

Light is usually a necessity for fish life because aquatic plants, on which some fish feed, depend on light for their growth. In a clear lake light may penetrate to great depths but in a heavily silted glacial lake it may penetrate only a few inches. Food plants grow as poorly in a heavily silted lake as do vegetables under heavy shade. Where the plants are scarce small water animals can find little or no food and the fish feed chiefly on insects that drop into the water near the shore.

The transparency of water to light of different colours and the colour of the water itself may be measured with portable equipment. A rough determination of transparency may be made by suspending a white pie plate or similar-sized object from the end of a calibrated line, lowering it into the water and observing the depth at which the plate is just visible. Unless silt or other non-organic matter is present a low transparency usually indicates high productivity because the heavy growth of microscopic plants in a productive lake reduces the transparency of the water.

The next step of investigation is to study the water itself and the dissolved gases it contains. Chemical factors, dissolved gases particularly, may change quite rapidly after a water sample has been obtained so that immediate chemical analysis is made by the use of a small portable chemical kit carried in the field. The amount of oxygen dissolved in the water is of the same importance to fish as the amount of oxygen in the air is to human beings. Determinations of dissolved oxygen and of other chemical factors of the water are made at various depths so that the portions of the lake suitable for occupancy by game fish of various species may be located. The examination of water is often extended to include an analysis of total dissolved materials, dissolved carbon dioxide, total hardness and other factors.

Plankton, the microscopic plants and animals found in the open waters of lakes at all depths, is the food of practically all young fish and minnows and even of some large fish which can collect it efficiently. Samples of plankton are secured by allowing the water to pass through nets of fine silk or mechanical traps containing silk filters (30,000 openings per square inch) and the tiny creatures retained are preserved for laboratory examination. Shrimps, snails, small clams, immature insects and similar organisms that inhabit the bottom deposits of a lake are also the food of many fish. A box-like dredge, usually six or nine inches square, secures samples of mud from an area of bottom. This mud is washed through a screen and the live animals remaining are preserved for laboratory analysis. The number of animals thus secured from 36 sq. inches of bottom mud may vary from a few to more than 1,000.

Fish for analysis are usually secured through the use of nets or traps or other types of equipment commonly used in the commercial fishing industry. For most purposes gill nets of selected sizes set in a standard manner are used. By operating standard sets of nets under standard conditions it is possible to compare populations of fish in different bodies of water and thus secure information by relating unknown fish populations to those made familiar through previous experience. The fish are measured and weighed, their sex, condition and stomach contents examined, parasites observed and finally a number of scales are removed for use in determining the age and history of the specimen.

The type of information secured for streams is much the same as for lakes. Streams however are somewhat more difficult to deal with because their flow varies, the fish may migrate and the amount of food and shelter for fish is seriously reduced at times. Mountain streams because of their cold water, severe freshets and steep changing rocky beds, offer additional difficulties.