

EXAMINATION OF THE SURFACE MICROLAYER OF LAKE MICHIGAN USING SCANNING ELECTRON MICROSCOPY

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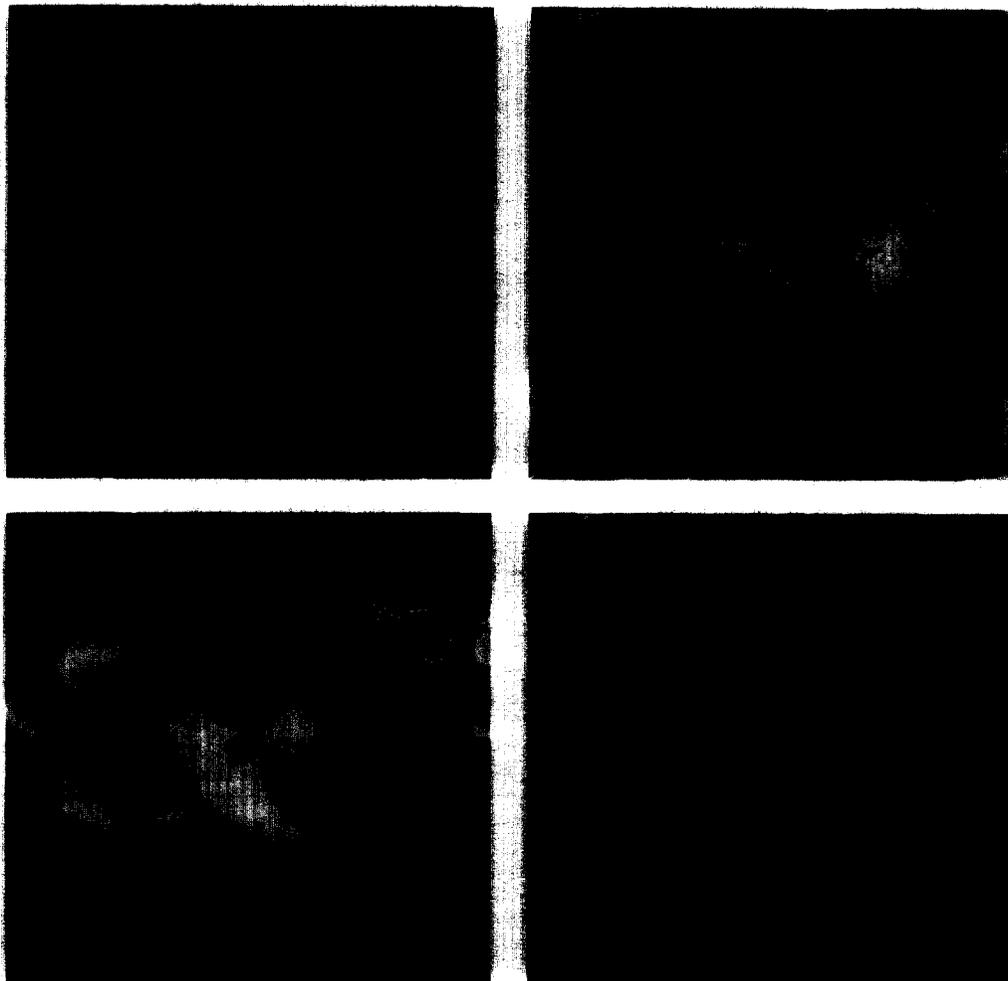
The top 280  $\mu\text{m}$  of water from Lake Michigan was studied in order to determine the types of particles and organisms present in the surface microlayer. The microlayer was sampled by dipping an aluminum screen into the water horizontal to the surface at stations located in Southern and Northern Lake Michigan. Surface microlayer and corresponding subsurface samples were collected in April and July, 1980.

After collection, the samples were immediately filtered onto 0.2  $\mu\text{m}$  and 0.8  $\mu\text{m}$  Nuclepore filters and fixed with 1% paraformaldehyde, 1% glutaraldehyde, and 0.5 M sodium cacodylate. The filters were dehydrated in alcohol, critical point dried, and coated with gold. Upon examination of the samples with an ISI Mini-SEM, the types of particles and organisms present were recorded. Segments of the samples were randomly photographed and then enumerated according to the following categories: bacteria, algae or miscellaneous. The miscellaneous category included diatom fragments, large and small particles, both organic and inorganic in nature, and organisms that were either unidentifiable or uncommon in the samples. Cell or particle numbers and the mean percent of total composition for each of the categories were determined.

In both April and July, bacteria were the dominant organisms in the microlayer. There was little variation in actual bacterial numbers (cells/ml) between the sets of samples. However, there was a difference in the mean percent composition. Bacteria represented from 76 to 90% of the total composition in April, whereas in July, 65 to 84% were bacteria. Algae represented a higher percentage of the total composition in the April microlayer, while in July, a higher percentage of miscellaneous particles was present. This trend was also apparent when samples collected at the same station in April and July were compared. Comparison of the samples collected on 0.2  $\mu\text{m}$  and 0.8  $\mu\text{m}$  filters showed little variation of the contents and bacterial numbers were quite similar.

Microlayer and subsurface samples collected in April were compared and the microlayer showed a somewhat greater diversity of organisms. Common diatoms in the microlayer and the subsurface were *Tabellaria*, *Fragilaria*, *Cyclotella* and *Stephanodiscus*. However, *Asterionella*, *Rhizosolenia* and several other diatoms were more common in the microlayer. Flagellates and blue-greens also appeared to be more common in the microlayer. Microlayer samples in July showed a higher concentration of miscellaneous particles when compared to subsurface samples.

These results are in agreement with other studies in which a high microbial concentration has been found in microlayers of both fresh and salt water. It is also suggested from this study that algae and particulates may be more concentrated in the microlayer as compared to subsurface waters. Supported by Michigan Sea Grant, National Oceanographic and Atmospheric Administration Grant NA-80AA-D-0072, Project R/TS-12.



FIGS. 1-4. Organisms and particles present in the microlayer of Lake Michigan.

FIG. 1. Typical size and shape of bacteria indicative of both April and July microlayer samples.

FIG. 2. April microlayer sample on 0.8 µm filter. *Tabellaria* (T) and *Fragilaria* (F) are the diatoms present along with large amounts of particulate matter (P).

FIG. 3. July microlayer sample on 0.2 µm filter. Fragments of the diatom *Stephanodiscus* (S) and various types of particles (P) are present. Bacteria are also evident in the background.

FIG. 4. *Pediastrum*, a common colonial green alga in the July microlayer.