1391
Tribonema minus	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
Tribonema viride	Kijümetouma	04-04-2017	NU-BOT-KVP-116	Pond	Planktonic	25˚45'22.3"N 94˚13'21.0" E	1091
	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Planktonic	25˚67'12.3"N 94˚07'37.1"E	1572
	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Planktonic	25˚46'34.3"N 94˚07'00.4"E	1412
	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3"E	2052
	Meriema	19-03-2018	NU-BOT-KVP-186	Small stream	Epiphytic	25°42'44"N 94°5' 39.2"E	1383
	Rüsoma	31-01-2019	NU-BOT-KVP-269	Fish pond	Planktonic	25˚43'36"N 94˚8' 44.0"E	1347
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression	Planktonic	25˚33'15.5"N	2443

				spring		94˚03'50.7"E	
	Tseminyu village	08-06-2019	NU-BOT-KVP-288	Constructed pond	Planktonic	25°55'34.0"N 94°13'42.5"E	1283
Tribonema vulgare	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Planktonic	25˚42'18.6"N 94˚10'42.5"E	1456
	Tsiesera	19-03-2018	-BOT-KVP-205	Pond	Planktonic	25°44'24.8"N 94°5'20.6"E	1433
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Floating	25°32'20.2"N 94°08' 24.9"E	1638
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3"N 94˚14'24.0" E	1249
	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Planktonic	25˚59'10.2"N 94˚14'10.6"E	1182
Vaucheria aversa	Kikha,Kohima village	03-04-2017	NU-BOT-KVP-104	Pond	Epilithic	25˚44'27.1"N 94°5'22.7"E	1516
	Mphie	23-05-2018	NU-BOT-KVP-212	Rice field	Epipelic	23°39'23.2"N 94°11' 08.6"E	1155
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0"E	882
Vaucheria pseudogeminata	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilithic	25°44'36.8"N 94°5'23.9"E	1401
	Tsiesera	19-03-2018	NU-BOT-KVP-203	Constructed pond	Epipelic	25°44'36.8"N 94°5' 23.9"E	1406
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Epipelic	25˚59'35.3" N 94˚15'23.6" E	1245
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Epipelic	25˚58'39.0"N 94˚16'12.2" E	1196

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Chara braunii	Meriema	19-03-2018	NU-BOT-KVP-188	Pond	Epipelic	25°42'54.2"N 94°5' 9.2"E	1395
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Epipelic	25˚58'39.0"N 94˚16'12.2" E	1196
Nitella hyaline	Yikhanu	18-10-2018	NU-BOT-KVP-241	Pond	Epipelic	25˚58'29.3"N 94˚16'21.6" E	1185
Nitella sp.	Meriema	19-03-2018	NU-BOT-KVP-190	Rice field	Epipelic	25°42'53.2"N 94°5'31.8"E	1447
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Epipelic	25˚58'39.0"N 94˚16'12.2" E	1196
Klebsormidium flaccidum	Meriema	19-03-2018	NU-BOT-KVP-191	Rice field	Planktonic	25°42'55.6"N 94° 5' 38.0" E	1384
	Dzükou Valley	20-09-2018	NU-BOT-KVP-252	Moist cave	Epilithic	25˚35'12.4"N 94˚02'59.0"E	2488
	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07'12.1" E	1658
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Klebsormidium klebsii	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wll	Epilithic	25˚39'85.3"N 94˚01'14.1"E	1529
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-207	Constructed pond	Epiphytic	25°40'55"N 94°07'00"E	1489
Closterium abruptum	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3" E	2052
	Kigwema	29-01-2018	NU-BOT-KVP-164	Pond	Planktonic	25˚36'21.0"N 94˚07'42.0"E	1602
	Meriema	19-03-2018	NU-BOT-KVP-186	Small	Epiphytic	25°42' 44"N	1383

				stream		94°5' 39.2"E	
Closterium acerosum	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3"N 94˚11'10.4"E	1361
	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Epiphytic	25˚46'34.3"N 94˚07'00.4"E	1412
	Tuophema	14-03-2018	NU-BOT-KVP-178	Rice field	Planktonic	25°51'50.0"N 94°10'.5"E	1275
	Chunlika	18-10-2018	NU-BOT-KVP-246	Pond	Epiphytic	25˚58'48.5"N 94˚14'11.3" E	1263
Closterium acerosum var.*minus*	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Planktonic	25˚35'06.8"N 94˚07'03.2"E	1595
Closterium acutum var. *variabile*	New Teroguunyu	05-09-2017	NU-BOT-KVP-133	Small water spring	Epilithic	25˚52'49.3"N 94˚11'10.4" E	1361
	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25°50'53.0"N 94°10'43.7"E	1437
Closterium dinae	Tuophema	14-03-2018	NU-BOT-KVP-179	Fish pond	Planktonic	25°51' 0.5"N 94°10'53.2"E	1437
	Rüsoma	31-01-2019	NU-BOT-KVP-263	Constructed pond	Epiphytic	25˚43'29.0"N 94˚8' 29.7"E	1398
	Rüsoma	31-01-2019	NU-BOT-KVP-267	Pond	Planktonic	25˚44'46.9"N 94˚8' 46.7"E	1344
	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0"E	658
Closterium ehrenbergii	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Planktonic	25˚46'34.3"N 94˚07'00.4"E	1412
	Khonoma	24-01-2018	NU-BOT-KVP-159	Small	Epilithic	25˚62'95.0"N	2015

				stream		94˚01'81.7"E	
	Meriema	19-03-2018	NU-BOT-KVP-197	River	Epiphytic	25°43'17.9"N 94° 5' 55.2"E	1200
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-213	Pond	Planktonic	25°40'45.8"N 94°07' 26.2"E	1399
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epiphytic	25˚43'58"N 94˚0'7.0" E	882
Closterium idiosporum	Khonoma	24-01-2018	NU-BOT-KVP-159	Small stream	Epilithic	25˚62'95.0"N 94˚01'81.7"E	2015
	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epiphytic	25°42'50.5"N 94° 5' 44.3"E	1399
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Planktonic	25˚58'50.2"N 94˚14'05.4"E	1239
	Chunlikha	18-10-2018	NU-BOT-KVP-246	Pond	Epiphytic	25˚58'48.5"N 94˚14'11.3"E	1263
Closterium kuetzingii	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epilithic	25°42'50.5"N 94°5' 44.3"E	1399
Closterium moniliferum	Meriema	19-03-2018	NU-BOT-KVP-197	River	Epiphytic	25°43'17.9"N 94° 5' 55.2"E	1200
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Planktonic	25°32'20.2"N 94°08' 24.9"E	1638
	Jakhama	12-07-2018	NU-BOT-KVP-257	Rice field	Epiphytic	25˚35'10.5"N 94˚07'28.3"E	1626
	Züzha, Peducha	02-02-2019	NU-BOT-KVP-273	Stream	Epilithic	25˚43'58"N 94˚0'7.0"E	882
Closterium parvulum	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2"N 94˚03'50.7"E	2458

Closterium pseudolunula	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5"E	1064
Closterium rectimarginatum	Khonoma	24-01-2018	NU-BOT-KVP-154	Small stream	Epilithic	25˚39'22.6"N 94˚01'17.2"E	1523
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Planktonic	25˚58'50.2"N 94˚14'05.4"E	1239
	Jakhama	07-07-2018	NU-BOT-KVP-254	Temporary pool	Epiphytic	25˚35'09.0"N 94˚07'12.0"E	1650
Actinotaenium silvae-nigrae	Dzükou Valley	20-09-2018	NU-BOT-KVP-252	Moist cave	Epilithic	25˚35'12.4"N 94˚02'59.0"E	2488
Cosmarium abbreviatum var. *minus*	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3"N 94˚7' 11.6"E	1586
Cosmarium anceps	Jakhama	12-07-2018	NU-BOT-KVP-153	Moist rock	Epilictic	25˚35'07.2"N 94˚07'13.4"E	1655
Cosmarium blytii	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Epilithic	25°32'20.2"N 94°08' 24.9"E	1638
	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0"N 94˚07'02.0"E	1652
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8" E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Epilithic	25˚33'18.2"N 94˚03'50.7"E	2458
Cosmaarium botrytis	Rüsoma	04-04-2017	NU-BOT-KVP-111	Pond	Epiphytic	25˚42'18.6"N 94˚10'42.5"E	1456
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Epilictic	25˚32'21.3"N	1657

						94˚08'19.7"E	
	Rüsoma	31-01-2019	NU-BOT-KVP-267	Pond	Epilithic	25˚44'46.9"N 94˚8' 46.7"E	1344
Cosmarium caelatum	Kigwema	29-01-2018	NU-BOT-KVP-171	Small stream	Epilithic	25˚36'8.1"N 94˚6' 39.7"E	1628
Cosmarium contractum var. *rotundatum*	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0"N 94˚16'12.2"E	1196
	Dzükou Valley	20-09-2018	NU-BOT-KVP-252	Moist cave	Epilithic	25˚35'12.4"N 94˚02'59.0"E	2488
Cosmarium crenatum	Dzükou Valley	20-09-2018	NU-BOT-KVP-252	Moist cave	Epilithic	25˚35'12.4"N, 94˚02'59.0"E	2488
Cosmarium difficile var. *dilatatum*	Tseminyu village	08-06-2019	NU-BOT-KVP-290	Fish pond	Epiphytic	25°55'34.0"N 94°13'42.5"E	1283
Cosmarium holmiense var. *hibernicum*	Jakhama	12-07-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚35'05.0"N 94˚07'02.0"E	1652
Cosmarium impressulum	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epiphytic	25˚39'85.2"N 94˚11'41.1"E	1529
Cosmarium laeve	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Planktonic	25˚35'06.8"N 94˚078'03.2'E	1595
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5"E	1283
Cosmarium ornatum	Dzü River, Rüsoma	31-01-2019	NU-BOT-KVP-271	River	Epilithic	25˚45'2"N 94˚10'47.0"E	660
	Yikhanu	18-10-2018	NU-BOT-KVP-239	Small stream	Epiphytic	25˚58'34.2"N 94˚16'26.2"E	1136

	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0"N 94˚16'24.0"E	1171
Cosmarium speciosum	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Epilithic	25°32'05"N 94°08'10"E	1710
	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Planktonic	25˚35'06.8"N 94˚07'03.2"E	1595
Cosmarium scutifirme	Dzükou	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Cosmarium sp.	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07'12.1"E	1658
Docidium undulatum	Dzükou Valley	04-04-2019	NU-BOT-KVP-284	River	Planktonic	25˚33'18.2"N 94˚03'50.7" E	2458
Pleurotaenium ehrenbergii	Zhadima	03-04-2017	NU-BOT-KVP-105	Fish pond	Epiphytic	25°48'37.0"N 94°03' 28.3"E	1227
	Rüsoma	05-04-2017	NU-BOT-KVP-112	Smal stream	Epilithic	25˚45'21.8"N 94˚10'44.7"E	1253
	Tseminyu	05-09-2017	NU-BOT-KVP-131	Small water spring	Epilithic	25˚45'21.8"N 94˚10'44.7"E	1198
	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Epilithic	25˚43'35.7"N 94˚8' 45.3"E	1345
	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5"E	1283
Pleurotaenium trabecula	Zhadima	03-04-2017	NU-BOT-KVP-102	Rice field	Epiphytic	25°48'23.1"N 94°03'42.8"E	1281
	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Panktonic	25°50'53.0"N 94°10'43.7"E	1437

	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wall	Epiphytic	25˚39'85.2"N 94˚11'41.1"E	1529
Staurastrum acutum var. *variance*	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0"N 94˚16'24.0"E	1171
Staurastrum punctulatum	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3"E	2052
Hyalotheca dissiliens	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3"E	2052
	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3"N 94˚7'11.6"E	1586
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451
Euastrum sublobatum	Jakhama	12-07-2018	NU-BOT-KVP-153	Moist rock	Epilithic	25˚35'07.2"N 94˚07'13.4"E	1655
Penium margaritaceum	Jotsoma village	04-09-2017	NU-BOT-KVP-127	Constructed pond	Epilithic	25˚40'22.7"N 94˚04' 0.1"E	1470
	Nerhema	11-09-2017	NU-BOT-KVP-140	Constructed pond	Epiphytic	25˚46'49.3"N 94˚07'06.0"E	1438
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8" E	2451
Cylindrocystis brebissonii	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist rock	Planktonic	25˚35'08.6"N 94˚07'12.1" E	1658
Netrium digitus	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Planktonic	25˚31'46.0"N 94˚7' 46.7"E	1731
	Jakhama	07-07-2018	NU-BOT-KVP-255	Small stream	Epiphytic	25˚35'05.0"N 94˚07'02.0"E	1652

Spirotaenia condensate	Dzüleke River	14-03-2018	NU-BOT-KVP-162	River	Epiphytic	25˚38'24.0"N 93˚59'06.4"E	1939
Spirogyra australica	Jakhama	07-07-2018	NU-BOT-KVP-255	Small stream	Floating	25˚35'05.0"N 94˚07'02.0"E	1652
Spirogyra decimina	Nerhema	11-09-2017	NU-BOT-KVP-142	Constructed pond	Floating	25˚46'34.3"N 94˚07'00.4"E	1412
	Nerhema	11-09-2017	NU-BOT-KVP-143	Pond	Floating	25˚46'38.9"N 94˚07'01.0"E	1480
	Khonoma	24-01-2018	NU-BOT-KVP-157	Moist wll	Epilithic	25˚39'85.3"N 94˚01'14.1"E	1529
	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-215	Temporary pool	Epiphytic	25°41'04.5"N 94°07' 09.4"E	1416
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Epilithic	25˚58'50.2"N 94˚14'05.4"E	1239
	Rüsoma	31-01-2019	NU-BOT-KVP-268	Drain	Floating	25˚43'35.7"N 94˚8' 45.3"E	1345
Spirogyra dubia	Meriema	19-03-2018	NU-BOT-KVP-191	Rice field	Floating	25°42'55.6"N 94° 5' 38.0"E	1384
	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Floating	24°40'57.6"N 94°06' 44.2"E	1483
	Chunlikha	18-10-2018	NU-BOT-KVP-248	Temporary pool	Floating	25˚48'43.0"N 94˚14'19.6"E	1266
Spirogyra insignis	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Floating	25°31'98.3"N 94°07' 97.8"E	1701
	Zunpha	08-06-2019	NU-BOT-KVP-295	Constructed pond	Floating	25°54'55.0"N 94°12'13.8"E	1268
Spirogyra	Nerhema	11-09-2017	NU-BOT-KVP-143	Pond	Floating	25˚46'38.9"N	1480

kundaensis						94˚07'01.0"E	
	Kijümetouma	04-04-2017	NU-BOT-KVP-115	Temporary pool	Planktonic	25˚45'26.4"N 94˚13'20.0"E	1085
Spirogyra mirabilis	Tuophema	14-03-2018	NU-BOT-KVP-179	Fish pond	Floating	25°51' 0.5"N 94°10'53.2"E	1437
	Tuophema	14-03-2018	NU-BOT-KVP-182	Temporary pool	Floating	25°51'35.2"N 94°10'15.9"E	1451
Spirogyra neglecta	Meriema	19-03-2018	NU-BOT-KVP-189	Constructed pond	Floating	25°42'55.6"N 94° 5' 25.7"E	1417
Spirogyra pratensis	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Floating	25˚43'57.0"N 94˚11'54.7" E	1504
	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Floating	25°42'50.5"N 94° 5' 44.3"E	1399
	Tsiesera	19-03-2018	-BOT-KVP-205	Pond	Floating	25°44'24.8"N 94°'20.6"E	1433
	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed pond	Floating	25˚43'36.9"N 94˚8' 45.7"E	1342
Spirogyra reticulate	Ginri	08-06-2019	NU-BOT-KVP-287	Rice field	Floating	25°55'30.0"N 94°13'40.5"E	1083
Spirogyra setiformis	L'Khel, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Floating	25˚43'57.0"N 94˚11'54.7"E	1504
	Hebenji	05-09-2017	NU-BOT-KVP-137	Small water spring	Floating	25˚52'28.4"N 94˚10'80.7"E	1461
	Khuzama	07-07-2018	NU-BOT-KVP-234	Moist wall	Floating	25˚32'21.3"N 94˚08'19.7"E	1655
	Khuzama	07-07-2018	NU-BOT-KVP-235	Moist rock	Floating	25˚32'21.3"N 94˚08'19.7" E	1657

	Jakhama	07-07-2018	NU-BOT-KVP-254	Temporary pool	Epiphytic	25˚35'09.0"N 94˚07'12.0"E	1650
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Epilithic	25˚58'39.0"N 94˚16'12.2"E	1196
	Peducha	02-02-2019	NU-BOT-KVP-278	Fish pond	Floating	25˚44'4"N 93˚59'36" E	878
Spirogyra submargaritata	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Floating	25°50'51.9"N 94°11'32.5"E	1319
	Tsakou, Kohima village	23-05-2018	NU-BOT-KVP-218	Constructed pond	Floating	25°40'32.1"N 94°06' 53.2"E	1512
	Mphie	23-05-2018	NU-BOT-KVP-230	Rice field	Floating	25°38'33.2"N 94°09' 13.0"E	1139
Spirogyra varians	Yikhanu	18-10-2018	NU-BOT-KVP-240	Pond	Planktonic	25˚58'33.0"N 94˚16'24.0"E	1171
	Yikhanu	18-10-2018	U-BOT-KVP-241	Pond	Epiphytic	25˚43'33.8"N 94˚8' 27.2"E	1185
Spirogya weberi	Rüsoma	04-04-2017	NU-BOT-KVP-110	Rice field	Planktonic	25˚42'51.3"N 94˚08'13.5"E	1456
	Hebenji	05-09-2017	NU-BOT-KVP-137	Small water spring	Floating	25˚52'28.4"N 94˚10'80.7"E	1461
	Nerhema	11-09-2017	NU-BOT-KVP-143	Pond	Epiphytic	25˚46'38.9"N 94˚07'01.0"E	1480
	Tuophema	14-03-2018	NU-BOT-KVP-178	Rice field	Planktonic	25°51'50.0"N 94° 10'.5"E	1275
Mougeotia boodlei	New Teroguunyu	05-09-2017	NU-BOT-KVP-134	Pond	Planktonic	25˚52'39.9"N 94˚11'11.3"E	1323

	L'Khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Floating	24°40'57.6"N 94°06' 44.2"E	1483
	Khuzama	07-07-2018	NU-BOT-KVP-231	Constructed pond	Floating	25°31'98.3"N 94°07' 97.8"E	1701
	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07'12.1"E	1658
Mougeotia sp.	Kigwema	29-01-2018	NU-BOT-KVP-171	Small stream	Epilithic	25˚36'8.1"N 94˚6' 39.7"E	1628
Zygnema sp.	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Epiphytic	25˚36'13.3"N 94˚7' 11.6"E	1586
	Jakhama	07-07-2018	NU-BOT-KVP-255	Small stream	Epiphytic	25˚35'05.0"N 94°07'02.0"E	1652
	Rüsoma	31-01-2019	NU-BOT-KVP-265	Constructed pond	Floating	25˚43'36.9"N 94˚8' 45.7"E	1342
Aphanochaete repens	Meriema	19-03-2018	NU-BOT-KVP-191	Constructed pond	Epiphytic	25°42'55.6"N 94° 5' 25.7"E	1417
	Meriema	20-03-2018	NU-BOT-KVP-189	Rice field	Epiphytic	25°42'55.6"N 94° 5' 38.0"E	1384
	Jakhama	07-07-2018	NU-BOT-KVP-254	Temporary pool	Epiphytic	25˚35'09.0"N 94˚07'12.0"E	1650
Draparnaldia acuta	Dzüleke River	24-01-2018	NU-BOT-KVP-161	River	Epilithic	25˚37'49.8"N 94˚58'37.5"E	1989
Stigeoclonium lubricum	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed Pond	Epilithic	25°41'01.1"N 94°06' 50.2"E	1466
Steigoclonium tenue	Seikhazou, Kohima village	03-04-2017	NU-BOT-KVP-103	Constructed Pond	Epilithic	25˚40'29.4"N 94˚06'54.5"E	1507
	L'Khek, Kohima	02-06-2017	NU-BOT-KVP-122	Drain	Epilithic	25˚40'45.0"N	1511

	village					94˚06'39.7"E	
	Khonoma	24-01-2018	NU-BOT-KVP-157	Constructed pond	Epilithic	25˚36'8.1"N 94˚6' 39.7"E	1529
	Dzüleke River	24-01-2018	NU-BOT-KVP-161	River	Epilithic	25˚38'24.0"N 93˚59'06.4"E	1936
	Kigwema	29-01-2018	NU-BOT-KVP-171	Small stream	Epilithic	25˚36'8.1"N 94˚6' 39.7"E	1628
	P'Khel, Kohima village	13-05-2018	NU-BOT-KVP-210	Constructed pond	Epilithic	25°41'01.1"N 94°06' 50.2"E	1446
	Yikhanu	13-05-2018	NU-BOT-KVP-240	Pond	Epilithic	25˚58'33.0"N 94˚16'24.0"E	1171
Eudorina eleg ans	Dzükou River	04-04-2019	NU-BOT-KVP-180	River	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451
	Dzükou Valley	05-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Oedogonium abbreviatum	Ehunnu	18-10-2018	NU-BOT-KVP-238	Fish pond	Floating	25˚58'44.0"N 94˚16'11.2"E	1196
	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Floating	25˚43'34"N 94˚0' 8.6"E	1002
Oedogonium sp. 1	Jotsoma	04-09-2017	NU-BOT-KVP-126	Pond	Epiphytic	25˚40'26.7"N 94˚03'56.2"E	1426
	Nerhema	11-09-2017	NU-BOT-KVP-139	Constructed pond	Epilithic	25˚46'38.3"N 94˚07'04.0"E	1432
	Khonoma	29-01-2018	NU-BOT-KVP-157	Constructed pond	Epilithic	25˚39'85.2"N 94˚1' 14.1"E	1529
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epizoic	25˚59'23.3"N 94˚14'24.0"E	1249

	Chunlikha	18-10-2018	NU-BOT-KVP-248	Temporary pool	Epiphytic	25˚48'43.0"N 94˚14'19.6"E	1266
Oedogonium sp. 2	Meriema	19-03-2018	NU-BOT-KVP-193	Constructed pond	Epiphytic	25°42'50.5"N 94° 5' 44.3"E	1339
	Kandinu	18-10-2018	NU-BOT-KVP-243	Fish pond	Epiphytic	25˚59'23.3"N 94˚14'24.0"E	1249
Hydrodictyon reticulatum	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-208	Pond	Floating	25° 40' 55"N 94°05' 05.1"E	1492
	L'Khek, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Floating	24°40'57.6"N 94°06' 44.2"E	1883
	Kenuozou	23-05-2018	NU-BOT-KVP-225	Drain	Floating	25°40'56.8"N 94°06' 33.3"E	1399
Microspora pachyderma	P'Khel, Kohima village	24-05-2018	NU-BOT-KVP-213	Pond	Floating	25°40'45.8"N 94°07' 26.2"E	1399
	L'Khek, Kohima village	25-05-2018	NU-BOT-KVP-223	Constructed pond	Epilithic	24°40'57.6"N 94°06' 44.2"E	1883
	Dzükou valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0" E	2483
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Epiphytic	25˚58'39.0"N 94˚16'12.2"E	1196
	Khuzama	07-07-2018	NU-BOT-KVP-236	Small stream	Epilithic	25˚31'46.0"N 94˚7' 46.7" E	1731
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Epilithic	25˚33'15.5"N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Microspora	Zhadima	03-04-2017	NU-BOT-KVP-102	Small water	Epiphytic	25°48'24.0"N	1222

tumidula				spring		94°03' 42.1"E	
	L'Khek, Kohima village	02-06-2017	NU-BOT-KVP-121	Pond	Epilithic	25˚43'57.0"N 94˚11'54.7"E	1504
	Tsieyama, Jotsoma	04-09-2017	NU-BOT-KVP-125	Constructed pond	Epilithic	25˚67'12.3"N 94˚07'37.1"E	1478
	Jotsoma	04-09-2017	NU-BOT-KVP-126	Constructed pond	Epiphytic	25˚40'26.7"N 94˚03'56.2"E	1426
	Hebenji	05-09-2017	NU-BOT-KVP-137	Constructed pond	Epilithic	25˚52'44.9"N 94˚11'10.2"E	1461
	Kigwema	29-01-2018	NU-BOT-KVP-155	Small stream	Epilithic	25˚36'6.2"N 94˚6' 32.7"E	1628
	Jakhama	12-07-2018	NU-BOT-KVP-256	Moist soil	Epilithic	25˚35'08.6"N 94˚07'12.1"E	1658
	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Epiphytic	25˚43'34"N 94˚0' 8.6"E	1002
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Epilithic	25˚33'13.4"N 94˚03'54.8"E	2451
	Ginri	08-06-2019	NU-BOT-KVP-286	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5"E	1064
Acutodesmus acuminatus	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-209	Constructed pond	Planktonic	25°41'02.6"N 94°06' 48.1"E	1465
	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Planktonic	25˚35'06.8"N 94˚078'03.2'E	1595
Coelastrumpseudomicroporum	Peducha	02-02-2019	NU-BOT-KVP-277	Rice filed	Floating	25˚43'34"N 94˚0' 8.6"E	1002
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451

Coelastrum sp.	Tseminyu	15-07-2019	NU-BOT-KVP-2	Fish Pond	Planktonic	25˚55’51.8"N 94˚13’30.2"E	1111
Desmodesmus abundans	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary poool	Planktonic	25°54'41.0"N 94°12'23.1"E	1282
Desmodesmus perforatus	Kigwema	29-01-2018	NU-BOT-KVP-168	Rice field	Planktonic	25˚36'13.3"N 94˚7' 11.6"E	1586
Desmodesmus subspicatus	Seikhazou, Kohima village	03-04-2017	NU-BOT-KVP-103	Constructed Pond	Epilithic	25˚40'29.4"N 94˚06'54.5"E	1507
	Tuophema	14-03-2018	NU-BOT-KVP-176	Pond	Planktonic	25°50'53.0"N 94°10'43.7"E	1437
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-212	Rice field	Planktonic	23°39'23.2"N 94°11' 08.6"E	1155
Pectinodesmus holtmannii	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451
Pediastrum tetras	Khuzama	07-07-2018	NU-BOT-KVP-232	Constructed pond	Planktonic	25°32'05"N 94°08' 10"E	1710
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8" E	2451
Scenedesmus acunae	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3"E	2052
	New Teroguunyu	05-09-2017	NU-BOT-KVP-136	Small water spring	Epilithic	25˚52'32.1"N 94˚10'06.4"E	1391
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Epiphytic	25˚33'15.5"N 94˚03'50.7"E	2443
	Dzükou Valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N	2489

						94˚02'46.4"E	
	Zunpha	08-06-2019	NU-BOT-KVP-294	Temporary pool	Planktonic	25°54'41.0"N 94°12'23.1"E	1282
Scenedesmus costatus	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Epiphytic	25°41'01.1"N 94°06' 50.2"E	1466
Scenedesmus raciborskii	Tseminyu village	08-06-2019	NU-BOT-KVP-291	Constructed pond	Epilithic	25°55'34.0"N 94°13'42.5"E	1283
Scenedesmus sp.	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Epiphytic	25°41'01.1"N 94°06' 50.2"E	1466
	Dzükou valley	29-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0" E	2488
Tetradesmus dimorphus	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-209	Constructed pond	Planktonic	25°41'02.6"N 94°06' 48.1"E	1465
	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Planktonic	25˚33'13.4"N 94˚03'54.8"E	2451
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Epilithic	25˚59'35.3"N 94˚15'23.6"E	1245
Actinastrum sp.	Seikhazou, Kohima village	03-04-2017	NU-BOT-KVP-103	Constructed Pond	Planktonic	25˚40'29.4"N 94˚06'54.5"E	1507
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Planktonic	25˚59'35.3"N 94˚15'23.6"E	1245
	Chunlikha	18-10-2018	NU-BOT-KVP-248	Temporary pool	Planktonic	25˚48'43.0"N 94˚14'19.6"E	1266
Chlorellaellipsoidea	Khonoma	29-01-2018	NU-BOT-KVP-158	Drain	Epilithic	25˚65'59.4"N 94˚02'17.1"E	1522
Chlorella sp.	Dzüleke	24-01-2018	NU-BOT-KVP-161	River	Epiphytic	25˚38'24.0"N 93˚59'06.3"E	2052

	Meriema	19-03-2018	NU-BOT-KVP-186	Small stream	Epiphytic	25° 42' 44"N 94° 5' 39.2"E	1383
	Yikhanu	18-10-2018	NU-BOT-KVP-239	Small stream	Planktonic	25˚58'34.2"N 94˚16'26.2"E	1136
Geminella interrupta	Jakhama	12-07-2018	NU-BOT-KVP-260	Drain	Epilithic	25˚35'05.7"N 94˚07'04.6"E	1601
Geminella sp.	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-210	Constructed pond	Planktonic	25°41'01.1"N 94°06' 50.2"E	1466
Oocystis irregularis	Dzükou Valley	20-09-2018	NU-BOT-KVP-253	Moist cave	Epilithic	25˚35'13.4"N 94˚02'50.0"E	2488
	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0"N 94˚16'12.2"E	1196
Oocystis natans	P' Khel, Kohima village	23-05-2018	NU-BOT-KVP-211	Drain	Epilithic	25°41'02.3"N 94°06' 48.1"E	1464
	Tseminyu village	08-06-2019	NU-BOT-KVP-289	Drain	Epilithic	25°55'54.0"N 94°13'25.5"E	1124
Stichococcus bacillaris	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed pond	Planktonic	25˚58'39.0"N 94˚16'12.2"E	1196
	Dzükou valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Epilithic	25˚67'12.3"N 94˚07'37.1"E	1572
Coccomyxa sp.	Dzükou valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4"E	2489
Cladophora	Khonoma	24-01-2018	NU-BOT-KVP-159	Small	Epilithic	25˚37.46.0"N	2015

glomerata				stream		94˚1' 5.4"E	
	Dzüleke	25-01-2018	NU-BOT-KVP-161	River	Epilithic	25˚38'24.0"N 93˚59806.5"E	1989
	Meriema	19-03-2018	NU-BOT-KVP-197	River	Epilithic	25˚59'35.3"N 94˚15'23.6"E	1200
	Kandinu	18-10-2018	NU-BOT-KVP-242	Pond	Epilithic	25˚59'35.3"N 94˚15'23.6"E	1245
	Dzü River	31-01-2019	NU-BOT-KVP-270	River	Epilithic	25˚45'11"N 94˚10'51.0"E	658
Cladophora crispate	Kandinu	18-10-2018	NU-BOT-KVP-244	Rice field	Epizoic	25°41'00.7"N 94°06' 49.1"E	1236
	Rüsoma	31-01-2019	NU-BOT-KVP-266	Fish pond	Epizoic	25˚43'35.7"N 94˚8' 45.3"E	1345
Rhizoclonium crassipellitum	Kenuozou	23-05-2018	NU-BOT-KVP-220	Consructed pond	Floating	25°41'00.7"N 94°06' 49.1"E	1467
	Rüsoma	31-01-2019	NU-BOT-KVP-266	Drain	Epiphytic	25˚43'35.7"N 94˚8' 45.3"E	1345
Rhizoclonium hieroglyphicu m	L'khel, Kohima village	02-06-2017	NU-BOT-KVP-122	Constructed pond	Floating	25˚40'45.0"N 94˚06'39.7"E	1511
	Seikhazou, Kohima village	03-04-2017	NU-BOT-KVP-103	Pond	Epilithic	25˚40'29.4"N 94˚06'54.5"E	1507
	Kikha,Kohima village	03-04-2017	NU-BOT-KVP-104	Pond	Epilithic	25˚44'27.1"N 94° 5' 22.7"E	1516
	Kijümetouma	04-04-2017	NU-BOT-KVP-117	Constructed pond	Epiphytic	25˚46'06.3"N 94˚13'47.2"E	1068
	Jotsoma	04-09-2017	NU-BOT-KVP-127	Constructed pond	Epilithic	25˚40'22.7"N 94˚04' 0.1"E	1470

	L'khel, Kohima village	05-09-2017	NU-BOT-KVP-140	Pond	Floating	25˚54'40.0"N 94˚07'22.7"E	1222
	Tuophema	14-03-2018	NU-BOT-KVP-180	Small stream	Epilithic	25°51'12.2"N 94°10'26.0"E	1440
	Tuophema	14-03-2018	NU-BOT-KVP-185	Drain	Floating	25°50'41.9"N 94°10'51.7"E	1457
	Meriema	19-03-2018	NU-BOT-KVP-188	Constructed pond	Floating	25°42'54.2"N 94°5' 9.2"E	1395
	P'Khel, Kohima village	23-05-2019	NU-BOT-KVP-209	Constructed pond	Floating	25°41'02.6"N 94°06' 48.1"E	1465
	P'Khel, Kohima village	23-05-2019	NU-BOT-KVP-216	Rice field	Epiphytic	25°38'47"N 94°09'38"E	1160
	Kenuozou	23-05-2018	NU-BOT-KVP-286	Drain	Epilithic	25°40'56.8"N 94°06' 33.3"E	1523
Rhizoclonium riparium	Ginri	08-06-2019	NU-BOT-KVP-226	Small water spring	Epilithic	25°55'34.0"N 94°13'42.5"E	1064
Trentopohlia sp.	Tsiesera	19-03-2018	NU-BOT-KVP-202	Moist soil	Epilithic	25°44'36.8"N 94°5'23.9"E	1401
	Khuzama	07-07-2018	NU-BOT-KVP-234	Moist wall	Epilithic	25˚32'21.3"N 94˚08'19.7"E	1655
	Jakhama	12-07-2018	NU-BOT-KVP-253	Moist wall	Epilithic	25˚35'07.2"N 94˚07'13.4"E	1657
Ulothrix tenerrima	New Teroguunyu	05-09-2017	NU-BOT-KVP-136	Small water spring	Epilithic	25˚56'42.3"N 94˚12'08.3"E	1391
	P'Khel, Kohima village	23-05-2018	NU-BOT-KVP-219	Drain	Epiphytic	25°40'57.7"N 94°06' 47.3"E	1478

	L'khel, Kohima village	23-05-2018	NU-BOT-KVP-224	Constructed pond	Epiphytic	24°40'57.6"N 94°06' 44.2"E	1483
	Jakhama	12-07-2018	NU-BOT-KVP-259	Constructed pond	Epilithic	25˚35'06.8"N 94˚07'03.2"E	1595
	Nsunyu	18-10-2018	NU-BOT-KVP-249	Pond	Epiphytic	25˚59'10.2"N 94˚14'10.6"E	1182
	Tsiekar, Jotsoma	04-09-2017	NU-BOT-KVP-124	Pond	Epilithic	25˚67'12.3"N 94˚07'37.1"E	1572
Ulothrix zonata	Khonoma	24-01-2018	NU-BOT-KVP-155	Small water spring	Epilithic	25˚39'21.3"N 94˚01'18.1"E	1510
	Tsokeda	08-08-2019	NU-BOT-KVP-289	Drain	Epiphytic	25°55'54.0"N 94°13'25.5"E	1124
	Dzükou valley	04-04-2019	NU-BOT-KVP-279	Moist cave	Epilithic	25˚35'14.3"N 94˚02'46.4" E	2489
Glaucocystis sp.	Dzükou Valley	04-04-2019	NU-BOT-KVP-280	Depression spring	Epilithic	25˚33'13.4"N 94˚03'54.8"E	2451
	Dzükou Valley	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Batrachospermum sp.	Jotsoma	04-09-2017	NU-BOT-KVP-129	Small stream	Epilithic	25˚40'16.2"N 94˚04' 24.0"E	1571
	Kijümetouma	04-04-2017	NU-BOT-KVP-115	Temporary pool	Planktonic	25˚45'26.4"N 94˚13' 20.0"E	1085
Euglena acus	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5"E	1319
	Chunlikha	18-10-2018	NU-BOT-KVP-245	Pond	Epilithic	25˚58'50.2"N 94˚14'05.4"E	1239
Euglena	Ehunnu	18-10-2018	NU-BOT-KVP-237	Constructed	Planktonic	25˚58'39.0"N	1196

mutabilis				pond		94˚16'12.2"E	
Euglena oxyuris	Tuophema	14-03-2018	NU-BOT-KVP-175	Rice field	Epiphytic	25°50'51.9"N 94°11'32.5"E	1319
Lepocinclis fusiformis	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Lepocinclis ovum var.*dimidio-mino*	Yikhanu	18-10-2018	U-BOT-KVP-241	Pond	Planktonic	25˚43'33.8"N 94˚8'27.2"E	1241
Phacus caudatus	Tsieyama, Jotsoma	04-09-2017	NU-BOT-KVP-125	Constructed pond	Planktonic	25˚67'12.3"N 94˚07'37.1" E	1478
	Khuzama	07-07-2018	NU-BOT-KVP-233	Rice field	Planktonic	25°32'20.2"N 94°08' 24.9"E	1638
	Dzükou River	04-04-2019	NU-BOT-KVP-281	Depression spring	Planktonic	25˚33'15.5"N 94˚03'50.7"E	2443
Phacus pleuronectes	Jotsoma	04-09-2017	NU-BOT-KVP-128	Rice field	Epiphytic	25˚40'28.6"N 94˚4' 31.4"E	1414

Published records of algal studies in Nagaland are mostly done on rice fields and few freshwater bodies. The algal studies of Kohima district is yet to be done thus, making this a first attempt to study the algal flora. Algae was collected from 107 sites which consisted of Natural ponds, Constructed ponds/ Water tanks, Rice fields, temporary water pool, depression springs, Rivers, Stream/ water spring, Drains, Moist soil and Moist rocks. Three hundred thirty one algal taxa belonging to 117 genera, 71 families, 38 orders and 14 classes were recorded in the present study. The systematic enumerations of the collected specimens are given below:

3.2 Representation of Different Classes of Algae

The numerical representation of different algal class is shown in Table 3 and the percentage distribution is given in Figure 2. The largest representation was from the Class Baccillariophyceae with 152 algal taxa, followed by Cyanophyceae having 60 taxa, Zygnematophyceae with 55 taxa, Chlorophyceae with 24 taxa, Trebouxiophyceae having 9 taxa, Ulvophyceae with 8 algal taxa, Xanthophyceae with 7 algal taxa, Euglenophyceae with 7 algal taxa, Charophyceae with 3 algal taxa, Klebsormidiophyceae and Coscinodiscophyceae with 2 algal taxa and one representation each from Class Gaucophyceae and Florideophyceae. The present work shows similarity with the work of Das and Adhikary (2008) who studied the freshwater algae from specific habitats from Eastern regions of India where they also recorded the Baccillariophyceae to be the dominant group, however the result differs with the work of Phukhan and Jha (2013) and Sharma and Bharadwaja (2017) who reported Chlorophyceae to be the dominant group while studying the algal flora of Sivasagar district in Assam and some freshwater bodies in Rajashthan respectively.

Table 3.3: Numerical representation of different algal class

Class	Order	Family	Genus	Species
Cyanophyceae	6	16	24	60
Baccillariophyceae	12	26	44	152
Coscinodiscophyceae	1	1	1	2
Xanthophyceae	2	2	2	7
Charophyceae	1	1	2	3
Klebsormidiophyceae	1	1	1	2
Zygnematophyceae	2	5	15	55
Chlorophyceae	4	7	14	24
Trebouxiophyceae	3	5	5	9
Ulvophyceae	3	3	4	8
Glaucophyceae	1	1	1	1
Florideophyceae	1	1	1	1
Euglenophyceae	1	2	3	7
Total	38	71	117	331

Cyanophyceae: Cyanophyceae or Blue green algae are unicellular or filamentous prokaryotic algae known for their nitrogen fixing abilities. They can adapt to almost all types of environment, both polluted and unpolluted. Majority of the blue green algae occurs in a distinct group, sheath or colony. In the present study, 61 algal taxa from this group have been reported; they are the second dominant class of algae contributing an overall percentage of 18.18 %. They belong to 5 orders viz. Chroococcales, Nostocales, Oscillatoriales, Spirulinales and Synechococcales with the largest representation from Order Nostocales with 18 taxa. The dominant genus was *Oscillatoria* with 13 algal taxa followed by *Phormidium* with 5 algal taxa and *Gleocapsa* and *Calothrix* each with 4 algal taxa. The present study was found to be similar with the work of Phukhan and Jha (2013) who reported the genus *Oscillatoria and Phormidium* to be the dominant genus in this group of algae while studying the algal flora of Sivasagar district in Assam. In the present study, the algal taxa *Oscillatoria brevis* and *Oscillatoria raoi* was reported from maximum (10) locations followed by *Oscillatoria tenuis* which was reported from 9 locations and *Oscilatoria agardhi* and *Oscillatoria limosa* which was reported from 7 locations. The maximum mode of occurrence of this group was Epilithic.

Baccillariophyceae: Baccillariophyceae or diatoms mostly occurs singly while some occurs as colonies or attached together to form filaments. They are unique because of their ornamented cell walls called the frustules. In the present study 152 diatom have been identified, they are most dominant class of algae in the present study contributing 45.90% of the total algal taxa and they are the most diversely distributed groups in different habitats, altitudes and seasons.. They belong to 12 orders *viz*., Bacillariales, Cocconeidales, Cymbellales, Eunotiales, Fragillariales, Licmophorales, Mastogloiales, Naviculales, Rhopalodiales, Surirellales, Tabellariales and Thalassiophysales with the largest representation from Order Naviculales with 51 taxa. The dominant genera are *Navicula* and *Pinnularia* each with 12 algal taxa which were followed by *Cymbella*, *Gomphonema* and *Eunotia* each with 10 algal taxa and than *Surirella* with 9 algal taxa. Das and Adhikary (2008) while studying some freshwater habitats of algae from Eastern region of India recorded that *Navicula* was the dominant genera in this group of algae; Phukhan and Jha (2013) also found the genra *Pinnularia* and *Navicula* to be the dominant genera of Class Bacillariophyceae while studying the algal flora of Sivasagr district in Assam. In the present study, the algal taxa which were reported from maximum habitat were *Cymbella tumidula*, *Navicula veneta* which was reported from 13 locations followed by *Brebissonia lanceolata* which was reported from 12 locations and *Achnanthidium minutissima*, *Cymbella aspera*, *Ulnaria ulna* which was reported from 11 locations.

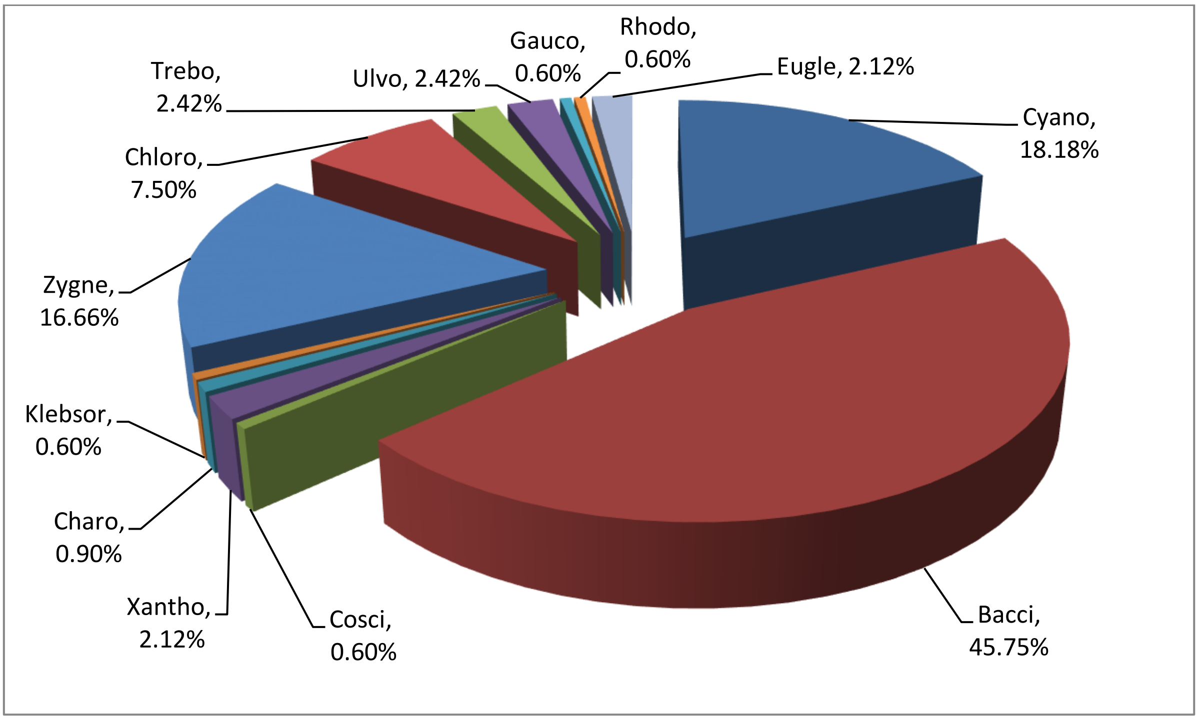


Figure 3.1: Percentage distribution of different class of algae
Cyano- Cyanophyceae; Bacci- Baccillariophyceae; Cosci-Coscinodiscophyceae; Xantho- Xanthophycea Zygne- Zygnematophyceae; Chloro- Chlorophyceae; Treubo- Treubouxiephyceae; Ulvo- Ulvophyceae; Glauco- Glaucophyceae; Flori- Florideophyceae; Eugle- Euglenophyceae.

Coscinodiscophyceae: They are also a class of diatoms which are radially symmetrical and having numerous discoid chloroplasts. In the present study, only 2 algal taxa *Melosira varians* and *Melosira varians* var. *aequalis* have been identified from this class of algae contributing to only an overall percentage of 0.60 %. They have been reported from all the seasons and found to occur in majority of the habitats studied. They were also found from three altitudinal ranges except 2101-2600 masl. *Melosira varians* was reported from 11 locations and *Melosira varians* var. *aequalis* have been reported from 4 locations. Mode of occurrence of this particular group is predominantly found to be planktonic.

Xanthophyceae: This group of algae are the yellow-green algae and they predominantly inhabits freshwater habitats. In the present study, 7 algal taxa have been reported from this group, belonging to 2 genera i.e., *Tribonema* and *Vaucheria*. They belong to 2 order Tribonemales and Vaucheriales with maximum taxa i.e., 5 algal taxa from order Tribonemales. They contributed an overall percentage of 2.12 %. Both the genera were reported from all the different seasons and mostly occurring in natural ponds and constructed ponds. The genera *Tribonema* was reported from all the different ranges of altitudes, whereas *Vaucheria* is reported only from the lower range of altitudes (600-1100; 1101-1600). The mode of occurrence for *Tribonema* is mostly planktonic and epiphytic, whereas it is mostly epipelic for *Vaucheria*.

Charophyceae: They are commonly called stoneworts or brittleworts. They are the most closely related to the land plants among the green algal groups. In the present study, 3 algal taxa belonging to 2 genera i.e., *Chara* and *Nitella* and a single order Charales is reported contributing an overall percentage of 0.90 %. They were found growing attached to natural ponds, constructed ponds and rice fields. They were collected within the altitudinal range of 1101-1600 masl only and during the spring and winter seasons. The genera *Chara* is reported from 2 locations and *Nitella* from 3 locations.

Klebsormidiophyceae: They are a group of Charophytic green algae**.** In the present study, 2 algal taxa belonging to single genera *Klebdormidium* were identified contributing an overall percentage of 0.60 %. They were reported from all different seasons collected mostly from moist soil and moist wall and occurring at the three upper ranges of altitudes

(1101-1600; 1601-2100; 2101-2600). Mode of occurrence of this group is predominantly epilithic.

Zygnematophyceae: They are a class of charophytic and conjugating green algae which are both unicellular and filamentous. In the present study, 55 algal taxa belonging to 15 genera are identified. Zygnematophyceae is third dominant group contributing to an overall percentage of 16.66 %. They belong to 2 orders *viz*., Desmidiales and Zygmatales with maximum taxa belonging to order Desmidiales (36). They are diversely distributed in all the different habitats, seasons and altitudes studied. The dominant genera are the genus *Cosmarium* with 15 taxa which is followed by Spirogyra (14). This result was found to be similar with the works of Das and Adhikary (2008) who while studying some freshwater habitats of algae from Eastern region of India also recorded the genus *Cosmarium, Closterium* and *Spirogyra* to be the dominant genus from this class of algae. In the present study, the algal taxa which were reported from maximum habitat are *Spirogyra setiformis* which is collected from 7 locations, *Spirogyra decimina* which was collected from 6 locations and *Closterium ehrenbergii* and *Pleurotaenium ehrenbergii* which were collected from 5 locations each. This group predominantly occurs as epiphytic or planktonic/floating and mostly in lentic water systems.

Chlorophyceae: They are a class of green algae which generally grows in freshwater habitats. In the present study, 24 algal taxa belonging to 14 genera are identified contributing an overall percentage of 7.50 %. They belong to 4 orders *viz*., with Chaetophorales, Chlamydomonadales, Oedogoniales and Sphaeropleales maximum taxa belonging to order Sphaeropleales (17). This class of algae was diversely distributed in all the different habitat, seasons and altitudinal range. The dominant genus was *Scenedesmus* with 4 taxa which were followed by *Oedogonium* and *Desmodesmus* (3 taxa each). The result was found to be similar with Das and Adhikary (2008) who studied the freshwater algae from specific habitats from Eastern regions of India and recorded the genus *Scenedesmus* to be the dominant genera from this class of algae. In the present study, the algal taxa which were reported from maximum habitat are *Microspora tumidula* which was collected from 12 locations, *Microspora pachyderma* and *Steigoclonium tenue* which was collected from 7 locations each and *Scenedesmus acunae* which was collected from 6 locations.

Trebouxiophyceae: They are a class of green algae which mostly occurs alone or in a colony. In the present study, 9 algal taxa belonging to 5 genera were identified contributing to an overall percentage of 2.42 %. They belong to 3 orders *viz.*, Chlorellales, Prasiolales and Trebouxiophyceae ordo incertae sedis with maximum taxa reported from order Chlorellales (6). They were collected from all the different habitats except rice field and moist soil; they were found in all the different seasons and ranges of altitude. The dominant genera were *Chlorella*, *Oocystis* and *Geminella* all with 2 taxa each. The algal taxa which were reported from maximum habitat were *Stichococcus bacillaris* (4 locations) and *Actinastrum* sp.and *Chlorella* sp. (3 locations each).

Ulvophyceae: They are a class of green algae, majority of which occurs in marine habitat. In the present study, 8 algal taxa belonging to 4 genera were identified which contributed an overall percentage of 2.42 %. They belong to 3 orders *viz.*, Cladophorales, Trentepohliales and Ulotricales with maximum algal taxa belonging to order Cladophorales (5). This class of algae was found to be diversely distributed occurring in all the different habitat, seasons and altitudinal range. The dominant genera were *Rhizoclonium* (4 taxa) and *Cladophora* and *Ulothrix* (3 taxa each). The algal taxa which were reported from maximum habitat are *Rhizoclonium hieroglyphicum* (12 locations) and *Cladophora glomerata* and *Ulothrix tenerrima* (6 locations each).

Glaucophyceae: They are a small group of unicellular algae found only in freshwater habitats. In the present study, only one algal taxa i.e., *Glaucocystis* sp. was reported contributing an overall percentage of 0.60 %. *Glaucocystis* sp. was collected from three locations at high altitude region (2101-2600 masl) only and in spring season.

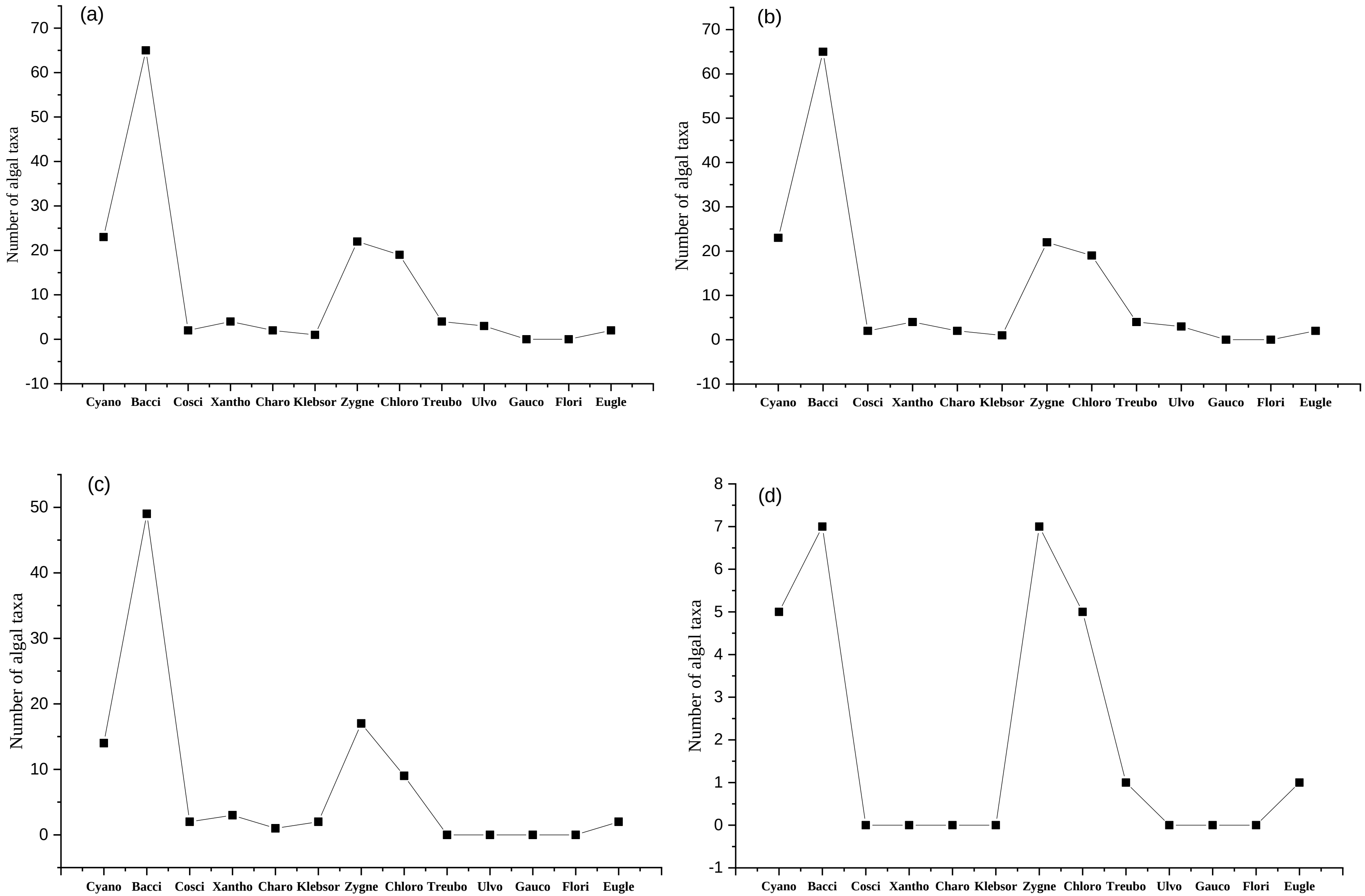
Florideophyceae: They are called the red algae. Majority of this group are found in marine habitats and only about 3 % are found in freshwater habitats. In the present study, only one algal taxa i.e., *Batrachospermum* sp. was identified from a small stream at the end of summer season at an altitudinal range of 1101-1600 masl. They contributed an overall percentage of 0.60 %. Phukhan and Jha (2013) while studying the algal flora of Sivasagr district in Assam reported *Batrachospermum* from lotic waters only.

Euglenophyceae: They are commonly called Euglenoids, they mostly occur solitary and with flagellates. Euglenoids are generally found in habitats with an abundance of decaying organic material. In the present study, 7 algal taxa belonging to 3 genera and 1 order Euglenida was identified contributing to an overall percentage of 2.12 %. The dominant genus is *Euglena* which has 3 algal taxa. This result was found to be similar with Das and Adhikary (2008) who studied the freshwater algae from specific habitats from Eastern regions of India and recorded the genus *Euglena* to be the dominant genera from this Class of algae. In the present study, they were collected from the lentic water bodies and were mostly found to occur as phytoplanktons. They were recorded from all the different ranges of altitudes and three seasons except winter.

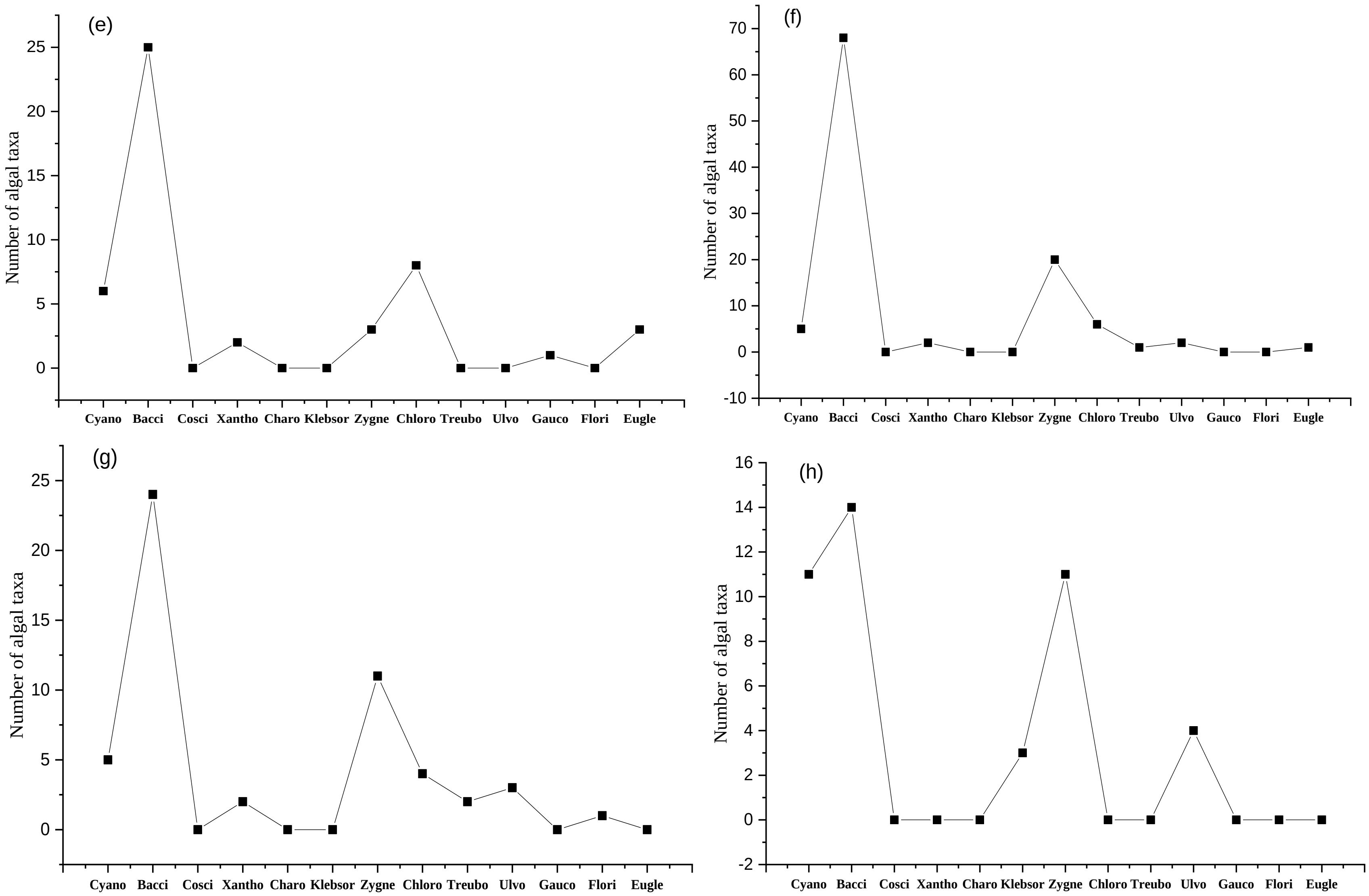
3.3 Diversity and distribution in different habitats

Algal samples were collected from lotic water bodies, lentic water bodies and some terrestrial habitats. Lentic water bodies are those aquatic water bodies that are still or standing waters. It consists of small temporary pools, ditches, ponds to very large lakes, whereas lotic water systems are those water bodies which are flowing like rivers, streams, drains etc. Altogether, algal samples were randomly collected from 127 sites at different areas of Kohima District which consists of 77 lentic water bodies of natural and constructed ponds/ water tanks, temporary water pools, rice fields, fish ponds and depression springs; 33 lotic water bodies of rivers, streams, water springs and drains and 17 terrestrial habitats which includes moist soil, moist rocks, walls and caves. The distribution of the various algal classes occurring in the different habitat is shown in Figure 3 and the occurrence of different algal taxa in various habitats is shown in Table-4.

Ponds: Algal samples were collected from 20 ponds at different locations throughout the different seasons. Out of 331 algal taxa recorded, 84 taxa have been reported from the different ponds. Baccillariophyceaea is the dominant class with a total of 33 algal taxa which is followed by Zygnematophyceae (16 taxa), Cyanophyceae (11 taxa), Chlorophyceae (7 taxa), Ulvophyceae (5 taxa), Trebouxiophyceae and Xanthophyceae (4 algal taxa each) and Coscinodiscophyceae, Charophyceae, Klebsormidiophyceae and Euglenophyceae each with (1 taxa each). The result was found to be similar with Sharma et al. (2018) and Khaliullina and Panina (2019) who found Baccillariophyceae to be the dominant group followed by Zygnematophyceae in a pond ecosystem from Assam and Russia respectively, however it varies with the work of Dwivedi and Pandey (2002) who found the group cyanophyceae to be dominant while studying Two ponds in Faizabad, India; Meena and Rout (2015) and Harsha et al. (2017) who reported the dominant group to be Chlorophyceae which was followed by Class Bacillariophyceae while studying some freshwater pond ecosystem. In the present study, the ddominant genera in the pond ecosystem were found to be *Pinnularia* (7 taxa), *Closterium* (6 taxa) and *Spirogyra* (4 taxa). The most diverse algal species were *Brebissonia lanceolata* and *Gomphonema affine* which are reported from 5 different ponds.



(a)
(b)
(c)
(d)
Number of algal taxa
Cyano Bacci Cosci Xantho Charo Klebsor Zygne Chloro Treubo Ulvo Gauco Flori Eugle


(e)
Number of algal taxa
25
20
15
10
5
0
Cyano Bacci Cosci Xantho Charo Klebsor Zygne Chloro Treubo Ulvo Gauco Flori Eugle
(f)
Number of algal taxa
70
60
50
40
30
20
10
0
-10
Cyano Bacci Cosci Xantho Charo Klebsor Zygne Chloro Treubo Ulvo Gauco Flori Eugle
(g)
Number of algal taxa
25
20
15
10
5
0
Cyano Bacci Cosci Xantho Charo Klebsor Zygne Chloro Treubo Ulvo Gauco Flori Eugle
(h)
Number of algal taxa
16
14
12
10
8
6
4
2
0
-2
Cyano Bacci Cosci Xantho Charo Klebsor Zygne Chloro Treubo Ulvo Gauco Flori Eugle

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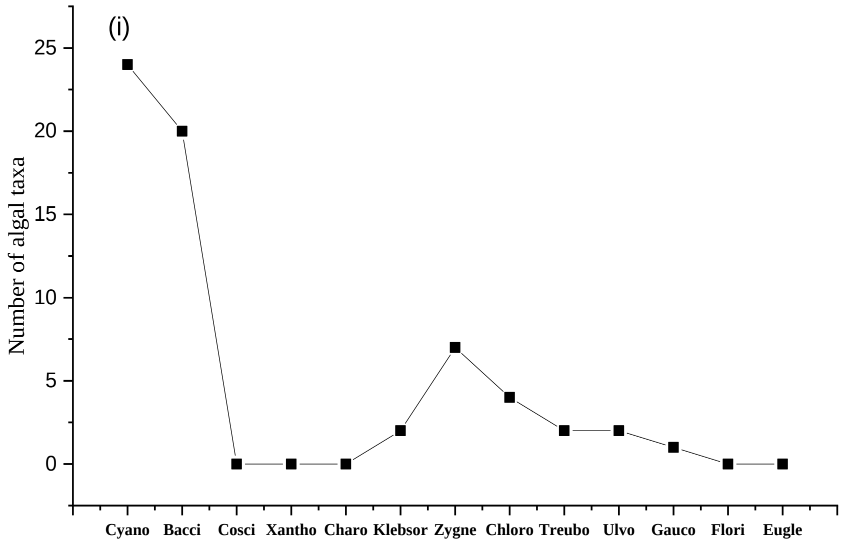

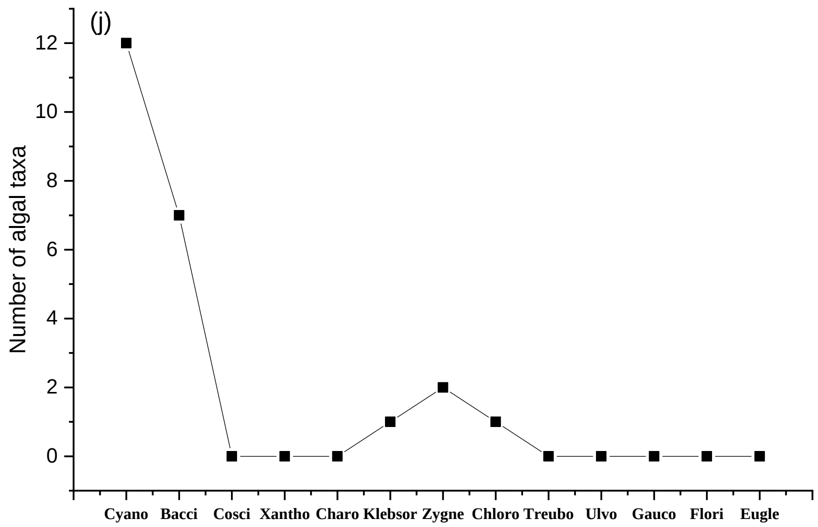

Fig. 3.2 Graph showing the total number of different class of algae in various habitats: (a) Ponds. (b) Constructed ponds/ Water tanks. (c) Rice fields/ Fish ponds. (d) Temporary pools. (e) Depression springs. (f) Rivers. (g) Streams/water springs. (h) Drains. (i) Moist rocks/walls/caves. (j) Moist soils

Constructed ponds/ water tanks: Algal samples were collected from 29 constructed ponds and water tanks from different locations at varying seasons. Altogether 145 algae out of 329 algal taxa have been reported from constructed ponds and water tanks. Baccillariophyceaea is the dominant class with a total of 65 algal taxa which is followed by Cyanophyceae and Zygnematophyceae with 22 algal taxa each. Chlorophyceae with 19 algal taxa, Trebouxiophyceae and Xanthophyceae with 4 algal taxa each, Ulvophyceae with 3 algal taxa, Coscinodiscophyceae, Charophyceae and Euglenophyceae each with 2 algal taxa, with 2 algal taxa and Klebsormidiophyceae with 1 algal taxa. The results slightly vary with Joseph (2017) who reported Cyanophyceae to be the dominant group which was followed by Bacillariophyceae and Grishi et al., (2014) who reported the Chlorophyceae to be the dominant group in some temple ponds of Maheminant group of algae. The dominant genera in pond ecosystem were *Oscillatoria* with 10 taxa, *Pinnularia* with 8 taxa and *Surirella* and *Spirogyra* each with 7 taxa. The most diverse algal species are *Achnanthidium minutissima*, *Rhizoclonium hieroglyphicum* and *Melosira varians* which arereported from 7, 5 and 4 different Constructed ponds/ water tanks.

Rice fields and Fish ponds: Algal samples were collected from 18 rice fields and fish ponds at different seasons. In the present study, rice fields and fish ponds have been grouped together because these two habitats were found to be very similar and in most cases, rice fields and fish ponds overlaps. Altogether 88 algal taxa out of 329 algal taxa have been reported from rice fields and fish ponds**.** Baccillariophyceaea wass the dominant class with a total of 49 algal taxa which was followed by Zygnematophyceae with 17 algal taxa, Cyanophyceae with 14 algal taxa, Chlorophyceae with 9 algal taxa, Xanthophyceae with 3 algal taxa, Euglenophyceae with 2 algal taxa and Coscinodiscophyceae, Klebsormidiophyceae and Charophyceae with 1 algal taxa each.

Kohima district is a hilly area with terrace type of rice field cultivation; the result in the present study was found to be similar with the works of Borah et al. (2021) surveyed the terrace rice fields of a hilly district in Southern Assam and recorded the class Bacillariophyceae to be the dominant group which was followed by Chlorophyceaea The result was also comparatively similar with the works of Sen and Sonmez (2006) where the dominant group in fish ponds was Bacillariophyceae followed by Chlorophyceaea, however the results differ from the work of Thajamanbi and Rout (2016) who surveyed the algal biodiversity from rice fields of Karimganj District Assam where Chlorophyceae was found to be the dominant group followed by Bacillariophyceae and Cyanophyceae. In the present study, the dominant genera in pond ecosystem were *Oscillatoria* with 9 taxa, *Spirogyra* with 8 taxa and *Surirella* with 6 taxa. The most diverse algal species were *Nitzschia clausii* and *Pinnularia viridis* where both algae were reported from 4 different rice fields and fish ponds.

Temporary pools: Blaustein and Schwartz (2001) defined temporary pool habitat as any habitat that has temporary standing water that can hold water long enough for some species to complete their life cycle. In India, algal studies on temporary water bodies have received very less attention. In the present study, algal samples were collected from 9 temporary water pools covering all the different seasons. Altogether 26 algae out of 329 algal taxa have been reported from this habitat. Zygnematophyceae was found to be the dominant class with a total of 9 algal taxa each which was followed by Baccillariophyceaea and Chlorophyceae with 7 algal taxa each and Cyanophyceae, Trebouxiophyceae and Euglenophyceae with 1 algal taxa each. No algae were reported from the other classes of algae. The results differ from the works done by Tiwari and Shukla (2007) where they reported Chlorophyceae to be the dominant class followed by Cyanophyceae and Baccillariophyceae. However the classification differs from the classification used in the present study, so comparatively, Cyanophyceae was the dominant group followed by Bacillariophyceae. The dominant genera in temporary pool ecosystem are *Spirogyra* with 6 taxaand *Oedogonium* with 4 taxa.

Depression spring: Algal samples werecollected from 3 depression springs from a high altitude region of Kohima District during spring season. Altogether 47 algal taxa have been reported from depression spring. Baccillariophyceaea is the dominant class with a total of 25 algal taxa which was followed by Chlorophyceae with 8 algal taxa, Cyanophyceae with 6 algal taxa, Zygnematophyceae with 3 algal taxa, Xanthophyceae and Euglenophyceae with 2 algal taxa and Glaucophyceae with 1 algal taxa. The dominant genera in pond ecosystem are *Eunotia* with 8 taxa and *Pinnularia* with 4 taxa. The most diverse algal species is *Eunotia paratridentula* which is reported from all the 3 Depression springs. Michaelis (1974) studied some cold springs of New Zealand and reported 19 algal species where Baccillariophyceae, Cyanophyceae and Rhodophyceae were the dominant group. In India, no previous work on algal studies on depression springs has been found thus the algal study of depression spring habitat is a first for India.

Rivers: Algal samples were collected from 6 Rivers**:** Dzüü River, Dzükou River, Dzükentun River, Dzüleke River, Dzüzha River and Meriema River during winter, spring and summer season. Altogether 104 algal taxa have been reported from depression rivers. Baccillariophyceaea is the dominant class with a total of 68 algal taxa which was followed by Zygnematophyceae with 20 algal taxa, Chlorophyceae with 6 algal taxa, Cyanophyceae with 5 algal taxa, Ulvophyceae and Xanthophyceae with 2 algal taxa each and Euglenophyceae with 1 algal taxa. No algal taxa have been reported from Class Coscinodiscophyceae, Klebsormidiophyceae Trebouxiophyceae, Charophyceae Glaucophyceae and Florideophyceae. This result is found to be similar with the works of Bhakta and Adhikary (2012) whose study revealed the dominance of group

Baccillaiophyceae from two main rivers of Eastern Indian region; Ramanujam et al. (2016) also recorded the dominance of Baccillariophyceae and *Navicula* to be one of the dominant genera in Umiew River, Meghalaya, however, Chopra et al. (2017) found differing results while studying the flora of Yamuna River. In the present study, the dominant genera were *Navicula* with 7 taxa, *Closterium*, *Nitzschia* and *Cymbella*, each with 6 taxa and *Cosmariuim* with 5 taxa. The most diverse algal species was *Cymbella tumidula* which was reported from all the 6 Rivers.

Streams/Water springs: Algal samples were collected from 15 streams and water springs during winter, summer and autumn season. Altogether 47 algal taxa have been reported from streams/water springs. Baccillariophyceaea was the dominant class with a total of 24 algal taxa which was followed by Zygnematophyceae with 11 algal taxa, Cyanophyceae with 5 algal taxa, Chlorophyceae with 4 algal taxa, Ulvophyceae with 3 algal taxa, Trebouxiophyceae and Xanthophyceae each with 2 algal taxa and Florideophyceae with 1 algal taxa. Class Florideophyceae is collected only from this habitat. The dominant genera in pond ecosystem are *Nitzschia* and *Closterium* each with 5 taxa and Oscillatoria with 4 taxa. The different algal taxa that were reported from streams are more or less equally diverse. The result was in conformity with the work of Hajong and Ramanujam (2021) who reported that Baccillariophyceae dominated the streams of West Garo hills, Meghalaya. However, the result slightly differs from the work done by Bhakta and Adhikary (2014) who explored some streams of Eastern and North-Eastern region of India and found the Class Cyanophyceae to be the dominant group which was followed by Class Baccillariophyceae.

Drain: Algal samples were collected from 12 drains and ditches covering all the seasons. Altogether 47 algal taxa have been reported from drain. Cyanophyceae was the dominant group 14 algal taxa each which were followed by Baccillariophyceaea and

Zygnematophyceae with 11 algal taxa each, Ulvophyceae with 4 algal taxa and Trebouxiophyceae with 3 algal taxa. In the present study, the dominant genera in drain ecosystem are *Oscillatoria* with 7 taxa and *Gomphonema* with 3 taxa. The dominance of the genera *Oscillatoria* can indicate the poor water quality status of drainage habitats as this species is known to tolerate organic pollution according to Palmer (1969).

Moist rock/walls/caves: Algal samples were collected from12 moist rocks, moist walls and moist cave walls covering all the seasons. Altogether 47 algal taxa have been reported from moist rocks, walls and caves. Cyanophyceae is the dominant class with a total of 26 algal taxa, which is followed by Baccillariophyceaea 20 algal taxa, Zygnematophyceae with 7 algal taxa, Chlorophyceae with 4 algal taxa, Klebsormidiophyceae, Trebouxiophyceae and Ulvophyceae each with 2 algal taxa and Glaucophyceae with 1 algal taxa. The result slightly differs with the work of Hajong et al. (2021) who reported Baccillariophyceae (35) and Cyanophyceae (31) to be the dominant class in some cave walls in Meghalaya. The dominant genera are *Oscillatoria with* 5 taxa and *Gloeocapsa* and *Pinnularia* with 4 taxa each. The most diverse algal species is *Nitzschia palea* and *Trentopohlia* sp. which is reported from 4 and 3 moist rock/walls/caves respectively. Cyanophyceaea are a diverse group with the ability to grow in almost all the different habitats which includes extreme environment. Whitton (1992) stated that Cyanobacteria are the primary plant colonizers in bare rocks or soil stabilizing the conditions for other plants to grow. Accordingly, the Class Cyanophyceae (cyanobacteria) were found to be the dominant class in both moist rocks/ walls/caves habitats and moist soil habitats.

Moist soil: Algal samples were collected from5 moist soils during summer and spring season. Altogether 23 algal taxa have been reported from moist soil. Cyanophyceae is the dominant class with a total of 12 algal taxa, which is followed by Baccillariophyceaea with 7 algal taxa, Zygnematophyceae with 2 algal taxa and Klebsormidiophyceae and Chlorophyceae each with 1 algal taxa. The maximum numbers of genera reported were *Nitzschia* and *Oscillatoria* with 4 and 3 taxa respectively. In the present study, the dominance of Cyanophyceae in moist soils which was similar with the works of Dirborne and Ramanujam (2020) and Dirborne et al. (2021) whose studies revealed the dominance of Cyanophyceae on the soil crust of East Khasi Hills, Meghalaya.

Algal species like *Oscillatoria raoi*, *Oscillatoria tenuis, Nitzschia clausii*, *Nitzschia palea*, *Cymbella aspera*, *Cymbella tumida*, *Gomphonema affine, Ulnaria ulna, Navicula cryptocephaloides, Navicula veneta*, *Pinnularioa viridis, Melosira varians, Rhizoclonium hieroiglyphicum* and *Tribonema viride* were the most diversely distributed species in the different habitat and locations studied. Dalkıran et al. (2021) studied the habitat and algal diversity relationship on some freshwater habitat where Bacillariophyceae was found to be the dominant group in different habitat such as ponds, ditches (drains), streams, water springs. This result is similar with the present study where Bacillariophyceae was the dominant class in the previously said habitat The different habitat types do effect the diversity of various class of algae and the present study shows the diverse distribution of different algae in the varied habitat, their dominance, unique occurrences of specific algal taxa where some habitat specific algal taxa have also been identified, e.g., *Batrachospermum w*hich grows specifically on slow running cool and shaded waters, *Nostoc* which are confined to moist soil and moist wall/rocks habitat

Table 3. 4: Table showing the occurrence of different algal taxa in various habitats

Algal Taxa	P	CP	RF	TP	DS	R	ST	D	MR	MS	Total occurrence in different habitat
Cyanophyceae											
Aphanothece conglomerate	-	-	+	-	-	-	-	-	+	-	**2**
Aphanothece stagnina	+	+	-	-	-	-	-	-	-	+	**3**
Gloeothece tepidariorum	-	-	-	-	-	-	-	-	+	+	**1**
Chrococcus minor	-	+	-	-	-	-	-	-	-	-	**1**
***Chrococcus* sp.2**	-	-	-	-	-	-	-	-	+	-	**1**
Gloeocapsa nigrescens	-	-	-	-	+	-	-	-	+	-	**2**
Gleocapsa novacekii	-	-	-	-	+	-	-	-	+	-	**2**
***Gloeocapsa* spp.1**	-	-	-	-	-	-	-	-	+	-	**1**
***Gloeocapsa* spp.2**	-	-	-	-	-	-	-	-	+	-	**1**
Calothrix braunii	-	-	-	-	-	-	-	-	++	+	**3**
Calothrix marchica* var. *intermedia	-	-	-	-	-	-	-	-	+	-	**1**
Calothrix parietina	+	+	-	-	-	-	-	-	+	-	**3**
***Calothrix* sp.**	-	-	-	-	-	-	-	-	++	-	**2**
***Westelliopsis* sp.**	+	-	-	-	-	-	-	-	-	-	**1**

Geitlerinema splendidum	-	++	-	-	-	-	-	-	-	-	**2**
Cyanotheceae ruginosa	-	-	-	-	+	-	-	-	+	-	**2**
***Lyngbya* spp. 1**	+	-	-	-	-	-	-	-	-	+	**2**
***Lyngbya* spp.2**	-	+	-	-	-	-	-	-	-	-	**1**
***Lyngbya* spp.3**	-	-	-	-	-	-	-	-	-	+	**1**
Oscillatoria agardhi	-	+	++	-	-	+	+	++	-	-	**6**
Oscillatoria agardhi* var. *isothrix	-	-	+	-	-	-	-	-	-	-	**1**
Oscillatoria brevis	++	+	-	-	+	-	+	-	++	+	**8**
Oscillatoria chlorine	-	-	+	-	-	-	-	-	-	-	**1**
Oscillatoria curviceps	-	-	+	-	-	-	-	-	-	-	**1**
Oscillatoria limosa	+++	-	+	-	-	-	-	+	+	-	**6**
Oscillatoria perornata	+	+	-	-	-	-	-	-	-	+	**3**
Oscillatoria princeps	-	+	+++	-	-	-	+	++	+	-	**8**
Oscillatoria raoi	-	++	++	-	-	++	+	+	+	+	**10**
Oscillatoria rubescens	-	+	-	-	-	-	-	-	-	-	**1**
Oscillatoria subbrevis	+	+	+	-	-	-	-	++	-	-	**5**
Oscillatoria tenuis	-	+++	+	++	-	++	-	+	-	-	**9**
Oscillatoria vizagapatensis	-	+	-	-	-	-	-	-	+	-	**2**
Phormidium ambiguum	-	-	-	-	-	-	-	+	-	-	**1**

Phormidium favosum	-	-	-	+	-	-	-	-	-	-	**1**
Phormidium pachydermaticum	-	-	+	-	-	+	-	-	-	-	**2**
Phormidium stagnina	-	-	-	-	-	+	-	-	-	-	**1**
***Phormidium* sp.**	+	-	-	-	-	-	-	-	-	-	**1**
Glaucospira agilssima	-	-	-	-	-	-	-	+	-	-	**1**
Spirulina nodosa	-	-	-	-	-	-	-	-	+	-	**1**
Spirulina laxissima	-	+	-	-	-	-	-	-	-	-	**1**
Aphanocapsa grevillei	-	-	-	-	+	-	-	-	-	-	**1**
***Aphanocapsa* sp.**	-	+	-	-	-	-	-	-	-	-	**1**
Merismopodia elegans	-	-	+	-	-	-	-	-	-	-	**1**
Pseudanabaena catenata	+	+	-	-	-	-	-	-	-	-	**2**
Lemmermaniella terrestris	+	-	-	-	-	-	-	-	-	-	**1**
Schizothrixtelephoroides	-	-	-	-	-	-	-	+	-	-	**1**
Bacillariophyceae											
Hantzschia amphioxys	-	+	-	-	-	-	-	++	-	-	**3**
***Hantzschia* sp.**	-	-	-	-	-	-	+	-	-	-	**1**
Nitzschia clausii	-	++	++++	-	-	+	+	+	-	+	**10**
Nitzschia linearis	-	-	-	-	-	+	+	-	-	-	**2**
Nitzschia nana	-	+	-	-	-	+	+	-	-	-	**3**

Nitzschia palea	+	+	++	-	-	+	+	-	++++	+	**11**
Nitzschia recta	-	-	-	-	-	-	-	-	-	+	**1**
Nitzschia sigma	-	+	-	-	-	+	-	-	-	-	**2**
Nitzschia sigmoidea	-	-	+	-	-	-	-	-	-	+	**2**
Nitzschia vermicularis	+	-	-	-	-	+	+	-	+	-	**4**
Achnanthidium eutrophilum	-	-	-	-	-	+	-	-	-	-	**1**
Achnanthidium latecephalum	-	-	-	-	-	+	-	-	-	-	**1**
Achnanthidium minutissima	+	++++ +++	-	-	+	+	+	-	-	-	**10**
Achnanthidium nanum	+	+	+	-	-	+	-	-	-	-	**4**
Achnanthidium neotropicum	-	-	-	-	+	+	+	-	++	-	**5**
***Achnanthidium* sp.**	-	-	+	-	-	-	-	-	-	-	**1**
Lemnicola hungarica	-	-	-	-	-	+	-	-	-	-	**1**
Planothidium lanceolatum	-	-	-	-	-	+	-	-	-	-	**1**
Cocconeis pediculus	-	-	-	-	-	+	+	-	-	-	**2**
Cocconeis placentulavar.euglypta	-	-	-	-	-	-	+	-	-	-	**1**
***Coconeis* sp.**	-	-	-	-	-	++	-	-	+	-	**3**
Brebissonia lanceolata	++++ +	+	-	-	+	++++	-	-	+	-	**12**

Cymbella affiniformis	-	-	-	-	-	+	-	-	-	-	**1**
Cymbella aspera	++	+	+++	++	-	++	+	-	-	-	**11**
Cymbella cymbiformis	-	-	-	-	-	-	-	-	-	-	
Cymbella excisa	-	-	-	-	-	++	+	-	-	-	**3**
Cymbella fontinalis	-	-	-	-	-	++	-	-	-	-	**2**
Cymbella kappii	-	+	-	-	-	-	-	-	-	-	**1**
Cymbella neocistula	-	-	+	-	-	-	-	-	-	-	**1**
Cymbella neoleptoceros	-	-	-	-	-	+	+	-	-	-	**2**
Cymbella tumidula	-	+++	++	-	-	++++ ++++ +	-	-	-	+	**15**
***Cymbella* sp.**	-	+	-	-	-	-	-	-	-	-	**1**
Cymbopleura amphicephala	-	+	+	-	+	-	-	-	-	-	**3**
Cymbopleura inaequalis	-	-	+	-	-	-	-	-	-	-	**1**
Cymbopleura naviculiformis	+	-	-	-	-	+	+	-	-	-	**3**
Oricymba subaequalis	-	+	+	+	-	-	-	-	-	-	**3**
Encyonema montana	-	-	-	-	-	-	+	-	-	-	**1**
Encyonema prostratum	-	-	-	-	-	-	-	+	-	-	**1**
Encyonema silesiacum	-	+	-	-	-	-	-	-	-	-	**1**

Encyonema sublungebertulotii	-	-	-	-	-	+	-	-	-	-	**1**
Encyonema vulgare	-	++	-	-	-	+	-	-	-	-	**3**
Gomphoneis pseudo-okunoi	-	-	-	-	-	+	-	-	-	-	**1**
Gomphonema acuminatum	-	+	-	-	-	-	+	-	-	-	**2**
Gomphonema affine	+++++	+	-	+	-	-	+	-	+	-	**9**
Gomphonema gracile	-	-	-	-	++	+++	-	-	-	-	**5**
Gomphonema lagenula	-	-	+	-	-	-	-	++	-	-	**3**
Gomphonema laticollum	-	-	+	-	-	-	-	-	-	-	**1**
Gomphonema minutum	-	-	+	-	-	+	-	-	-	-	**2**
Gomphonema pumilum* var. *elegans	-	-	-	-	-	+	-	-	-	-	**1**
Gomphonema truncatum	-	++	+	-	-	-	-	-	-	-	**4**
Gomphonema ventricosum	-	+	-	-	-	-	-	-	-	-	**1**
Gomphonema vibrio	-	-	-	-	-	-	-	+	-	-	**1**
Placoneis clementioides	-	+	-	-	-	-	-	-	-	-	**1**
***Placoneis* sp.**	+	-	-	-	-	-	-	-	-	-	**1**
Rhoicosphenia abbreviata	-	+	+	-	-	+	-	-	-	-	**3**
Eunotia bilunaris	+	+	+	-	++	-	-	-	+	-	**6**

Eunotia epithemioides	-	-	-	-	+	+	-	-	-	-	**2**
Eunotia implicate	-	-	-	-	+	-	-	-	-	-	**1**
Eunotia naegelii	-	-	-	-	+	-	-	-	-	-	**1**
Eunotia novaecaledonica	-	-	-	-	++	-	-	-	-	-	**2**
Eunotia paratridentula	-	-	-	-	+++	-	-	-	-	-	**3**
Eunotia perminuta	-	-	-	-	-	-	-	-	+	-	**1**
Eunotia rhombiodea	-	-	+	-	-	-	-	-	-	-	**1**
Eunotia serra	-	-	-	-	++	-	-	-	-	-	**2**
Eunotia tridentula	-	-	-	-	++	-	-	-	-	-	**2**
Fragillaria capucina	-	-	-	-	-	+++	-	++	-	-	**5**
Fragilaria mazamaensis	-	-	+	-	-	+	-	-	-	-	**2**
Fragilaria rumpens	-	+++	-	-	-	++	-	-	++	-	**7**
Fragillaria vaucheriae	-	-	+	-	-	-	-	-	-	-	**1**
Odontidium hyemale	-	-	-	-	+	-	-	-	-	-	**1**
Odontidium mesodon	-	-	-	-	++	++	+	+	-	-	**6**
Staurosira construens	-	-	-	-	-	+	-	+	-	-	**1**
Hannaea inaequidentata	-	-	-	-	-	+	-	-	-	-	**1**
Ulnaria acus	++	+++	+	-	-	++	-	-	-	-	**8**
Ulnaria biceps	-	-	+	-	-	+	-	-	-	-	**2**

Ulnaria contracta	+	-	-	-	-	-	-	-	-	-	**1**
Ulnaria ulna	+++	+++	-	-	-	++++	+	-	-	-	**11**
Achnanthes exigua	+	-	-	-	-	-	-	-	-	-	**1**
Mastogloia smithii* var.*lacustris	-	-	-	-	-	+	-	-	-	-	**1**
***Amphipleura* sp.**	-	+	-	-	-	-	-	-	-	-	**1**
***Frustulia* sp.**	-	+	-	-	-	-	-	-	-	-	**1**
Diadesmus confervacea	+	+	+	-	-	+	-	-	-	-	**4**
Diadesmis gallica	-	-	+	-	-	-	-	-	-	-	**1**
Diploneis calcilacustris	+	+	-	-	-	-	-	-	-	-	**2**
Diploneis elliptica	+	-	-	+	-	+	-	+	-	-	**4**
Diploneis lusatica	-	+	-	-	-	-	-	-	-	-	**1**
Diploneis ovalis	-	++	+	-	-	-	-	-	-	-	**3**
Diploneis puella	-	+	-	-	-	+	-	-	-	-	**2**
Diploneis puellafallax	-	-	+	-	-	-	-	-	-	-	**1**
Diploneis smithii	-	-	-	-	-	-	+	-	-	-	**1**
Diploneis yatukaensis	-	++	-	-	-	-	-	-	-	-	**2**
Caloneis acuta	-	-	-	-	+	-	-	-	-	-	**1**
Caloneis silicula	-	-	+	-	-	-	++	+	-	-	**4**
Caloneis strelnikovae	-	-	-	-	++	-	-	-	-	-	**2**

Gyrosigma acuminatum	-	+	++	-	-	++	-	-	-	+	**6**
Gyrosigma obtusatum	-	-	-	-	-	+	-	-	-	-	**1**
Gyrosigma scalproides	-	-	-	-	-	++	-	-	-	-	**2**
***Gyrosigma* sp.**	-	-	+	-	-	-	-	-	-	-	**1**
Navicula cryptocephaloides	++	+	-	-	-	++	++	+	+	-	**9**
Navicula erifuga	-	+	-	-	-	-	-	-	-	-	**1**
Navicula lanceolata	-	-	-	-	-	+	+	-	-	-	**2**
Navicula peregrina	-	-	-	-	-	+	-	-	-	-	**1**
Navicula radiosa	-	++	-	-	-	+	-	-	-	-	**3**
Navicula rhyncocephala	-	++	-	+	-	+	-	-	++	-	**6**
Navicula riediana	+	-	-	-	-	-	-	-	-	-	**1**
Navicula rostellata	-	-	-	-	-	+	-	-	-	-	**1**
Navicula symmetrica	-	-	+	-	-	-	-	-	-	-	**1**
Navicula veneta	-	++	+	-	-	-	+	++	+	++	**9**
Navicula viridula	-	-	-	-	-	++	-	-	-	-	**2**
Kobayasiella subtilissima	-	-	-	-	-	-	+	-	-	-	**1**
Neidium affine	+	+	-	-	-	-	-	-	-	-	**2**
Neidium productum	-	-	+	+	-	+	-	-	-	-	**3**
Pinnularia appendiculata	-	+	-	-	+	+	-	-	-	-	**3**

Pinnularia borealis	-	+	-	-	++	-	-	-	-	-	**3**
Pinnularia divergens	+++	++	-	-	-	+	-	+	+	-	**8**
Pinnularia divergens var. mesoleptiformis	+	+	-	-	-	-	-	-	-	-	**2**
Pinnularia gigas	-	-	+	-	-	-	-	-	-	-	**1**
Pinnularia latarea	+	-	-	-	-	-	-	-	-	-	**1**
Pinnularia sikkimensis	+	+	+	-	-	-	-	-	-	-	**3**
Pinnularia subanglica	+	-	-	-	-	-	-	-	-	-	**1**
Pinnularia subgibba	-	-	+	-	+	-	-	-	+	-	**4**
Pinnularia viridiformis	++	+	-	-	-	+	+	-	+	-	**6**
Pinnularia viridis	++	+	++++	-	++	+	-	-	-	-	**10**
***Pinnularia* sp.**	-	-	-	-	-	-	-	-	+	-	**1**
***Pleurosigma* sp.**	-	-	-	-	-	+	-	-	-	-	**1**
Sellaphora seminulum	-	-	-	-	-	-	+	-	-	-	**1**
***Sellaphora* sp.**	-	+	-	-	-	-	+	-	-	-	**2**
Stauroneis anceps	+	+	-	-	-	-	-	-	-	-	**2**
Stauroneis smithii	-	-	+	-	-	-	-	-	-	-	**1**
***Stauroneis* spp. 1**	+	-	-	-	-	-	-	-	-	-	**1**
Stauroneis* spp. *2	-	-	+	-	-	+	+	+	-	-	**2**

Epithemia sorex	++	+++	-	-	+	-	-	-	-	-	**6**
Rhopalodia gibba	+	++	-	-	++	+++	-	-	-	-	**8**
Rhopalodia gibberula	-	-	+	-	-	-	-	-	-	-	**1**
Cymatopleura solea	-	-	-	-	-	+	-	-	-	-	**1**
Iconella biseriata	-	+	-	-	-	-	-	-	-	-	**1**
Iconella tchadensis	-	++	-	-	-	-	-	-	-	-	**2**
Surirella antioquiensis	-	+	-	-	-	-	-	-	-	-	+
Surirella atomus	-	+	+	-	-	+	-	-	-	-	**3**
Surirella brebissonii	-	+	+	-	-	-	-	-	-	-	**2**
Surirella capronioides	-	-	+	-	-	-	-	-	-	-	**1**
Surirella elegans	-	+	+	+	-	-	-	-	-	-	**3**
Surirella linearis	-	-	+	-	-	-	-	-	-	-	**1**
Surirella roba	-	-	+	-	-	++	-	-	+	-	**4**
Surirella robusta	-	++	-	-	-	++	-	-	-	-	**4**
Surirella tenera	+	+	-	-	-	-	-	-	+	-	**3**
***Surirella* sp.**	-	++	-	-	-	-	-	-	-	-	**2**
Diatoma vulgaris	+++	+	+	-	+	-	-	-	++	-	**7**
Amphora coffeiformis	-	-	-	-	-	+	-	-	-	-	**1**
Amphora copulate	-	++	+	-	-	-	-	-	-	-	**3**

Ampohora ovalis	-	++	+	-	-	+	-	-	-	-	**4**
Amphora proteus	-	-	+	-	-	-	-	-	-	-	**1**
Coscinodiscophyceae											
Melosira varians	+	++++	+	-	-	++++ +	-	-	-	-	**11**
Melosira varians* var.*aequalis	+	+	-	-	-	-	-	-	-	-	**2**
Xanthophyceae											
Tribonema affine	-	+	-	-	++	-	+	-	-	-	**4**
Tribonema bombycinum	-	+	-	-	-	-	-	-	-	-	**1**
Tribonema minus	-	+	-	-	-	-	-	-	-	-	**1**
Tribonema viride	+++	++	+	-	+	-	++	-	-	-	**9**
Tribonema vulgare	+++	-	++	-	-	-	-	-	-	-	**5**
Vaucheria aversa	+	-	-	-	-	+	-	-	-	-	**2**
Vaucheria pseudogeminata	++	-	+	-	-	-	-	-	-	-	**3**
Charophyceae											
Chara braunii	-	++	-	-	-	-	-	-	-	-	**2**
Nitella hyaline	+	-	-	-	-	-	-	-	-	-	**1**
***Nitella* sp.**	-	+	+	-	-	-	-	-	-	-	**2**

Klebsormidiophyceae											
Klebsormidium flaccidum	-	-	+	-	-	-	-	-	++	+	**4**
Klebsormidium klebsii	-	+	-	-	-	-	-	-	+	-	**2**
Zygnematophyceae											
Closterium abruptum	-	-	-	-	-	+	+	-	-	-	**2**
Cylindrocystis brebissonii	-	-	-	-	-	-	-	-	-	+	**1**
Closterium acerosum	+	++	+	-	-	-	+	-	-	-	**5**
Closterium acerosum* var.*minus	-	+	-	-	-	-	-	-	-	-	**1**
Closterium acutum* var. *variabile	+	-	-	-	-	-	+	-	-	-	**2**
Closterium dinae	++	+	+	-	-	+	-	-	-	-	**5**
Closterium ehrenbergii	+	+	-	-	-	+++	-	-	-	-	**5**
Closterium idiosporum	++	+	-	-	-	+	-	-	-	-	**4**
Closterium kuetzingii	-	+	-	-	-	-	-	-	-	-	**1**
Closterium moniliferum	-	-	++	-	-	++	-	-	-	-	**4**
Closterium parvulum	-	-	-	-	-	+	-	-	-	-	**1**
Closterium pseudolunula	-	-	-	-	-	-	+	-	-	-	**1**
Closterium rectimarginatum	+		-	+	-	-	+	-	-	-	**3**
Actinotaenium silvae-nigrae	-	-	-	-	-	-	-	-	+	-	**1**
***Cosmarium abbreviatum* var.**	-	-	+	-	-	-	-	-	-	-	**1**

minus											
Cosmarium anceps	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**1**
Cosmarium blytii	**-**	**-**	+	**-**	+	+	**-**	**-**	**-**	**-**	**3**
Cosmaarium botrytis	++	**-**	**-**	**-**	**-**	**-**	+	**-**	+	**-**	**4**
Cosmarium caelatum	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**1**
Cosmarium contractum* var *rotundatum	**-**	+	**-**	**-**	**-**	**-**	**-**	**-**	++	**-**	**3**
Cosmarium crenatum	**-**	**-**	**-**	**-**	**-**	**-**	+	**-**	+	**-**	**1**
Cosmarium difficile* var. *dilatatum	**-**	**-**	+	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Cosmarium holmiense* var. *hibernicum	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**1**
Cosmarium impressulum	**-**	+	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Cosmarium laeve	**-**	++	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Cosmarium ornatum	**-**	**-**	**-**	**-**	**-**	+	+	**-**	**-**	**-**	**2**
Cosmarium scutifirme	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**		**1**
Cosmarium speciosum	+	++	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
***Cosmarium* sp.**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	+	**1**
Docidium undulatum	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**1**
Pleurotaenium ehrenbergii	**-**	+	++	**-**	**-**	+	+	**-**	**-**	**-**	**5**

Pleurotaenium trabecula	+	+	+	-	-	-	-	-	-	-	**3**
Staurastrum acutum* var. *variance	+	-	-	-	-	-	-	-	-	-	**1**
Staurastrum punctulatum	-	-	-	-	-	+	-	-	-	-	**1**
Hyalotheca dissiliens	-	-	+	-	+	+	-	-	-	-	**3**
Euastrum sublobatum	-	-	-	-	-	-	-	-	+	-	**1**
Penium margaritaceum	+	++	-	-	-	-	-	-	-	-	**3**
Cylindrocystis brebissonii	-	-	-	-	-	-	-	-	+	-	**1**
Netrium digitus	-	-	-	-	-	++	-	-	-	-	**2**
Spirotaenia condensate	-	-	-	-	-	+	-	-	-	-	**1**
Spirogyra australica	-	-	-	-	-	+	-	-	-	-	**1**
Spirogyra decimina	++	+	++	+	-	-	-	-	-	-	**6**
Spirogyra dubia	-	+	+	+	-	-	-	-	-	-	**3**
Spirogyra insignis	-	++	-	-	-	-	-	-	-	-	**2**
Spirogyra kundaensis	-	-	+	+	-	-	-	-	-	-	**2**
Spirogyra mirabilis	-	-	+	+	-	-	-	-	-	-	**2**
Spirogyra neglecta	-	+	-	-	-	-	-	-	-	-	**1**
Spirogyra pratensis	++	++	-	-	-	-	-	-	-	-	**4**
Spirogyra reticulate	-	-	++	-	-	-	-	-	-	-	**2**
Spirogyra setiformis	-	++	+	++	-	-	+	-	+	-	**7**

Spirogyra submargaritata	-	+	++	-	-	-	-	-	-	-	**3**
Spirogyra varians	++	-	-	+	-	-	-	-	-	-	**2**
Spirogya weberi	+	-	++	-	-	-	+	-	-	-	**4**
Mougeotia boodlei	+	-	-	-	-	+	-	-	-	-	**1**
***Mougeotia* sp.**	-	++	-	-	-	-	-	-	+	-	**3**
***Zygnema* sp.**	-	+	+	-	-	+	-	-	-	-	**3**
Aphanochaete repens	-	+	+	+	-	-	-	-	-	-	**3**
Draparnaldia acuta	-	-	-	-	-	+	-	-	-	-	**1**
Stigeoclonium lubricum	-	+	-	-	-	-	-	-	-	-	**1**
Steigoclonium tenue	+	+++	-	-	-	+	-	-	-	-	**5**
Eudorina elegans	+	+	-	-	++	-	-	-	-	-	**4**
Oedogonium abbreviatum	-	-	+	-	-	-	-	-	-	-	**1**
***Oedogonium* spp.1**	-	++	+	-	-	-	-	-	-	-	**3**
***Oedogonium* spp. 2**	-	++	+	+	-	-	+	-	-	-	**5**
Hydrodictyon reticulatum	+	+	+	-	-	-	-	-	-	-	**3**
Microspora pachyderma	+	++	-	-	+	+	-	-	+	-	**6**
Microspora tumidula	+	++	+	-	+	-	+	-	-	+	**7**
Acutodesmus acuminatus	-	++	-	-	-	-	-	-	-	-	**2**
Coelastrumpseudomicroporum	-	-	-	-	+	-	-	-	-	-	**1**

Coelastrum sp.	-	-	-	-	-	-	-	-	-	-	
Desmodesmus abundans	-	-	-	+	-	-	-	-	-	-	**1**
Desmodesmus perforatus	-	-	+	-	-	-	-	-	-	-	**1**
Desmodesmus subspicatus	+	+	-	-	-	+	-	-	-	-	**3**
Pectinodesmus holtmannii	-	-	-	-	+	-	-	-	-	-	**1**
Pediastrum tetras	-	-	-	-	+	-	-	-	-	-	**1**
Scenedesmus acunae	-		-	+	++	+	+	-	+	-	**6**
Scenedesmus costatus	-	-	+	-	-	-	-	-	-	-	**1**
Scenedesmus raciborskii	-	+	-	-	-	-	-	-	+	-	**2**
***Scenedesmus* sp.**	-	+	-	-	-	-	-	-	+	-	**2**
Tetradesmus dimorphus	+	++	-	-	+	-	-	-	-	-	**4**
					Trebouxiophyceae						
***Actinastrum* sp.**	+	+	-	++	-	-	-	-	-	-	**4**
Chlorellaellipsoidea	-	-	-	-	-	-	-	+	-	-	**1**
***Chlorella* sp.**	-	-	-	-	-	+	++	-	-	-	**3**
Geminella interrupta	-	-	-	-	-	-	-	+	-	-	**1**
***Geminella* sp.**	-	+	-	-	-	-	-	-	-	-	**1**
Oocystis irregularis	-	+	-	-	-	-	-	-	+	-	**2**
Oocystis natans	-	-	-	-	-	-	-	++	-	-	**2**

Stichococcus bacillaris	++	+	-	-	-	-	-	-	-	-	**3**
***Coccomyxa* sp.**	-	-	-	-	-	-	-	-	+	-	**1**
Ulvophyceae											
Cladophora glomerata	+	-	-	-	-	++++	-	-	-	-	**5**
Cladophora crispate	+	-	-	-	-	-	-	-	-	-	**2**
Rhizoclonium crassipellitum	-	+	-	-	-	-	-	+	-	-	**2**
Rhizoclonium hieroglyphicum	+++	+++++	-	-	-	+	-	+	+	-	**12**
Rhizoclonium riparium	-	-	-	-	-	-	+	-	-	-	**1**
***Trentopohlia* sp.**	-	-	-	-	-	-	-	-	+++	-	**3**
Ulotrichaceae											
Ulothrix zonata	+	-	-	-	-	-	+	+	-	-	**3**
Ulothrix tenerrima	-	+	-	-	-	-	+	+	-	-	**3**
Glaucophyceae											
***Glaucocystis* sp.**	-	-	-	-	+	-	-	-	++	-	**3**
Florideophyceae											
***Batrachospermum* sp.**	-	-	-	-	-	+	-	-	-	-	**1**
Euglenophyceae											
Euglena acus	+	-	+	++	-	-	-	-	-	-	**4**

Euglena mutabilis	**-**	+	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Euglena oxyuris	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Lepocinclis fusiformis	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**-**	**1**
Lepocinclis ovum* var.*dimidio-mino	**-**	**-**	+	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Phacus caudatus	**-**	+	**-**	**-**	+	**-**	**-**	**-**	**-**	**-**	**3**
Phacus pleuronectea	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	**-**	**-**	**1**

3.4 Altitudinal Distribution

In the present study, altitude was divided into four categories according to their range: 600-1100 masl, 1101-1600 masl, 1601-2100 masl and 2101-2600 masl. It is known that as altitude increases, rainfall and light intensity also increases and temperature decreases. All these variables have an effect on the growth of algae. Algae are known to be able to adapt to different environment which includes extreme environments where specific algae adapts to these environments. Algal diversity and distribution in different ranges of altitude is discussed below and the altitudinal variation of different class of algae is shown in Figure 4.

600-1100 masl: Algae was collected from Pond, Constructed pond/Water tank, Rice field, Temporary pool, Stream and River in this altitude range and covering winter, spring and summer seasons. The dominant class Baccillariophyceae contributed an overall percentage of 68.18% which was followed by Zygnematophyceae with a percentage contribution of 10.60% and Cyanophyceae and Chlorophyceae with a percentage contribution of 6.06 % each. The maximum representation of the algal genera belongs to the Genera *Closterium* and *Navicula* with 5 taxa each followed by *Nitzschia*, *Achnanthidium* and *Cymbella* with 4 algal taxa each and *Spirogyra* and *Oscillatoria* with 3 taxa each. The genera *Planothidium*, *Pleurosigma* and *Cymatopleura* were only reported from this altitudinal range.

1101-1600masl: Algae was collected from all the seasons and different habitats studied except from Depression spring. Baccillariophyceae is found to be the dominant class contributing an overall percentage of 48.24% followed by Zygnematophyceae with a percentage contribution of 14.91% and Cyanophyceae with a percentage contribution of 14.47%. In the present study, the maximum representation of the algal genera belongs to

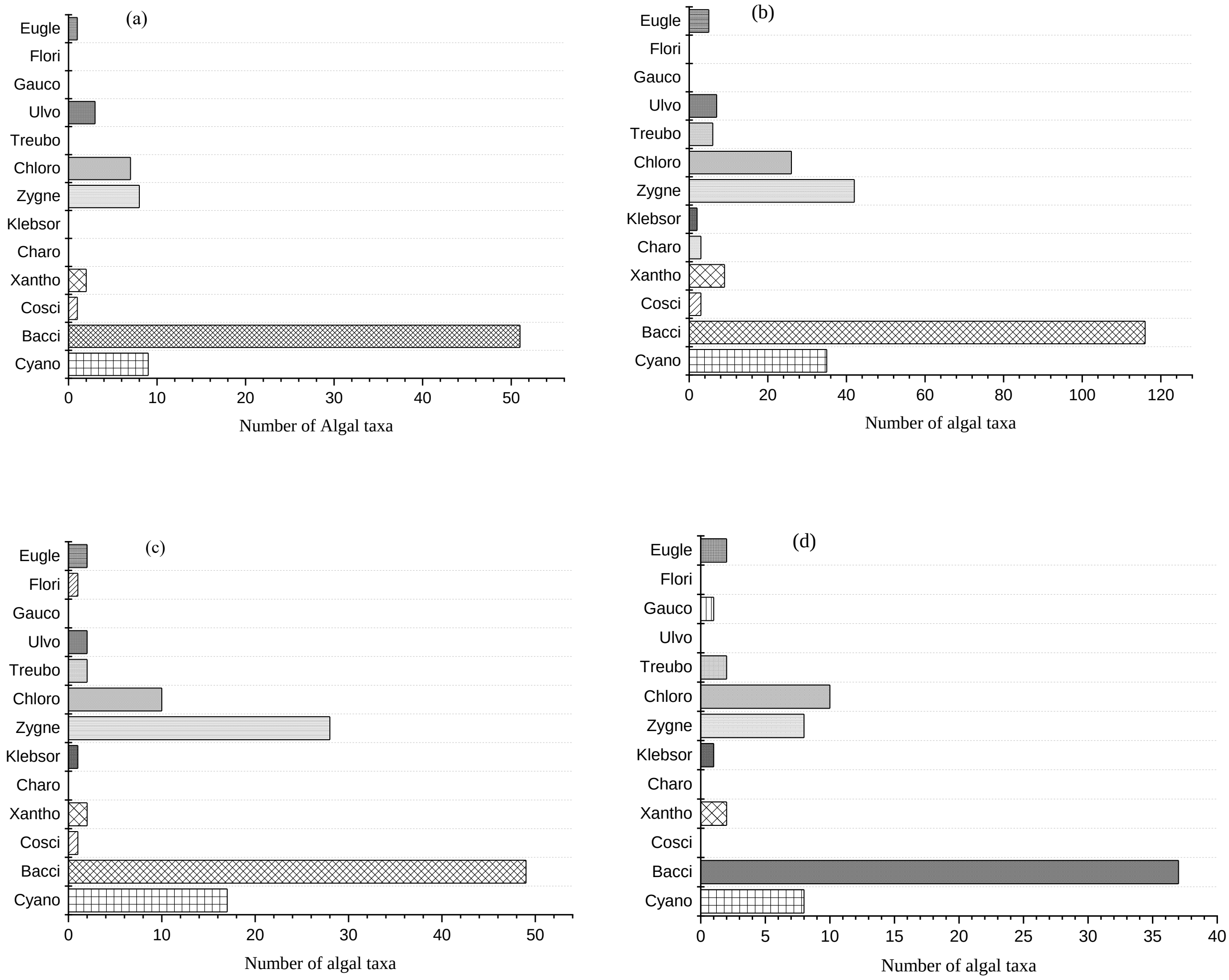

Fig. 4: Bar graph showing the distribution of different class of algae in the varying altitude range: a). 600-1100 masl; b). 1101-1600 masl; c).1601-2100 masl; d). 2101-2600 masl.

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the genera *Oscillatoria* with 13 algal taxa followed by *Spirogyra* with 12 algal taxa and *Pinnularia* with 10 algal taxa. The genera *Nostochopsis*, *Geitlerinema*, *Glaucospira, Merismepodea*, *Lemmermaniella*, *Schizothrix*, *Placoneis*, *Staurosira*, *Mastogloia, Amphipleura*, *Frustulia*, *Kobayasiella*, *Chara*, *Acutodesmus*, *Actinastrum* and *Batrachospermum* were only reported from this altitudinal range

1601-2100 masl: Algae was collected during winter and summer season and from all the different habitats except Depression spring. The dominant class Baccillariophyceae contributed an overall percentage of 42.30 % which was followed by Zygnematophyceae with a percentage contribution of 24.03 % and Cyanophyceae with a percentage contribution of 16.34 %. The maximum representation of the algal genera belongs to the Genera *Oscillatoria* with 7 algal taxa, *Navicula* and *Cosmarium* with 6 algal taxa each and Closterium with 5 algal taxa. The genera *Lemnicola, Achnanthes, Euastrum, Cylindrocystis*, *Netrium*, *Spirotaenia* and *Draparnaldia* were only reported from this altitudinal range.

2101-2600masl: In this range, algae were collected from few depression springs; rivers and Moist cave in spring and autumn season at Dzükou valley. The dominant class Baccillariophyceae contributed an overall percentage of 53.33 % which was followed by Cyanophyceae and Chlorophyceae with a percentage contribution of 12 % each and Zygnematophyceae with a percentage contribution of 10.66 %. The maximum representation of the algal genera belongs to the Genera *Eunotia* with 8 algal taxa followed by the genera *Pinnularia* with 6 algal taxa and genera *Navicula* with 4 algal taxa. The genera *Glaucocystis, Cyanotheceae, Pectinodesmus, Eudorina*, *Hannae, Actinotaenium*, *Gomphoneis* and *Docidium* were only reported from the high altitude region. Most of the *Eunotia* and Gleocapsa taxa reported are also confined to this altitudinal range. In India there is countable number of works done on algae of high altitude regions; algal studies of high altitude by different workers recorded Cyanophyceae (Toppo et al. 2016), Baccillariophyceae (Bhakta et al. 2010) and Chlorophyceae (Kant and Gupta, 1998) as highly dominant. The present study also shows such dominance and distribution of algae which suggest that altitude can influence the composition and growth of similar algal taxa irrespective of the region.

In all the different altitude ranges, Baccillariophyceae is found to be the dominant class contributing approximately half of the algal taxa recorded. The altitude range of

1101-1600 and 1601-2100 had the most diverse group of algae where majority of the algal taxa and 11 classes of algae out of the 13 classes were reported. It should be noted that majority of the areas under Kohima district lies between these two altitudinal ranges. This result was found to be similar with Das and Adhikary (2012c) who studied the algae in different altitudinal ranges in Arunachal Pradesh. In their study, Bacillariophyceae was found to be the dominant group in the different ranges and also the mid altitudinal range from 700-1550 masl was reported to harbour the maximum algal flora, followed by Baccillariophyceae. The present study however differs from the works of Kumar and Sethn (2010) who surveyed different geographical locations of Kangra district, Himachal Pradesh between the aititude range of 450 m - 4570 m and found the Chlorophyceae to be the dominant group followed by baccillariophycaea. Das and Adhikary (2012b) also found differing datas while surveryyng some freshwater bodies of Nagaland at very low range of altitude (below 200 masl) and mid range of the altitude (1100-1600 masl) where they found the Chlorophyta to be dominant group followed by Baccillariophyceae.

In the present study, the following algal taxa *Oscillatoria brevis, Nitzschia palea, Achnanthidium minutissima, Brebissonia lanceolata, Fragilaria rumpens, Fragillaria capucina, Navicula rhyncocephala, Navicula veneta, Neidium productum, Pinnularia divergens, Surirella roba, Tribonema viride, Microspora tumidula* is found to be common in all the different altitudinal range, whereas *Nitzschia vermicularis, Odontidium mesodon, Navicula cryptocephaloides, Pinnularia subgibba, Pinnularia viridis, Sellaphora* sp., *Rhopalodia gibba, Scenedesmus acunae, Microspora pachyderma* were reported from the three upper altidudinal ranges (1101-1600 masl: 1601-2100 masl; 2101-2600 masl) and *Oscillatoria agardhi, Oscillatoria tenuis, Nitzschia clausii, Cymbella tumidula, Melosira varians, Closterium moniliferum, Spirogyra setiformis, Cladophora glomerata* reported from the three lower altitudinal ranges (600-1100 masl;

1101-1600 masl; 1601-2100 masl). *Epithemia sorex* was reported from three altitude range except 1601-2100 masl, whereas *Achnanthidium neotropicum* was reported from three altitude range except in the range of 1101-1600 masl.

3.6 Seasonal occurance of algae

The seasonal occurances of algae have been characterised in the present study and the distributional pattern and diversity of algal class and taxa have been studied. Baccillariophyceae was found to be the dominant class in all the different seasons. This result was found to differ from the works of Hajong and Ramanujam (2018) who reported the class Zygnematophyceae to be dominant. In the present study, algae taxa such *Oscillatoria brevis, Oscillatoria limosa, Nitzschia clausii, Nitzschia palea, Brebissonia lanceolata, Ulnaria acus, Navicula cryptocephaloides, Navicula veneta, Pinnularia divergens, Rhopalodia gibba* and *Melosira varians* were common occurance in all the seasons.

The dominant groups occurring in the different seasons are as follows:
1. Spring: Baccillariophyceae > Cyanophyceae > Zygnematophyceae > Chlorophyceae

2. Summer: Baccillariophyceae > Cyanophyceae > Zygnematophyceae > Chlorophyceae

3. Autumn: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae

4. Winter: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae

The dominant algal genera in spring season were *Oscillatoria* (10 algal taxa), *Pinnularia* (9), *Closterium* (9) and *Eunotia* (8); in summer season were *Oscillatoria* (10 algal taxa), Cosmarium (10), Spirogyra (10) and *Closterium* (9); in autumn season were *Pinnularia* (6 algal taxa), *Nitzschia* (4), *Oscillatoria* (3), *Closterium* (3) and *Cosmarium* (3) and in winter season were *Cymbella* (8 algal taxa), *Oscillatoria* (7), *Navicula* (6), *Pinnularia* (6) and *Closterium* (6). The distribution of algal taxa in different seasons is given in Table-5.

Table 5: Distribution of Algae in different seasons

Algal Taxa	Spring	Summer	Autumn	Winter
Cyanophyceae				
Aphanothece conglomerate	+	+	-	-
Aphanothece stagnina	+	+	-	-
Gloeothece tepidariorum	-	+	-	-
Clorococcus minor	-	+	+	-
Chrococcus sp.	+	-	-	-
Gloeocapsa nigrescens	+	-	-	-
Gleocapsa novacekii	+	-	-	-
Gloeocapsa spp.1	+	-	-	-
Gloeocapsa spp.2	-	+	+	-
Calothrix braunii	-	+	-	-
Calothrix marchica var. intermedia	-	-	-	+
Calothrix parietina	+	+	-	-
Calothrix sp.	+	-	-	+
Westelliopsis sp.	-	-	+	-
Cylindrospermum majus	-	+	-	-
Cylindrospermum stagnale	+	-	-	-
Anabaena iyengarii	-	+	-	-
Anabaena laxa	-	+	-	-
Anabaena variabilis	-	+	-	-
Nostoc ellipsosporum	-	+	-	-
Nostoc spp.1	+	+	-	-
Nostoc spp.2	-	+	-	-
Nostochopsis lobata	-	+	-	-
Tolypothrix byssoidea	-	-	-	+
Tolypothrix distorta	+	-	-	-
Stigonema tomentosum	+	-	-	-
Steigonema sp.	-	+	-	-
Geitlerinema splendidum	-	+	-	-
Cyanotheceae ruginosa	+	-	-	-
Lyngbya spp.1	+	+	-	-
Lyngbya spp.2	+	-	-	-
Lyngbya spp.3	-	+	-	-
Oscillatoria agardhi	+	+	-	+
Oscillatoria agardhi var. *isothrix*	-	+	-	-
Oscillatoria brevis	+	+	+	+
Oscillatoria chlorina	+	+	-	-

Oscillatoria curviceps	+	-	-	-
Oscillatoria limosa	+	+	+	+
Oscillatoria perornata	+	-	-	-
Oscillatoria princeps	+	+	+	-
Oscillatoria raoi	+	+	-	+
Oscillatoria rubescens	-	+	-	-
Oscillatoria subbrevis	-	+	-	+
Oscillatoria splendida	-	+	-	-
Oscillatoria tenuis	+	+	-	+
Oscillatoria vizagapatensis	+		-	+
Phormidium ambiguum	-	+	-	-
Phormidium favosum	+	-	-	-
Phormidium pachydermaticum	-	+	+	-
Phormidium stagnina	+	-	-	-
Phormidium sp.	-	-	+	-
Glaucospira agilssima	-	+	-	-
Spirulina nodosa	-	+	-	-
Spirulina laxissima	-	+	-	-
Aphanocapsa grevillei	+	-	-	-
Aphanocapsa sp.	-	-	-	+
Merismopodia elegans	-	+	-	-
Pseudanabaena catenata	+	-	-	+
Lemmermaniella terrestris	+	-	-	-
Schizothrixtelephoroides	-	+	-	-
Baccillariophyceae				
Hantzschia amphioxys	-	+	-	-
Hantzschia sp.	-	+	-	-
Nitzschia clausii	+	+	+	+
Nitzschia linearis	+	-	+	-
Nitzschia nana	-	+	+	-
Nitzschia palea	+	+	+	+
Nitzschia recta	+	-	-	-
Nitzschia sigma	-	+	-	+
Nitzschia sigmoidea	+	-	-	-
Nitzschia vermicularis	+	+	-	+
Achnanthidium eutrophilum	-	-	-	+
Achnanthidium latecephalum	-	-	+	+
Achnanthidium minutissima	+	+	-	+
Achnanthidium nanum	+	+	-	-
Achnanthidium neotropicum	+	+	-	-
Achnanthidium sp.	-	-	-	+
Lemnicola hungarica	-	-	-	+
Planothidium lanceolatum	-	-	-	+
Cocconeis pediculus	-	+	-	+
Cocconeis placentula var. *euglypta*	-	+	-	-

Cocconeis sp.	+	-	-	+
Brebissonia lanceolata	+	+	+	+
Cymbella affiniformis	-	-	-	+
Cymbella aspera	+	+	-	+
Cymbella cymbiformis	-	-	-	+
Cymbella excise	-	+	-	+
Cymbella fontinalis	-	-	-	+
Cymbella kappii	-	+	-	-
Cymbella neocistula				+
Cymbella neoleptoceros	+	-	-	+
Cymbella tumidula	-	+	-	-
Cymbella sp.	-	-	-	+
Cymbopleura amphicephala	+	+	-	-
Cymbopleura inaequalis	-	-	-	+
Cymbopleura naviculiformis	+	+	-	-
Oricymba subaequalis	-	+	-	-
Encyonema montana	-	+	-	-
Encyonema prostratum	-	+	-	-
Encyonema silesiacum	-	+	-	-
Encyonema sublungebertulotii	+	-	-	-
Encyonema vulgare	+	+	-	+
Gomphoneis pseudo-okunoi	+	-	-	-
Gomphonema acuminatum	+	+	-	-
Gomphonema affine	+	+	+	-
Gomphonema gracile	+	+	-	+
Gomphonema lagenula	-	+	-	-
Gomphonema laticollum	-	-	-	+
Gomphonema minutum	+	-	-	-
Gomphonema pumilum var. *elegans*	+	-	-	-
Gomphonema truncatum	+	+	+	-
Gomphonema ventricosum	+	-	-	-
Gomphonema vibrio	-	-	-	+
Placoneis clementioides	-	+	-	-
Placoneis sp.	-	-	+	-
Rhoicosphenia abbreviate	+	-	-	+
Eunotia bilunaris	+	-	+	+
Eunotia epithemioides	+	-	-	-
Eunotia implicate	+	-	-	-
Eunotia naegelii	+	-	-	-
Eunotia novaecaledonica	+	-	-	-
Eunotia paratridentula	+	-	-	-
Eunotia perminuta	-	+	-	-
Eunotia rhombiodea	-	-	+	+
Eunotia serra	+	-	-	-
Eunotia tridentula	+	-	-	-

Fragilaria mazamaensis	-	+	-	+
Fragilaria rumpens	+	+	-	+
Fragillaria vaucheriae	-	+	-	-
Odontidium hyemale	+	-	-	-
Odontidium mesodon	+	+	-	+
Staurosira construens	-	+	-	-
Hannaea inaequidentata	+	-	-	-
Ulnaria acus	+	+	+	+
Ulnaria biceps	-	+	-	+
Ulnaria contracta	-	-	+	-
Ulnaria ulna	+	+	+	+
Achnanthes exigua	-	-	-	+
Mastogloia smithii var *lacustris*	-	+	-	-
Amphipleura sp.	+	+	-	-
Frustulia sp.	-	-	-	+
Diadesmus confervacea	-	+	+	+
Diadesmis gallica	-	-	-	+
Diploneis calcilacustris	-	+	-	-
Diploneis elliptica	+	+	-	-
Diploneis lusatica	-	+	-	-
Diploneis ovalis	+	+	-	-
Diploneis puella	+	-	-	+
Diploneis puellafallax	+	-	-	-
Diploneis smithii	-	+	-	-
Diploneis yatukaensis	+	+	-	-
Caloneis acuta	+	-	-	-
Caloneis silicula	+	+	-	-
Caloneis strelnikovae	+	-	-	-
Gyrosigma acuminatum	+	+	-	+
Gyrosigma obtusatum	-	-	-	+
Gyrosigma scalproides	-	+	-	+
Gyrosigma sp. 1	+	-	-	-
Navicula cryptocephaloides	+	+	+	+
Navicula erifuga	-	-	-	+
Navicula lanceolata	-	+		+
Navicula peregrine	-	-	-	+
Navicula radiosa	+	+	-	-
Navicula rhyncocephala	+	+	-	-
Navicula riediana	-	-	+	-
Navicula rostellata	+	-	-	-
Navicula symmetrica	+	-	-	-
Navicula veneta	+	+	+	+
Navicula viridula	-	+	-	+
Kobayasiella subtilissima	-	+	-	-
Neidium affine	-	+	-	-

Neidium productum	+	+	-	+
Pinnularia appendiculata	+	+	+	-
Pinnularia borealis	+	-	-	+
Pinnularia divergens	+	+	+	+
Pinnulariadivergens var. *mesoleptiformis*	+	-	-	+
Pinnularia gigas	-	-	-	+
Pinnularia sikkimensis	+	+	+	-
Pinnularia subanglica	-	-	+	-
Pinnularia subgibba	+	+	-	+
Pinnularia viridiformis	+	+	+	-
Pinnularia viridis	+	+	+	+
Pinnularia sp.	+	-	-	-
Pleurosigma sp.	-	-	-	+
Sellaphora seminulum	-	+	-	-
Sellaphora sp.	+	+	-	+
Stauroneis anceps	+	-	+	-
Stauroneis smithii	+	-	-	-
Stauroneis spp. 1	-	-	+	-
Stauroneis spp. 2	-	+	-	+
Epithemia sorex	+	+	-	-
Rhopalodia gibba	+	+	+	+
Rhopalodia gibberula	+	-	-	-
Cymatopleura solea	-	-	-	+
Iconella biseriata	-	+	-	-
Iconella tchadensis	+	-	-	-
Surirella antioquiensis	-	+	-	-
Surirella atomus	+	-	-	-
Surirella brebissonii	+	-	+	-
Surirella capronioides	-	-	-	+
Surirella elegans	+	+	-	-
Surirella linearis	+	-	-	-
Surirella roba	+	+	-	-
Surirella robusta	+	+	+	-
Surirella tenera	+	+	-	+
Surirella sp.	-	-	-	-
Diatoma vulgaris	+	+	-	-
Amphora coffeiformis	-	-	-	+
Amphora copulata	-	+	-	+
Ampohora ovalis	+	+	-	-
Amphora proteus	+	-	-	-
Coscinodiscophyceae				
Melosira varians	+	+	+	+
Melosira varians var.*aequalis*	+	+	-	+

Xanthophyceae				
Tribonema affine	+	-	-	-
Tribonema bombycinum	+	-	-	-
Tribonema minus	-	+	-	-
Tribonema viride	+	+	-	+
Tribonema vulgare	+	+	+	-
Vaucheria aversa	+	+	-	+
Vaucheria pseudogeminata	+	-	+	-
Charophyceae				
Chara braunii	+	-	+	-
Nitella hyaline	-	-	+	-
Nitella sp.	+	-	+	-
Klebsormidiophyceae				
Klebsormidium flaccidum	+	+	-	-
Klebsormidium klebsii	-	+	-	+
Zygnematophyceae				
Closterium abruptum	+	-	-	+
Closterium acerosum	+	+	+	-
Closterium acerosum var. *minus*	-	+	-	-
Closterium acutum var. *variabile*	+	+	-	-
Closterium dinae	+	-	-	+
Closterium ehrenbergii	+	+	-	+
Closterium idiosporum	+	-	+	+
Closterium kuetzingii	+	-	-	-
Closterium moniliferum	+	+	-	+
Closterium parvulum	+	-	-	-
Closterium pseudolunula	-	+	-	-
Closterium rectimarginatum	-	+	+	+
Actinotaenium silvae-nigrae	-	+	-	-
Cosmarium abbreviatum var. minus	-	-	-	+
Cosmarium anceps	-	+	-	-
Cosmarium blytii	+	+	-	-
Cosmarium botrytis	+	+	-	+
Cosmarium caelatum	-	-	-	+
Cosmarium contractum var. *rotundatum*	-	+	+	-
Cosmarium crenatum		+	+	-
Cosmarium difficile var. *dilatatum*	-	+	-	-
Cosmarium holmiense var. *hibernicum*	-	+	-	-
Cosmarium impressulum	-	-	-	+
Cosmarium laeve	-	+	-	-
Cosmarium ornatum	-	-	+	+
Cosmarium speciosum	-	+	-	-
Cosmarium Scutifirme	+	-	-	-
Cosmarium sp.	-	+	-	-

Docidium undulatum	+	-	-	-
Pleurotaenium ehrenbergii	+	+	-	+
Pleurotaenium trabecula	+	-	-	+
Staurastrum acutum var. *variance*	-	-	+	-
Staurastrum punctulatum	-	-	-	+
Hyalotheca dissiliens	+	-	-	+
Euastrum sublobatum	-	+	-	-
Penium margaritaceum	+	+	-	-
Cylindrocystis brebissonii	-	+	-	-
Netrium digitus	-	+	-	-
Spirotaenia condensate	+	-	-	-
Spirogyra australica	-	+	-	-
Spirogyra decimina	-	+	+	+
Spirogyra dubia	+	+	+	-
Spirogyra insignis	-	+	-	-
Spirogyra kundaensis	+	+	-	-
Spirogyra mirabilis	+	-	-	-
Spirogyra neglecta	+	-	-	-
Spirogyra pratensis	+	+	-	+
Spirogyra reticulate	-	+	-	-
Spirogyra setiformis	-	+	+	+
Spirogyra submargaritata	+	+	-	-
Spirogyra varians	-	-	+	-
Spirogya weberi	+	+	-	-
Mougeotia boodlei	-	+	-	-
Mougeotia sp.	-	-	-	+
Zygnema sp.	-	+	-	+
Chlorophyceae				
Aphanochaete repens	+	+	-	-
Draparnaldia acuta	-	-	-	+
Stigeoclonium lubricum	-	+	-	-
Steigoclonium tenue	+	+	-	+
Eudorina elegans	+	-	-	-
Oedogonium abbreviatum	-	-	+	+
Oedogonium spp.1	-	+	+	+
Oedogonium spp. 2	+	-	+	-
Hydrodictyon reticulatum	-	+	-	-
Microspora pachyderma	+	+	+	-
Microspora tumidula	+	+	-	+
Acutodesmus acuminatus	-	+	-	-
Coelastrum pseudomicroporum	+	-	-	+
Coelastrum sp.	-	+	-	-
Desmodesmus abundans	-	+	-	-
Desmodesmus perforatus	-	-	-	+
Desmodesmus subspicatus	+	+	-	-

Pectinodesmus holtmannii	+	-	-	-
Pediastrum tetras	+	+	-	-
Scenedesmus acunae	+	+	-	+
Scenedesmus costatus	-	+	-	-
Scenedesmus raciborskii	-	+	-	-
Scenedesmus sp.	+	+	-	-
Tetradesmus dimorphus	+	+	+	-
Trebouxiophyceae				
Actinastrum sp.	+	-	+	-
Chlorellaellipsoidea	-	-	-	+
Chlorella sp.	+	-	+	+
Geminella interrupta	-	+	-	-
Geminella sp.	-	+	-	-
Oocystis irregularis	-	+	+	-
Oocystis natans	-	+	-	-
Stichococcus bacillaris	+	+	+	-
Coccomyxa sp.	+	-	-	-
Ulvophyceae				
Cladophora glomerata	+	-	+	+
Cladophora crispate	-	-	+	+
Rhizoclonium crassipellitum	-	+	-	+
Rhizoclonium hieroglyphicum	+	+	+	-
Rhizoclonium riparium	-	+	-	-
Trentopohlia sp.	+	+	-	-
Ulothrix tenerrima	-	+	+	-
Ulothrix zonata	-	+	-	+
Glaucophyceae				
Glaucocystis sp.	+	-	-	-
Florideophyceae				
Batrachospermum sp.	-	+	-	-
Euglenophyceae				
Euglena acus	+	-	-	-
Euglena mutabilis	-	-	+	-
Euglena oxyuris	+	-	-	-
Lepocinclis fusiformis	+	-	-	-
Lepocinclis ovum var. *dimidio-mino*	-	-	+	-
Phacus caudatus	+	+	-	-
Phacus pleuronectea	-	+	-	-

The study reveals a high algal diversity due to its heterogeneity which aided to the growth, survivalility and regeneration of algal species in the mountainous region of Kohima. Since the collected sample locations were influenced by varying climatic, edaphic and physiographic features, the differences in species richnessat each locations and seasons could be attributed to the specificity of the algal habitat and the seasonal affects on their growth. As variations in environmental factors impose the adaptive abilities of organisms, only those species which acclimatize to those conditions or those which can become accustomed to the changing natures of those habitats survives.The dominance of Class Cyanophyceae in drains were selective in the habitat they grow such as in antropogenically disturbed area which depictstheir tendency of creating a niche thatfavors their dominance in that particular sites.Padhi et al. (2010) in their work stated that Diatoms usually grow better in unpolluted water bodies. The dominance of Baccillariophyceae in majority of the study sites does indicate less pollution status of Kohima district. The Genus *Eunotia* was found to dominate the water bodies at higher altitude and Genus *Cyanotheceae, Pectinodesmus, Eudorina, Hannae, Actinotaenium, Gomphoneis, Docidium*were found only at high altitudes and this represents their affinity towards colder region or lower temperature.

Chapter-4: Summary and Conclusion

The present study was taken up to explore the algal diversityof Kohima district as no work has been done. The area being a biodiversity hotspot region elucidated high species richness and thus it provided a huge scope for algal studies. The study was mostly concentrated on the freshwater habitats (lotic and lentic waters), covering the four seasons (spring, summer, autumn and winter) at varying altitudes across the district. Altogether, 331 algal taxa belonging to 117 genera, 71 families, 38 orders and 14 classes were recorded. The total number of different algal classesare given below:

Baccillariophyceae-52; Cyanophyceae-60; Zygnematophyceae-55; Chlorophyceae-24; Trebouxiophyceae- 9; Ulvophyceae-8; Xanthophyceae-7; Euglenophyceae-7; Charophyceae-3; Klebsormidiophyceae-2; Coscinodiscophyceae- 2; Gaucophyceae-1; Florideophyceae-1.

In total, 127 samples were collected from different habitats and the order of dominance of algal classesin different habitat is given below:

Pond: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae > Ulvophyceae > Trebouxiophyceae = Xanthophyceae> Coscinodiscophyceae = Charophyceae = Klebsormidiophyceae = Euglenophyceae.

Constructed ponds / water tanks: Baccillariophyceae > Cyanophyceae > Zygnematophyceae > Chlorophyceae > Trebouxiophyceae = Xanthophyceae > Ulvophyceae > Coscinodiscophyceae = Charophyceae = Euglenophyceae > Klebsormidiophyceae.

Rice fields and fish ponds: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae > Xanthophyceae > Euglenophyceae > Coscinodiscophyceae = Charophyceae = Klebsormidiophyceae.

Temporary pools: Zygnematophyceae > Baccillariophyceae > Chlorophyceae > Cyanophyceae = Trebouxiophyceae = Euglenophyceae.

Depression spring: Baccillariophyceae > Chlorophyceae > Cyanophyceae > Zygnematophyceae > Xanthophyceae = Euglenophyceae > Glaucophyceae.

Rivers: Baccillariophyceae > Zygnematophyceae > Chlorophyceae > Cyanophyceae > Ulvophyceae = Xanthophyceae > Euglenophyceae.

Streams / water springs: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae > Ulvophyceae > Trebouxiophyceae = Xanthophyceae > Florideophyceae.

Drain: Baccillariophyceae > Cyanophyceae = Zygnematophyceae > Ulvophyceae > Trebouxiophyceae.

Moist rock / walls / caves: Cyanophyceae > Baccillariophyceae > Zygnematophyceae > Chlorophyceae > Klebsormidiophyceae = Trebouxiophyceae = Ulvophyceae > Glaucophyceae.

Moist soil: Cyanophyceae > Baccillariophyceae > Zygnematophyceae > Klebsormidiophyceae = Chlorophyceae.

The distribution of algae in different altitudinal range: 600-1100; 1101-1600 masl; 1601-2100masl; 2101-2600 masl shows that 1101-1600 and 1601-2100 had the most diverse group of algae where 11 classes of algae out of the 13 classes were reported.

Baccillariophyceae is found to be the dominant class in all the altitudes.The taxa that were common to all the altitudes is *Oscillatoria brevis, Nitzschia palea, Achnanthidium minutissima, Brebissonia lanceolata, Fragilaria rumpens, Fragillaria capucina, Navicula rhyncocephala, Navicula veneta, Neidium productum, Pinnularia divergens, Surirella roba, Tribonema viride, Microsporatum idula.* Certain algal genera were recorded specifically from a particular altitudinal range, they are:

600-1100 masl: The genera *Planothidium, Pleurosigma* and *Cymatopleura.*

1101-1600 masl: The genera *Nostoc hopsis, Geitlerinema, Glaucospira, Merismepodea, Lemmermaniella, Schizothrix, Placoneis, Staurosira, Mastogloia, Amphipleura, Frustulia, Kobayasiella, Chara, Acutodesmus, Actinastrum* and *Batrachospermum.*

1601-2100masl: The genera *Lemnicola, Achnanthes, Euastrum, Cylindrocystis, Netrium, Spirotaenia* and *Draparnaldia.*

2101-2600masl: The genera *Glaucocystis, Cyanotheceae, Pectinodesmus, Eudorina, Hannae, Actinotaenium, Gomphoneis, Docidium.*

Algal samples were collected from all different seasons and the dominant groups are as follows:

Spring: Baccillariophyceae > Cyanophyceae > Zygnematophyceae > Chlorophyceae.

Summer: Baccillariophyceae > Cyanophyceae > Zygnematophyceae > Chlorophyceae.

Autumn: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae.

Winter: Baccillariophyceae > Zygnematophyceae > Cyanophyceae > Chlorophyceae.

Significant findings and significance of work:

1. *Actinotaenium silvae-nigrae* which was collected from the moist cave of Dziikou valley was a first report for India.

2. *Batrachospermum* sp. which was collected from a small stream in Jotsoma Village is rare algal taxa which grow in very clean, shaded and slow moving water.

3. Algal diversity studies on high altitude depression springs habitat are a first for India.

4. The study also depicts algal habitats thriving in high altitude caves of Dziikou, and such groundworks are limited in India.

5. The study is an exploratory comprehensive work for algal studies of Kohima district with meticulous outcome as majority of the algal taxa recorded are the first reports for Nagaland.

Overall, the study emphasized on algal diversity has brought much insight on Nagaland phycology. In today's scenario this discipline is of immediate interest to researchers because of algae's importance in water, soil including forest ecology. Moreover, this topic is of prime concern to scientist due to algal crucial role in science, medicine and technology. The database collected in this research can be an important source to distinguish economically important algal species for local authorities or researchers working in this part of Indo-Myanmar hotspot region. Furthermore, this indagation or investigation has unveiled the possibilities of more diverse algal species in this pocket of Nagaland forest ecosystem which could aid to biodiversity richness.

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List of Publications

1. Chaturvedi SK, Kuotsu K (2019) Pollination biology of Larsenaianthus careyanus (Benth.) W. J. Kress 7 Mood, (zingiberaceae) at Mokokchung district, Nagaland, India. Int J Plant Repro Biol. 11(1): 98-102.
2. Chaturvedi SK, Kuotsu K, Kamba J (2020) Pollination and diversity of visitors and pollinators of Alpinia blepharocalyx K. Schum. (Zingiberaceae) in Nagaland (N-E India). Int J Plant Repro Biol. 12(2): 123-127.
3. Kuotsu K, Chaturvedi SK (2020) Diversity of Desmids from Freshwater Bodies of Kohima District, Nagaland, India. J Indian bot soc. 100(3&4): 177-184
4. Yeptho L, Ajungla A, Kutsu K (2021) Ethnic study on Bastenga, a fermented bamboo shoot product of Nagaland, India. Cur Sci. 120(4): 712-715.
5. Kuotsu K, Chaturvedi SK (2021) Floristic survey of Algae in some freshwater habitats of Kohima District, Nagaland (India). J Adv Plant Sci. 11(1): 60-73.
6. Das M, Semy K, Kuotsu K. (2022) Seasonal monitoring of algal diversity and spatiotemporal variation in water properties of Simsang river at South Garo Hills, Meghalaya, India. Sustainable Water Resources Management. 8:1-16.

List of Seminar, Workshop and Conference attended

1. Training programme on 'Production technology of Blue green algae- *Spirulina*' Organised by CCUBA, IARI, New Delhi on July 18-21, 2017.
2. Basic Microbiological Techniques for studying Microbes organised by Division of Microbiology, ICAR-IARI, New Delhi-110012 on July 24-31, 2017.
3. Hands on training on "Functional Genomics" Organised by Department of Biotechnology, Govt. of India Sponsored. Institutional Biotech Hub, Nagaland University, Lumami and Department of Botany, Nagaland University. Sponsored by 'Institutional Biotech Hub' on November 14-21, 2017
4. Short term skill development training program in Biotechnology for students of North-East India. Sponsored by Institute of Bioresources and Sustainable development, Department of Biotechnology,Govt. of India on November 16- December 15, 2017
5. Hands on Training on 'Genomics and Gene Expression Analysis' Organized by Department of Biotechnology, Govt. of India Sponsored Advanced level Institutional Biotech Hub, Department of Botany, Nagaland University, Lumami on July 18-23, 2018.
6. National Conference of Stakeholders on Conservation, Cultivation, Resource development and Sustainable Utilization of Medicinal Plants of North- Eastern India. Department of Botany, Nagaland University, Lumami Nagaland and Society for Conservation and resource Development of Medicinal Plants (SMP), New Delhi on March 6-7, 2019
7. International Conference on "Chemical Ecology, Environment and Human Health: Emerging Frontiers and Synthesis (ICCEEHH 2019). Department of Zoology, Sikkim University on August 9-10, 2019.
8. The 9th Conference on Taxonomy and Systematics in Thailand (TST9) on October 2-4, 2019
9. Research Ethics, Paper Writing and IPR. Organised and sponsored by UGC-SAP (DSR-111), Department of Botany and Department of Biotechnology, Govt. of India sponsored. Advanced Level Institutional Biotech Hub, Nagaland University, Lumami. November, 14-15, 2019

10. National e- Conference on "Bioresources and Sustainable Livelihood of Rural India. Department of Botany, Nagaland University, Lumami-798627, Nagaland on September 28-29, 2020
11. National Webinar on Biotechnology in Plant Genetic Resource Conservation organised by Department of Botany, Model Christian College, Kohima, Nagaland on October 23, 2021

Research Paper Presented in Seminar/ Conference

1. Kuotsu K. and Chaturvedi S.K. (2019) Some potential medicinally important Algal Taxa from Nagaland, North east India. In: National Conference of Stakeholders on Conservation, Cultivation, Resource development and Sustainable Utilization of Medicinal Plants of North- Eastern India. Department of Botany, Nagaland University, Lumami Nagaland and Society for Conservation and resource Development of Medicinal Plants (SMP), New Delhi on March 6-7, 2019
2. Kuotsu K. and Chaturvedi S.K. (2019) "Study on diversity of Algal in different water bodies to assess the water quality of Kohima District, Nagaland. In: International Conference on "Chemical Ecology, Environment and Human Health: Emerging Frontiers and Synthesis (ICCEEHH 2019). Department of Zoology, Sikkim University on August 9-10, 2019.
3. Kuotsu K. and Chaturvedi S.K. (2019) Aquatic algal Diversity of Kohima District, Nagaland, India. The 9th Conference on Taxonomy and Systematics in Thailand (TST9). October 2-4, 2019.
4. Kuotsu K. and Chaturvedi S.K. (2020) Potential Algal resources from Kohima District. In: National e- Conference on "Bioresources and Sustainable Livelihood of Rural India. Department of Botany, Nagaland University, Lumami-798627, Nagaland on September 28-29, 2020