Iowa Science Teachers Journal

Volume 15 | Number 3 Article 8

1978

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Introduction

The three dominant groups of algae found in Iowa are Chlorophyta (green algae), Cyanophyta (blue-green algae), and Chrysophyta (golden-brown algae). The golden-brown algae is composed of a variety of species called diatoms. This is the first in a series of articles on Iowa diatoms.

Unlike most other plant species which have cell walls of cellulose, diatoms have siliceous cell walls constructed of two overlapping valves which fit together like the lids of Petri dishes. These walls are ornamented with fine ridges, lines and pores that are characteristic for each species. Although the contents of the cells decompose readily the cell walls are very resistant to degradation. The cell walls form the basis for most biological studies involving the identification and occurrence of diatoms. Diatoms store their excess food reserves as oils and it is believed that prehistoric diatoms may have contributed significantly to the existing petroleum reserves of the world.

During Tertiary and Quaternary times, the production of diatoms was so prolific that large deposits of cell walls were formed on the ocean floor. Today the largest of these deposits are mined commercially and, when processed, are used in industrial filtration, paint and varnish fillers, metal polishes, automobile polishes, bleaching powders, sugar refining and in industrial insulators where excessively high temperatures are involved. Alfred Nobel used diatomaceous earth as an absorbent for nitroglycerin in the production of dynamite. An interesting class activity can involve the investigation of different metal and car polishes or bleaching powders to determine which products contain the shells of diatoms.

Collecting

The first step in the study of diatoms is to collect them. Diatoms can be collected in a variety of places, the most common denominator is aquatic habitats. Some diatoms grow on the stems and leaves of aquatic plants and are called *epiphytic* diatoms. Others are *planktonic*. A third major group is *benthic* and is found growing on the substrates of aquatic communities. Some diatoms are terrestrial, but they are not discussed in this paper. Dominant species will vary with the type of habitat and sampling method used in collecting them. Listed below are some different techniques used in collecting different types of diatoms.

1. Epiphytic diatoms can be collected by squeezing aquatic plants in one's hand over a collecting pan. The fluid collected is placed in vials or small jars.

2. Benthic diatoms may be collected by scraping rocks or sticks. Benthic diatoms can also be collected by carefully removing a sample of diatoms from the bottom of an aquatic community and pipetting the brown, silky growth (often accompanied by air bubbles) from the surface of the mud. The diatoms collected in this manner may be transferred to vials for study in the laboratory. Benthic diatoms can also be obtained by core sampling sediments. Special research coring devices may be obtained from biological supply houses or soil samplers may be used. The coring technique makes separation of the diatoms from the sample very difficult. Diatoms may also be collected by scraping the glass sides of aquaria or sampling the sediments at the bottom of aquaria.

3. Planktonic diatoms can be collected by using a diatometer or a plankton net.* The diatometer method involves the removal of the bottom from a wooden slide box, placing clean slides in the box and suspending the box of slides beneath the water surface of a lake or stream so that the slides are held in a vertical position (10). The box should be suspended about 14 days. The diatoms will settle and grow on the plain glass slides. The diatoms collected by the diatometer may be stored on slides or the diatoms may be scraped from slides and stored in vials. If a plankton net is used to collect diatoms the net should have a mesh of 210 strands to the inch.

Regardless of the source, all samples should be labeled with the date, location and sample number. Any notes concerning the physical or biological parameters of the collecting site should also be included. When using the diatometer, record the depth at which the diatometer is placed below the water level. All samples should be temporarily stored in small vials or jars.

Discussion

Much valuable information can be obtained from the collection of diatoms. Some diatoms prefer cool-water. In general cool-water diatoms have a maximum temperature tolerance of 55° F and are affected by thermal pollution. Cool-water diatoms are important in the food webs of many aquatic communities. If the water temperature remains much above 55° F, a water flea (which can withstand a water

*Plankton nets may be obtained from Turtox/Cambosco, 8200 South Hoyne Ave., Chicago, Ill. 60620.

temperature of 95° F) would starve to death if it depended upon cool-water diatoms for its food source. In turn, other organisms feeding on these microcrustaceans would also be affected.

Diatoms, like many other aquatic organisms, are sensitive to changes in the chemical and physical parameters of their aquatic habitats. Core samplings of the sediments of midwest lakes suggest that diatom diversity was affected when pioneers settled the midwest. Pollution of water by agricultural runoff, erosion and waste disposal affected the distribution and occurrence of many epiphytic species.

Some biologists speculate that these changes may have occurred due to massive blooms of blue-green algae or to massive blooms of planktonic diatoms or to increased turbidity causing shading (1). Due to such factors, species of diatoms that occur only in the spring apparently become more abundant than those occurring in late summer or fall. In undisturbed environments species occurring in the spring, summer and fall are present in relatively uniform numbers. Presently, only in shallow lakes are heavy populations of summer and fall diatoms observed.

In general, diatoms can be useful indicators in assessing man's impact on the environment. Now that you know of the importance of diatoms and the techniques used in collecting them, you will now need to know how to prepare them for study. Preparation for study will be the topic of the next article in this series.

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