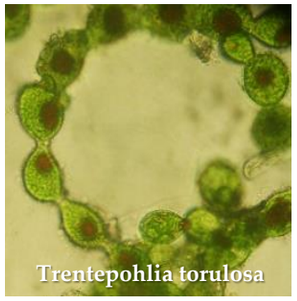
tolerance mechanisms like secretion of exopolysaccharides, which help them in adherence and sustaining in extreme conditions. Most important feature in such habitats is the availability of water, which is supplemented through rain or atmospheric moisture. Nutrients to such habitats are transported by rainwater, aerosols and dust or soil particles.


Nostoc sphaericum


Stigonema minutum


Trentepohlia aurea


Trentepohlia torulosa

Terrestrial algae with their microbial biocoenosis such as bacteria and fungi are sometimes involved in weathering of their substratum. But in other hand the cyanobacterial components are a rich source of UV sun screen pigments such as Scytonemin and MAAs (Mycosporine-like Amino Acids). The members of Trentepohliaceae also develop a large amount of carotenoid pigments, which play a key role in protection from high irradiance.

THERMAL ALGAE

Thermal springs are specialised habitats characterised by high temperature of water and sulphur emission. The thermal aquatic environment provides special situations for studying the distribution of algae in natural temperature gradients. In India, about 130 thermal springs are located so far, which are found in Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Maharashtra, Meghalaya, Odisha, Tripura, Uttarakhand and West Bengal.


Cyanobacterial mat

The average temperature in the core zone of the springs ranges from 50°C to 80°C and exhibit limited algal diversity, which is confined only to certain species of cyanobacteria/blue green algae.

ECONOMIC IMPORTANCE OF ALGAE

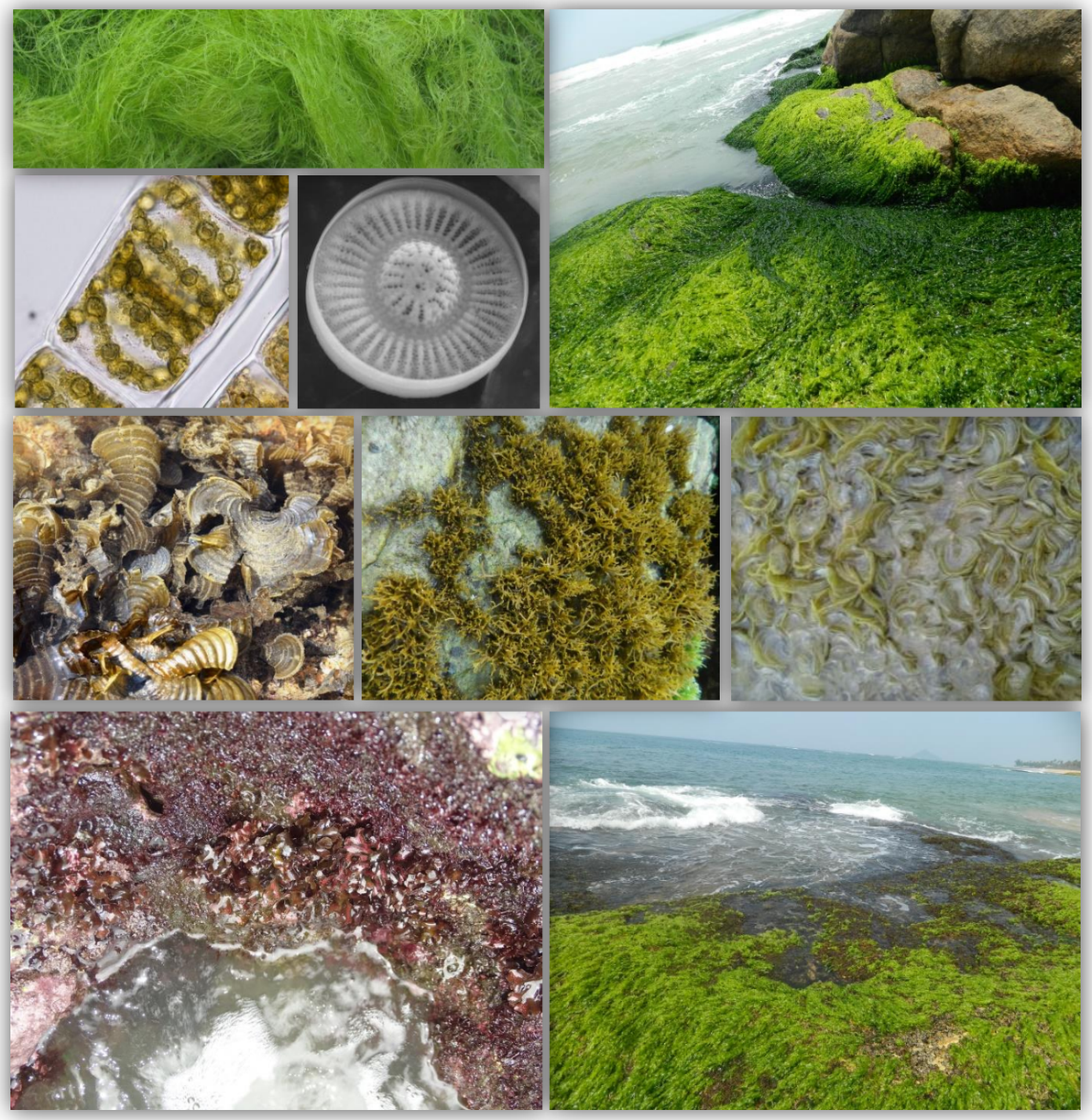
- Seaweeds are consumed as food by humans and animals.
- Blue green algae are nitrogen fixers, thus used as bio-fertilizers.
- Algae are used in treatment of waste water.
- Algae are rich sources of phycocolloids (agar, carrageenan from red algae; alginates from brown algae).
- Algae are sources of bioenergy.
- Many species of algae have nutritional, neutraceutical and pharmaceutical values.

Enquiries
Scientist-in-Charge
ENVIS Resource Partner on Biodiversity
Botanical Survey of India, CNH Building
Howrah – 711 103, West Bengal.
Phone: 033 2668 0667 (O); +91 9433858776 (M)
E-mail: bsi@envis.nic.in; envis@cal2.vsnl.net.in

BSI ENVIS Team
Dr. P. Singh, Director, BSI
Dr. V. Sampath Kumar, Scientist-in-Charge
Dr. S. Gantait, Programme Officer
Mr. T. Chakrabortty, Information Officer
Mr. S. Nandi, IT Officer

Text and Photos: Dr. R.K. Gupta & Dr. S.K. Das, Cryptogamic Section, BSI, Howrah; Dr. M. Palanisamy & Dr. S.K. Yadav, Southern Regional Centre, BSI, Coimbatore and Dr. S. Bhakta, Western Regional Centre, BSI, Pune.

Glimpses of Algae in India



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Algae are the simple photosynthetic organisms that lack embryogenesis. They are a ubiquitous group of organisms, comprising microscopic unicellular to gigantic kelps, inhabiting widest range of habitats, from pond to ocean, soil to snow and thermal to polar habitats. To understand the fundamental role in the world's ecosystems, a reliable and modern introduction to their kaleidoscopic diversity and systematics is indispensable. Blue green algae or Cyanophytes (Cyanoprokaryotes) are prokaryotic in nature, lacking any membrane-bound organelles whilst all other algal groups are eukaryotic.

Algae are systematically classified into various groups basing on their pigment composition and reserve food materials. The principal pigments in algae are chlorophyll a, chlorophyll b, β-carotene, xanthophylls and phycobilins. Starch is the important reserve food in all groups of algae. Other associated reserve products are laminarin, mannitol, fats and oils. Reproduction in algae is by vegetative, asexual and sexual modes. Algae reproduce vegetatively by fragmentation, fission and akinete or hormogonia production. Asexual reproduction is by means of formation of zoospore, aplanospore, hypnospore, autospore, auxospore, tetraspore, etc. Sexual reproduction is by union of cytoplasm and nuclear material of two gametes of two organisms of the same species.


Euglenoid bloom in ponds


Algal growth in lentic water body


Luxuriant growth of green seaweed


Algae on bark of tree

Taxonomically, algae are classified into 11 groups namely Cyanophyceae, Xanthophyceae, Cryptophyceae, Chrysophyceae, Dinophyceae, Bacillariophyceae, Euglenophyceae, Chlorophyceae, Chloromonadineae, Phaeophyceae and Rhodophyceae (Fritsch, 1935, 1945). In India, more than 7300 algal taxa belonging to 741 genera in 206 families have been recorded and described so far. Algae show a habitat specificity in their mode of occurrence, which is inferred by the restriction of certain organisms to their specific habitats. The algal diversity is briefly presented here in three broad categories, viz., freshwater algae, marine algae and terrestrial algae. Besides, information on thermal algae, (a specialised group of algae) growing in thermal springs of India is presented. Freshwater taxa are the dominant ones in the total algal biota of the country (approx. 67%), followed by marine (22%) and terrestrial (11%) taxa.

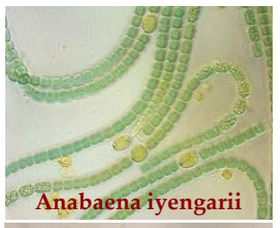
FRESHWATER ALGAE

Fresh water composes 3.9% of global water. Freshwater environments can be grouped into stagnant waters (lentic systems, including ponds, lakes, marshes, and other enclosed water bodies) and flowing waters (lotic systems: rivers, streams, canals and waterfalls). The phyco-biotic components in both ecosystems are regulated by nutrients, carbon availability and limnological parameters. Sometimes eutrophic conditions in different lentic water bodies instigate the formation of a thick layer blue green algal biomass on the surface of the water body called 'bloom', which has several adverse environmental impacts. The freshwater algal populations are belonging to all groups of algae other than Phaeophyceae and Rhodophyceae, though a few freshwater forms of the latter have also been recorded. The freshwater algal forms are either planktonic or attached (epiphytic, epilithic, epizoic) or benthic in their occurrences.

In India, about 67% of the algal population are found in freshwater habitats. Among them, the green algae (Chlorophyceae) are the most diverse group with different morphological forms, viz., unicellular, colonial and filamentous. Many conjugating green algae, i.e., desmids, are important ecological indicators of the trophic status of the water bodies. Except a few marine


Aphanothece elebans


Oscillatoria limosa

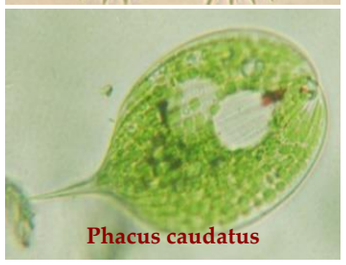

Anabaena iyengarii


Xanthidium superbum var. centricornis


Ecballocystopsis himalayensis


Volvox carteri


Micrasterias radians


Phacus caudatus

forms, most of the euglenoids (Euglenophyceae) are confined to freshwater habitats. Yellow green algae (Xanthophyceae) and silica-bearing algae, viz., Bacillariophyceae, Dinophyceae and Chrysophyceae are also important components of this ecosystem.

MARINE ALGAE

India has a coastline of 7516.6 km, which harbours several groups of marine algae including microscopic phytoplankton and macroscopic seaweeds, which live on seashores, rock pools, shallow waters of seas, etc. Marine macro algae, popularly known as seaweeds with significant features such as basal disk, called a holdfast, and a frond of varying length, shape and colour which often resemble a plant in having stem-like and leaf-like parts. They mostly belong to Brown (Phaeophyceae), Red (Rhodophyceae) and Green (Chlorophyceae) algae. Brown seaweeds are usually large (e.g., giant kelps). Red seaweeds generally range from a few centimetres to about a metre in length; however, red seaweeds are not always red, they are sometimes purple, or even brownish red. The size of Green seaweeds is similar to that of red seaweeds. Monsoon and post-monsoon seasons influence the composition and abundance of seaweeds.


Boergesenia forbesii


Caulerpa racemosa


Chondracanthus acicularis


Chnoospora bicanaliculata

In India, a total of 865 species of seaweeds, belonging to 247 genera have been reported so far. These seaweeds comprise of 442 species of Rhodophyceae belonging to 151 genera; 212 species of Chlorophyceae belonging to 46 genera; 211 species of Phaeophyceae belonging to 50 genera. Seaweeds are at the base of the marine food chain. The monitoring of seaweeds is important while assessing the environmental status of biodiversity of marine ecosystems, which support a large number of flora and fauna.

TERRESTRIAL ALGAE

Algal colonization is also found on different aeroterrestrial habitats such as stone surfaces, soil crusts, building facades and tree barks. The algal mat on such habitats mostly composed of coccal or filamentous blue green algae as well as filamentous green algal members of the families Trentepohliaceae and Vaucheriaceae. They usually form patches in green, blue-green and blackish colour but sometimes in other colours also. They exhibit several desiccation