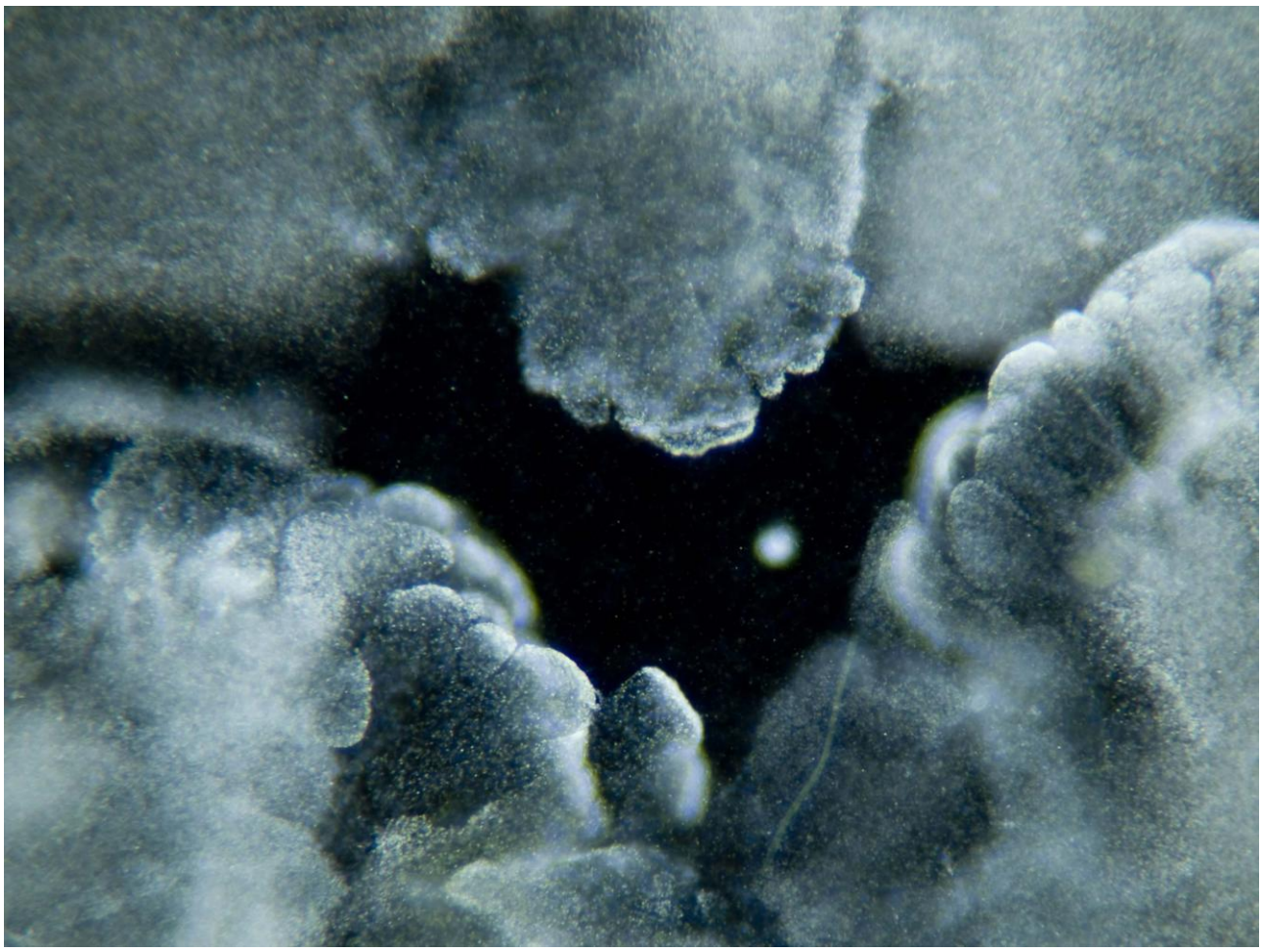
BioMEDIA ASSOCIATES LLC
HIDDEN BIODIVERSITY Series
Microorganisms in Polluted Waters

Study Guide Written and Photographed by Rubén Duro Pérez

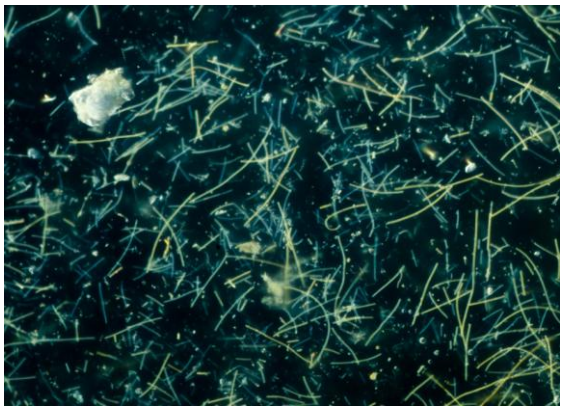
Supplement to Video Program

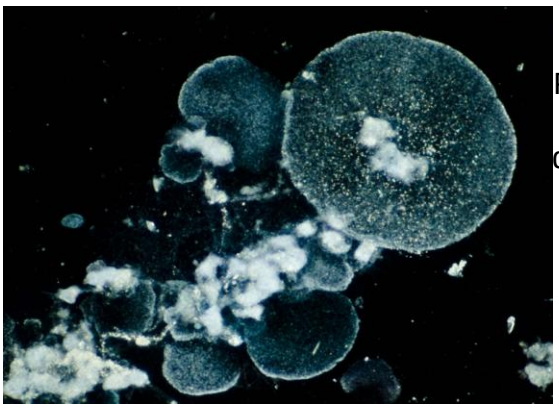


Water contains many dissolved substances (solutes) and particulates. Water is often thought of as the universal solvent. Pure water is rarely found in nature. Unwanted solutes and particulates are considered to be contaminants. The words “contaminants” and “pollutants” imply something bad but they should not be universally condemned since they may contribute to the microorganic food chain.

Purification processes mediated by microorganisms are present in natural bodies of water. If the rate of purification exceeds the rate of new pollution the water will become cleaner.

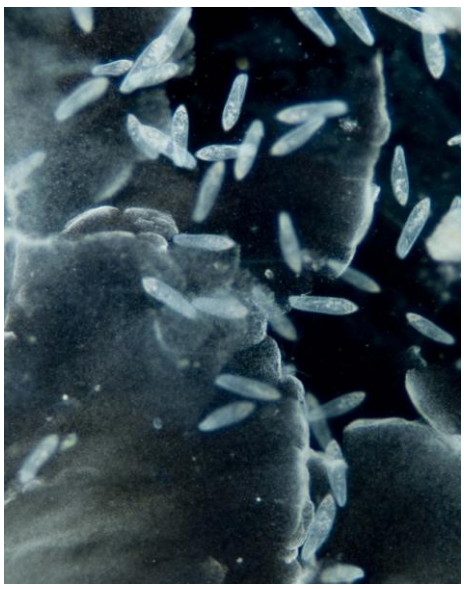
Bacteria are the first organisms “attacking” the organic matter that contaminates the water (sometimes also inorganic matter).





Populations of bacteria degrade organic matter dissolved in the water to turn it into carbon dioxide, water and mineral salts. Thus, bacteria constitute a first front of water purification.

In addition, bacteria give rise to the establishment of a complex trophic network, as they are the main food of large numbers of microorganisms. The activity of these bacteria-eating microorganisms is what completes the process of water purification.

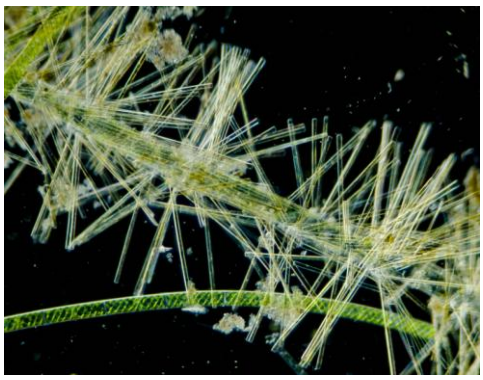


Some questions:

Why do you think that all water in the wild is always polluted in some extent? Could

you explain in your own words the concept of "self-purification of water"?

Because the level of contamination varies from one body of water to the next, at each location a specific list of characteristics is given. Local ecosystems differ among bodies of water with little dissolved or suspended organic matter and those more heavily polluted.



Scientists have studied these different aquatic environments and found that communities living in them are different according to the amount of pollution. So they created the term "saprobic" to refer to organisms closely related to the level of water pollution.

Among the most important saprobic organisms are those that feed on the bacteria that carry out the process of self-purification of water, especially ciliates and rotifers.

Some questions:

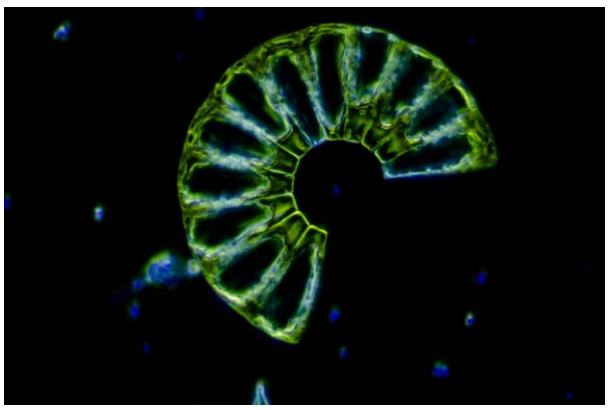
How are communities that inhabit the waters with different levels of pollution different?

Why do rotifers and ciliates stand out among the set of saprobic organisms?

Because each group of saprobes is optimally suited to particular levels of water pollution, scientists have selected target organisms and given them the name of "bio-indicator organisms". The presence of one or more of these organisms reveals the level of pollution of the water in which they live, and is a relatively simple method to determine the environmental quality of aquatic ecosystems.

Rotifers from the *Rotaria neptunia* species are bio-indicators of water with high organic pollution.

The diatom *Meridion circulare* is a bio-indicator of very clean water with little organic pollution.



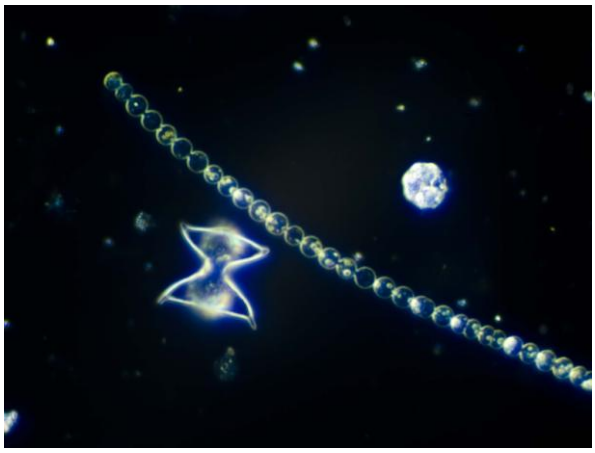
The presence of a single species of bio-indicator organism in the water cannot determine exactly the level of pollution. To do that requires the presence of a number of indicator species for the same environmental conditions.

Some questions:

What is the defining characteristic of a bio-indicator organism?

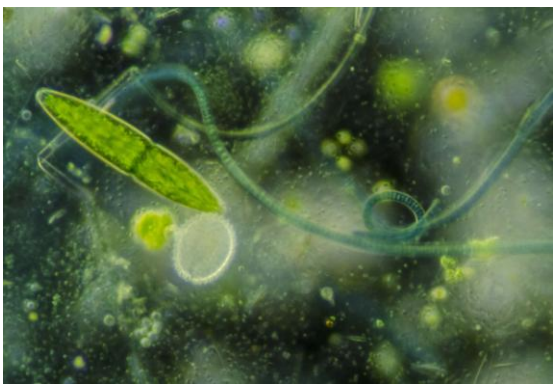
Why do you think that the presence of a single species of bio-indicator organism is not sufficient to determine the quality of a mass of water?

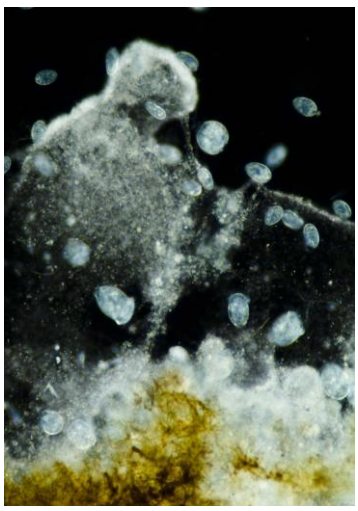
Based on the presence of bio-indicator organisms it is possible to define three different types of water: oligosaprobic waters, mesosaprobic waters and polisaprobic waters.



Oligosaprobic waters are those with very little organic pollution. Because of this shortage of organic substances these waters are home for few species of living organisms. Fresh water springs and high mountain streams belong to this group.

Mesosaprobic waters have medium levels of organic pollution. The organic matter allows the establishment of a rich community of organisms. These waters are the richest in species. Most lakes and ponds, as well as many rivers belong to this group.





Polisaprobic waters are those with a high level of organic pollution. These waters are almost empty of dissolved oxygen and usually give off a nasty smell. The most abundant organisms in these waters are bacteria whose large populations make life difficult for other species. Wastewater and even the water remaining in the flower vases belong to this group.

Some questions:

In which of the three types of water can you find a greatest diversity of microscopic organisms? Why?

What kind of water do you think is the water you drink?

Kingfisher *(Alcedo atthis)*

Grey wagtail *(Motacilla cinerea)*

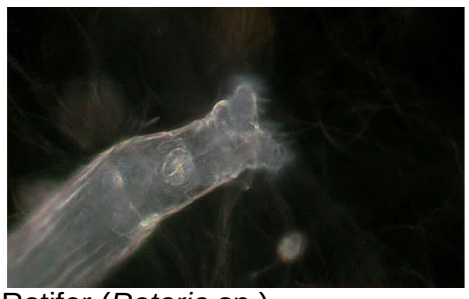
Ciliates (*Colpìdium* sp.)

Ciliate (*Stentor* sp.)

Ciliate (*Carchesium* sp.)

Diatoms

eliozoo (*Actinophris* sp.)



Rotifer (*Rotaria* sp.)

Ciliate (*Paramecium* sp.)