

# Freshwater Phytoplankton ID SHEET

## TARGET ALGAE



### Aphanizomenon spp.



Credit: GreenWater Laboratories/CyanoLab

#### Notes about Aphanizomenon:

Toxin: Saxitoxin                      N-fixation: Yes  
Cyanophyta – Cyanophyceae – Nostocales  
4 described species

Trichomes solitary or gathered in small or large fascicles (clusters) with trichomes arranged in parallel layers.



### Dolichospermum spp.



Credit: GreenWater Laboratories/CyanoLab

### Dolichospermum spp.

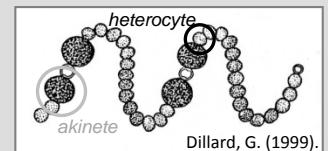


Credit: GreenWater Laboratories/CyanoLab

#### Notes about Dolichospermum

Toxin: Anatoxin-a                      N-fixation: Yes  
Cyanophyta – Cyanophyceae – Nostocales  
More than 80 known species

Trichomes are straight, curved or coiled, in some species with mucilaginous colorless envelopes, mat forming.



### Raphidiopsis spp.

Straight morphotype



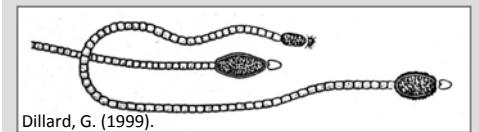
### Raphidiopsis spp.

Curved morphotype

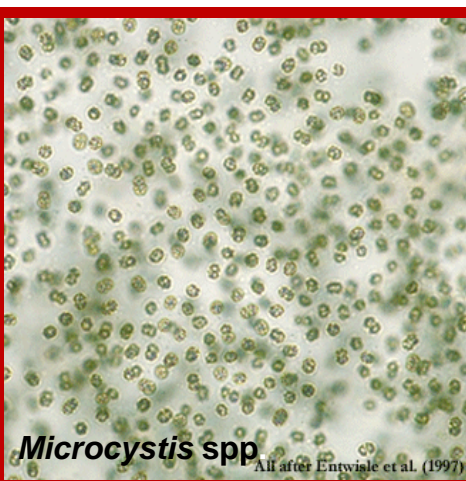
#### Notes about Raphidiopsis:

Toxin: Cylindrospermopsin                      N-fixation: Yes  
Cyanophyta – Cyanophyceae – Nostocales  
Around 10 known species

Trichomes are straight, bent or spirally coiled. Cells are cylindrical or barrel-shaped pale blue-green or yellowish, with aerotypes. Heterocytes and akinetes are terminal.



### Microcystis spp.

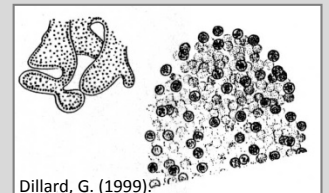


### Microcystis spp.

#### Notes about Microcystis:

Toxin: Microcystin                      N-fixation: No  
Cyanophyta – Cyanophyceae – Chroococcales  
Around 25 known species

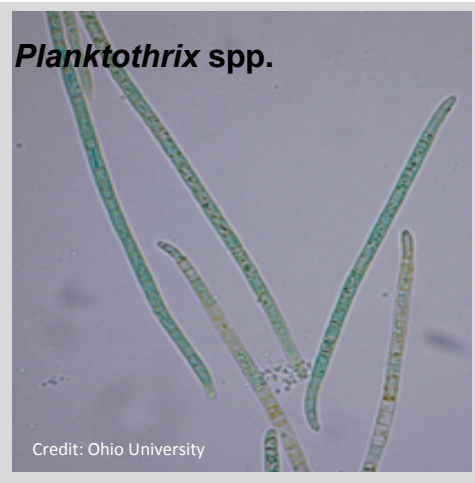
Colonies are irregular, cloud-like with hollow spaces and sometimes with a well developed outer margin. Cells are spherical with may aerotypes.



## Planktothrix spp.



## Planktothrix spp.



### Notes about Planktothrix:

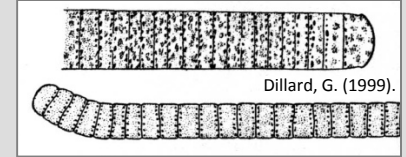
Toxin: Microcystins      N-fixation: No

Marine version: Trichodesmium

Cyanophyta – Cyanophyceae – Oscillatoriales

More than 70 known species

Trichomes cylindrical, straight or slightly waved, motile with gliding oscillations.



### Terminology:

**Akinete(s)** - thick-walled resting spore, full of reserve material, which enable the alga to survive periods when environmental conditions are not favorable to growth

**Heterocyte(s)** - special cell with thick several layered cell wall, active in nitrogen fixation

**Trichome(s)** - a filament (row) of cells, which are connected

Reference: Cronberg, G., and H. Annadotter. 2006. Manual on Aquatic Cyanobacteria. A photo guide and synopsis of their toxicology. ISSHA, Copenhagen, Denmark.

### Nitrogen Fixation:

Nitrogen is an essential component in the synthesis of the aerotopes. A deficit of nitrogen may not only affect cell metabolism negatively, but also the buoyancy of the organism. Cyanobacteria can make use of nitrogen as: nitrate, nitrite or ammonium. Some species are also able to perform nitrogen fixation of atmospheric nitrogen ( $N_2$ ). Order of preference is ammonium > nitrate >  $N_2$ .

Nitrogen-fixation occurs inside a special transformed, vegetative cell, the heterocyte. Heterocytes are thick-walled. The nitrogen-fixing enzyme complex, nitrogenase, is functioning inside the heterocyte. Nitrogenase is inactivated by oxygen, and the heterocytes provide protection by enhanced respiration, and by the barrier of the heterocyte envelope.

During periods when environmental sources of combined inorganic nitrogen have been depleted, the nitrogen-fixing cyanobacteria become most competitive. The common distributed freshwater genera that can fix nitrogen are the heterocyte-bearing, filamentous members of the Nostocales: Anabaena, Anabaenopsis, Aphanizomenon, Cyndrospermopsis and Gloeotrichia. Trichodesmium and Richelia are nitrogen fixing marine genera.