

Some types of observations of fish and their environment cannot be made with conventional limnological equipment. Diving equipment may sometimes be useful. At great depths in cold water with light penetration reduced by silt it has been desirable to use underwater television equipment for extensive observations. The first North American use of such equipment in freshwater fisheries research was made by the limnologists of the Canadian Wildlife Service in Banff National Park in 1952. The closed circuit television system used was designed, built and operated by the National Research Council. Since this pioneer effort there has been a rapid expansion of the use of television in limnological and oceanographic research in several countries.

LABORATORY STUDIES

After the summer field investigations have been completed the laboratory takes over. Plankton samples are examined and the kinds and numbers of organisms enumerated. The weight of these organisms, though slight, is determined and, through a knowledge of the amount of water filtered to obtain the sample, the total numbers and weights of the organisms in the whole or any part of the lake may be calculated. When a series of samples is taken throughout the year calculations are made of the annual production of microscopic fish food in the lake and the rate at which it is produced. The samples of bottom animals are treated in a similar manner and the amount of animal fish food per acre of bottom determined. This may vary at any time during the summer from a few pounds to more than 30 pounds per acre. Because the crop is renewed several times each season the yearly production may amount to more than one hundred pounds per acre of bottom.

A detailed examination of preserved whole fish specimens provides information regarding life history and racial characteristics of the fish as well as a means of comparing the relative condition of fish from various water areas. An analysis of stomach contents provides an index of the food of the fish and, taken in conjunction with samples of plankton and bottom fauna from the same area, may indicate preference for certain food items or actual selection of one particular type of food from among many. Food selection by some species of fish is well marked and, since some species feed at night, it appears that senses other than sight are involved in some types of selection. An examination of the reproductive organs of the fish indicates whether it is mature or immature and if mature, whether or not its reproductive potential is normal. Internal parasites in fish are common and the kinds of parasites may have some bearing on the health and reproductive capacity of the fish.

Fish scales offer one of the most important items for laboratory study. Not only can the age of a fish and its growth rate be determined from an examination of its scales but, by careful measurement of the various year zones on the scales, it is possible to calculate the size of the fish at previous ages and thus the growth rates for various periods in its past history. Through careful examination of many fish and their food organisms and an evaluation of their physical and chemical environment it is possible to detect the ills of the fish population and to make plans to improve its future welfare.

HATCHERIES AND OTHER MANAGEMENT METHODS

Improvement of a fish population may involve improvement of the habitat to furnish more food, more shelter, more or better spawning facilities, less competition from other species of fish, or any combination of these activities. It is sometimes desirable to add additional fish to a body of water or to replace those present with members of a different species. To perform these latter functions hatcheries furnish a convenient method. The National Parks and Historic Sites Service operates three fish hatcheries for the production and distribution of fish, under desirable circumstances, in National Park waters. On occasion fish from other sources, both provincial and federal, are made available for release in National Parks.