Life Beneath the Surface

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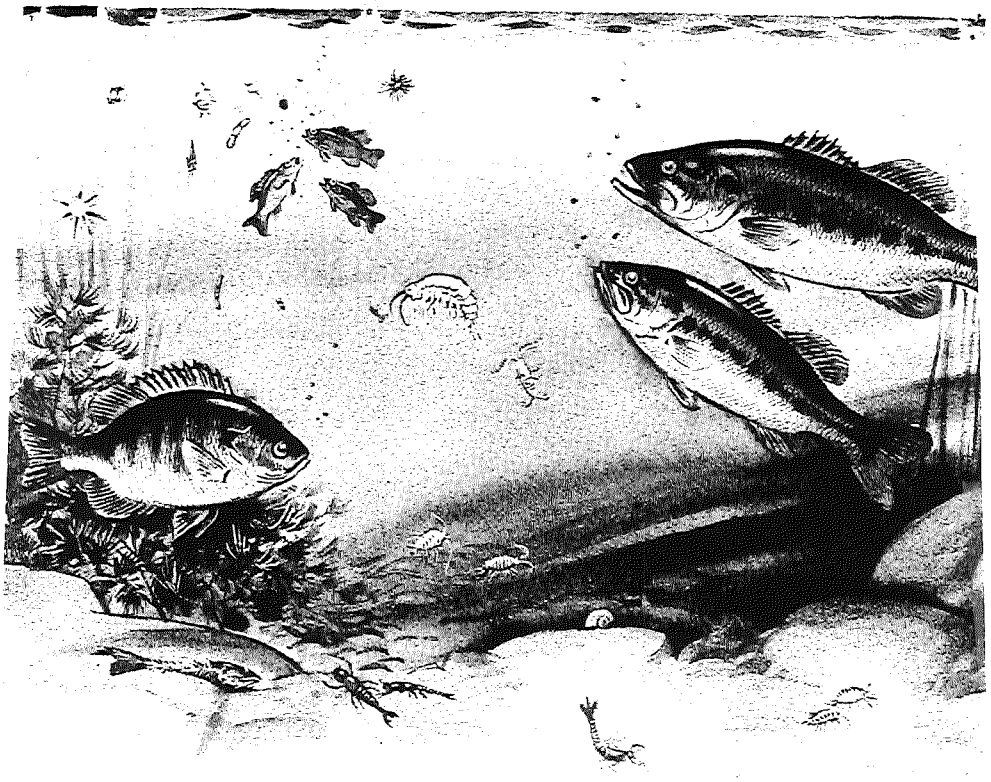

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Life beneath the surface of a lake is as diverse as life upon the land, and fishery management depends upon an understanding of this aquatic environment

By ROBERT T. LACKEY
and JAMES R. ZUBOY

FISHERIES management is concerned with producing the best possible fishing experience. Ever wondered how such a worthwhile goal is achieved? Certainly, the fisheries manager must work directly with fish, but he must also look at other parts of the aquatic environment.

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Life beneath the surface of a lake is as diverse as life on land. Plants and animals grow, reproduce and die; most are rarely noticed by man. Just as the wildlife manager must understand and manipulate the terrestrial environment to achieve optimum game harvest, the fisheries manager must work in a similar manner with the aquatic environment.

Of the aquatic environments, lakes and reservoirs provide the most recreation. Lakes and reservoirs also provide the fisheries manager with one of his greatest challenges.

PLANTS

Life beneath the lake surface can be divided into two classes: the plants and the animals. *Phytoplankters,* tiny plants that float in the upper layer of lakes, are usually the most important plants to the fisheries manager. Like most plants, they carry on photosynthesis to store the sun's energy. This is the first level of life in lakes, the level at which energy is stored to *power* the living lake. To fish, phytoplankters are the first part of a food chain. Small animals eat phytoplankters and are in turn eaten by larger animals which are then eaten by fish.

Fisheries managers can have problems when phytoplankton abundance is too high or too low. If for some reason the phytoplankton population becomes very large, a *bloom* develops. During a bloom, green scum gives the water a soupy appearance. When these plants die, they decompose and, in the process, use oxygen required by fish. A fish die-off may occur under these circumstances and is called a *summerkill.* One solution to this problem is for the fisheries manager to chemically treat before phytoplankton populations explode.

Low phytoplankton levels also cause problems for the manager. If the phytoplankton level is low, the lake cannot support as many fish as it might at higher phytoplankton levels. One solution is to fertilize just as a farmer fertilizes his crops. By increasing the initial link in the food chain, we may ultimately increase the final link — fish.

Rooted aquatic plants are also important in a lake. These plants flourish in coves and shallow water where their roots can get a good hold. Rooted plants, like phytoplankton, carry on photosynthesis which adds energy to the lake.

Rooted plants are often important in providing good fishing. First, weed beds are good habitat for young game fish and small forage species. Game fish can cruise these weedy areas in search of prey. Secondly, weed beds provide some fish with protection from predators during the reproductive season. Perhaps most important, rooted aquatic plants shelter a rich assortment of small animals which serve as fish food.

Rooted aquatic plants can cause the fisheries manager problems. Overabundance makes angling a frustrating chore. Rooted aquatic plants also compete with phytoplankton for sunlight and nutrients. Since phytoplankton are more important in the aquatic food chain, this competition is bad for fish production. Overabundance of rooted plants is often associated with super-rich (eutrophic) lakes that support mainly rough fish, like suckers and bullheads.

Control of rooted aquatics can be achieved by chemicals or water level manipulation. Chemical control is limited to smaller lakes and ponds because of the high cost involved. Water level manipulation can be used to retard plant growth, but is not always possible.

Underabundance of rooted aquatic plants is a less common fisheries management problem. Providing additional habitat is usually the solution here. Brush piles are sometimes added to heavily fished lakes to concentrate fish. Artificial reefs of old tires,

commonly used in saltwater fisheries management, also show some promise for improving lake habitat.

ANIMALS

Zooplankters, tiny organisms that drift with the currents, are the most abundant animals in lakes. They feed on phytoplankters and small zooplankters. The importance of zooplankton is their role of *transferring* the solar energy phytoplankton have captured to the animal community. Young fish are dependent on zooplankton for their food supply, but managing zooplankton to improve fishing is very difficult. The best approach is to maintain good water quality and adequate food.

Bottom animals, termed *benthos,* live in and on the floor of lakes. Benthos include worms, crayfish, sowbugs, and a large variety of insect larvae. Most common of the benthos are the larvel stages of midge flies. Benthic organisms eat a variety of foods, including bacteria, phytoplankton, zooplankton and decaying organic material.

Most fish prey heavily on benthic animals. In fact, many adult game fish are totally dependent to these animals for food. Benthos perform another important service to a lake, that of recycling organic materials by eating dead plants and animals. This activity also prevents excess accumulation of biological debris in lakes.

Even though benthic animals are important to fish, there is little specific management that can be implemented. Occasionally exotic species such as aquatic sowbugs have been introduced to increase available fish food, but this is not a common approach.

Of all the animals inhabiting lakes, *fish* are the largest and most impressive. They have been pursued by man for food and sport for at least 7,000 years. Yet only a relatively small number of fish species are actively sought by man.

Fish are the most common of all vertebrates (animals with a backbone), in fact, there are probably more species of fish than of all other vertebrates combined.

Within a lake each species of fish lives in a manner and location that suits its particular requirements. These requirements vary from species to species and over the lifetime of an individual fish. Some species prefer the quiet of weed beds, while others thrive in deep, clear water.

Food to a fish may be nearly anything that can be swallowed. Some fishes, like the shad and alewife, are mainly plankton feeders. At the other extreme are the northern pike and muskellunge, which prey almost exclusively on other fish.

Next time you are fishing at your favorite lake, look closely at the water. You may be able to see phytoplankton and zooplankton. Pick up a submerged rock or stick and look for benthos. And look at your catch to see the end-product from life beneath the surface.

About the Author:

Dr. Bob Lackey is professor of fisheries science at Oregon State University. In 2008, he retired after 27 years with the Environmental Protection Agency's national research laboratory in Corvallis where he served as Deputy Director among other senior science and management jobs. Since his very first fisheries job mucking out raceways in a California trout hatchery, he has worked on an assortment of natural resource issues from various positions in government and academia. His professional assignments involved diverse aspects of natural resource management, but mostly he has operated at the interface between science and policy. He has published over 100 articles in scientific journals. Dr. Lackey has long been an educator, having taught at five North American universities and continues to teach a graduate course in ecological policy. Canadian by birth, he is now a U.S.-Canadian dual-citizen living in Corvallis, Oregon.