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Tenderfoot's Fish Sampling Program

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For a thorough quantitative and qualitative survey of the fish population in Tenderfoot Lake, the first step is to determine the lake's relief; where the deep and shallow spots lie and the presence or absence (and whereabouts) of the hypolimnion and epilimnion layers of the lake. This data could be obtained by taking oxygen and temperature readings (at meter intervals descending vertically till one hit bottom) at different locations in the lake, and is necessary for planning what kind of nets to use and where to set them. The oxygen readings would also clue one into whether adequate oxygen is available for the fish.

Another preliminary task is to delve into the lake's past. Has it a history of good fishing for a particular kind of fish? Has it ever been overfished? Was it ever stocked with a certain type of fish? This kind of information is needed later as a part of the whole picture when the productivity is evaluated.

Good point

The lake's water chemistry plays an important part in defining what organisms will live there. Water samples should be taken from both the hypolimnion and epilimnion levels in the lake and tested for alkalinity, acidity, and pH (some fish have low tolerance levels for acidity), the nitrate and phosphate

levels (needed nutrients for phytoplankton, they indicate the lake's productivity), and the water hardness.

An AM and PM plankton tow and count should be done for three reasons. First, to get an insight into the lake's productivity - what kinds and types of microscopic organisms live there and in what quantities. Second, plankton constitute the bottom of the food chain and larger organisms depend on them either directly or indirectly for food. Third, the plankton tow may help explain oxygen level measurements. For instance, if a high oxygen reading had been observed, a large phytoplankton population at that depth would account for the data. (Good point!)

In addition, Tenderfoot's macroinvertebrates should be looked at as both possible food sources for and/or predators on the fish.

If all the kinds of fish in the lake are not known, the best method for catching a representative sample population is that of using several different kinds of gear.

Maze nets lead the fish into the middle of the net or trap and once in, the fish can't get back out. Fyke nets and pot gear (minnow traps, for instance) are kinds of maze nets that should be used in the shallows of Tenderfoot Lake. The way to set a minnow

trap is to place a piece of bread in one end, then fit the two halves of trap together to form a "cage". The line attaching to the top of the trap allows it to be lowered vertically down to a shallow level in the water where small fish may be swimming. The hoop net, a type of fyke net, is used for larger fish than is the minnow trap but also is set in shallow (water) locations. To set it, one drives tall stakes (which support the successive "rings" of the hoop net) into the lake's bottom. The open end of the net in near the deeper water and the net is stretched back (backwards) and secured by the stakes (and leads to the shallower water). The mesh size of the net determines the minimum size of fish able to be caught, since the smaller fish may be able to slip through the mesh. If a big mesh size is the only size used, one may have difficulty evaluating the condition of and quantity of small fish in the lake (or those which are very young fish).

Gill nets rely on some sort of movement from the fish for their snaring action. The fish goes through as far as it can, then as the widest part of its body gets stuck, it can't go backwards because its gills get caught. As noted before, the mesh size of the net to use is important and depends on the size of fish one wants.

In the case of Tenderfoot Lake, the graduated mesh net should be used since a sample of all the sizes of fish available are desired. A small-mesh net could also be set on the surface and a large-mesh one used as a deep net to try all possibilities for fishing. The graduated mesh size net is composed of a long lengthwise net with the mesh size at one end very small (for catching tiny fish) and then increasing in mesh size (for larger fish) as the other end of the net is reached. Some gill nets should be set on the surface by attaching weights to both ends of the net and floats at intervals along the entire top edge of the net to keep it near the surface. The smaller mesh end of the net should be the end set closer to shore, and the net should be set in as straight a line as possible, aiming for deeper water with the larger-mesh end. The light line running along the top edge of the net should be the one attached to the surface floats and the heavy lead line should run along the entire horizontal edge of the set net. The weights at both ends of the net are necessary for anchoring the net in place and to keep it untangled and stretched out. Deep gill nets should also be set. These are used to catch fish swimming

in the lower regions of the lake. They are set in the same manner as the surface gill nets except that no floats are attached along the upper line of the net. Instead, ~~the~~ weights drag the net to the depths and only two floats, one at either end, mark the location of the net and keep the upper line of the net somewhat taut.

Both the maze nets and the gill nets should be checked for fish frequently. (The fish in the maze nets will be alive, but the ones in the gill nets may be dead from suffocation).

The gill nets are a little more difficult to check for fish since they must be hauled up arm length by arm length in order to see the entire mesh area and then redropped (in a straight line and tangle-free) back into the water. The entire length of the net must be checked starting at one end and ending at the other, carefully removing each fish caught in the net.

A third fish-catching method that could be attempted is seining. A seine is an encircling net which two people may haul through the shallow water between them and at intervals, scoop up the net ends from the water, trapping small fish inside. Another seine may be hauled through the

water by boat. Seining around the edges of Tenderfoot Lake where small fish may live might be useful for catching fish too small for the regular "set" nets.

Once the fish are caught, the data to take from each fish includes: the fork, standard, and total lengths, weight, identification as to species of fish (determined by keying the fish with a reference book), age (ascertained or estimated by examining the scales and counting the number of rings), and gut analysis. All the fish should be kept separately by the location where they were caught until all the data from the fish is recorded and shows what sizes, etc, of the fish were caught where.

Especially important is the relationship between the estimated age, length, and weight of a fish. For each species of fish the average relationship between age, length, and weight should be determined. Both a length-frequency curve and an age-size graph should be plotted in order to see this information more clearly. Each of these graphs and figures next should be compared with Curlander's book on nation-wide fish populations. The pondoral index should be calculated for each species too. This condition factor is equal to the average weight of the fish times 10^5 divided by the average total length cubed. When compared to the literature values

in Carlander, the calculated ponderal index should show how Tenderfoot's fish are sized in relation to other fish in lakes in other places. For instance, do the fish seem to be small for their age? Are they of normal size? Does the weight compare well with other fish's weights of the same age?

Next, if one researches into what things the fish species found normally eat, compares this information to the total list of what was found in the stomachs of the fish during gut analysis, and also refers to the plankton count of Tenderfoot, a pretty good idea of what is available for the fish to eat and what they <u>are</u> eating will be obtained.

At this point, the water chemistry data from analysis of the Tenderfoot water samples should be taken into account. It may help explain some of the facts just discovered about Tenderfoot's fish population if it is not in good shape. If the lake is very acidic, the fish with low tolerance to acid (such as bass) would do poorly, for instance. The nitrate and phosphate levels are indicative of the productivity of Tenderfoot. If these essential nutrient levels are low, the whole Tenderfoot aquatic population will be adversely affected. Oxygen levels, also, must be

adequate, etc.

Further, the history of the lake matters. If overfished in the past, Tenderfoot may just now be recovering from a low point in quantity of a particular species of fish.

Finally, competition between fish species should be considered. If fish of one species are found that appear small for their age perhaps another species is out-competing them for available food or nesting sites. As an example, the Bergner Lake shiners were competing with the bass there, both for food and were possibly laying eggs in the bass nests.

Thus, all the data gathered should be analyzed as a complete picture of the lake's fish population. Statements about the types and quantities of fish and their sizes should be able to be made. When the mentioned observations are evaluated, the productivity of Tenderfoot and whether the lake is a good place to live (considering food supply, O_2, and pH levels) should be clearly seen.