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FISH ECOLOGY: TAKE-HOME QUESTION

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Before surveying the fish population of Tenderfoot lake, it would be wise to gather some information about the lakes' immediate past of about ten years. Perhaps the population of sport fish was depleted several years ago by overfishing, or perhaps there was once a fish kill in the lake. This step is not absolutely necessary, but it is often helpful to have some rough idea of the kind of fish to expect when sampling before actually starting. The next, vital step to take would be to determine closely the morphology of the lake. Note inflowing and outflowing creeks (eg. Tenderfoot), marshes, and all drainage areas. Find out what the bottom is like, where the ridges, sills and basins of the lake are, if any. Note areas where littoral vegetation is emergent. *Use chemical data to help in net placement + data interpretation.*

Next, the nets must be chosen, and placed so that a truly representative sample of the total fish population be captured. Several long gill nets should be used primarily. Each net should have a graduated mesh size from very small (minnows and fingerling fish are necessary) to large holes. The nets can be strung at the basin (or basins) of the lake, either anchored to catch bottom fish, or attached to floats to catch the fish in the upper few meters of water. A long gill net should be strung over the shallow sill of the lake (if there is any), if possible in such a way that the net hangs from the water surface to the lake bottom. Obviously, this can only be done in a lake with a shallow enough sill. Fyke nets can be set in drainage areas, especially along any small incoming creeks where fish would be likely to travel, and in the shallower, marshy areas. In the case of a large stream such as Tenderfoot, a gill net might be effectively used at the stream-lake junction.

Shallow areas; marshes and shoreline water, water under docks or in drainage pipes, can be sampled with a seine at the same time the stationary nets are being pulled. Minnow traps can even be set to catch the very small fish. Nets should be pulled twice a day in the morning and in the evening, to give a day and nighttime determination.

The fish should be separated according to day, time, location of net and species. Once all of them are categorized, each fish should be weighed, measured and gutted, the stomachs saved in a separate marked bag for later analysis. Enough fish should be pulled from the lake until it is felt that a most nearly representative sample has been accomplished without disturbing the balance of the lake. It must be remembered that a certain selection factor will always bias quantitative analysis of the population; some types and ages of fish simply get caught easier than others. This factor can be minimized by setting different types of nets and traps, but it never wholly disappears.

The analysis of the fish must now begin. Stomach contents for each species at each day, time, and place should be analyzed under a dissecting scope to determine the kind of nutrients the populations have been feeding on. Are they well-fed, or are their stomachs empty? Do fish of the same species in different places in the lake, or at different times of the day, eat the same food? Where are the most productive places in the lake, from the fish's standpoint, and what kind of smaller fish are the larger fish eating? All of these questions can be answered by stomach analysis.

Another parameter to consider is the age-length ratio, or age-weight

ratio of the fish. Aging can be done by scales, and enough fish of each species should be aged so that representatives from each age class are accounted for. A standard book such as the Curlanders used for the UNDERC course should then be used to compare the values for the fish being surveyed with average or optimal values compiled from thousands of fish throughout the world. The books contain another indicator for fish; this is the age-independent "condition factor" which relates length to weight, and gives an optimal unit for most fish species. The condition factor may be calculated from simple length-weight values, and by comparing to the standard, one can tell if a lake population is stunted, average, or above average with respect to general bulk. Often, it may take some ingenuity and knowledge of fish habits to determine just what is causing stunting among a population.

Sampling a fish population in this way can allow one to determine primarily whether or not the fish are in good shape with respect to competition, predation, availability of nutrients, in general, whether that fish is thriving or dying out. Stunting and weight loss will show up in the condition factors, and length-age charts. It will show whether the fish are feeding on the right nutrients; whether the food chain is in balance or not. Predictions can be made about the near future of the lake, for instance, an abundant catch of minnows may indicate a good year ahead for the game fish. Scale aging not only tells the age of a fish, but like a tree, a fish grows a broad ring during a plentiful summer and a narrow ring during a hard summer. Careful observations of scales, therefore, can actually give back information of the state of the fish population several years ago, and the nutrient levels of the lake at that time, information that can be compared with *the levels today.*