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HOW TO ESTIMATE THE DAILY CONSUMPTION OF FISH UNDER NATURAL

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HOW TO ESTIMATE THE DAILY ∧CONSUMPTION OF FISH UNDER NATURAL CONDITIONS

A. J. Bajkov

With the help of modern methods of investigations
we can fairly accurately estimate the total amount of plankton in
a lake, the total amount of bottom fauna, the total amount of
organic matter in the water, the rates of growth of fishes, etc.,
and even in certain cases the total amount of fish in our waters.
But our knowledge regarding the daily consumption of fish under
natural conditions is still very incomplete at the present time.
However, we cannot fully understand the exchange of organic
matter under the surface of water without the definite knowledge
of how much fish eat and of what part of the food is used for the
building of the fish body. It seems to me that rearing and feeding
experiments in aquaria or small tanks cannot solve the whole
problem as the conditions under those circumstances are very
different from the conditions of the natural life of fish, where
the fish can move freely in a large area and select such kinds of
food as it desires. Moreover, there are seasonal changes in
temperature in natural waters which influence not only consumption
and the rates of digestion but also the amount of available food.

Furthermore, under the natural condition in majority
of our species, the food consumption changes with the age of the
fish. The alkalinity of water also influences greatly the rates
of growth and probably also the rates of digestion. As a general
rule fish grow much faster in alkaline than in acid or neutral waters.
The whitefish in Lake Winnipegosis, for instance, increase in weight

about four times faster than in Trout lake, Wisconsin, (Hile).
Speckled trout in Maligne Lake in Jasper National Park grow five
or six times faster than in some acid or neutral waters of Prince
Edward Island. These examples show that the daily consumption of
the same species is not a constant value but a function of many
factors as temperature, alkalinity, etc., and, therefore, it must
be determined in each particular case separately.

Some years ago I estimated the daily consumption of
whitefish (Coregonus clupeaformis) in Manitoban lakes by the
following method. The fish in question is practically a night
feeder and during the summer the rates of digestion are rapid.
The gill nets were set at sunset and lifted at sunrise. It may be
assumed that the average stomach content will show a half-fed
condition because those fish which are caught just after sunset
will have empty stomachs and those caught just at sunrise will
have full stomachs. Exactness will depend on number of fish
examined. This is the simple example of estimating food
consumption when fish feed mostly at night. The same method can
be applied also if fish feed all during the day and night. In
the latter case the daily consumption must be theoretically twice
as much as that for day or night feeders.

The above described method is not always convenient
in practice and cannot be used with fry or small fishes as smelt,
stickleback and others, which are serving as food for larger fishes.
For this case another method is suggested. It is easy to catch a
number of small fish by a minnow seine or other means. A sufficient
number of them, say 100, must be preserved at once as soon as they

are landed and the total amount of the stomach contents only (not food in the intestine) should be carefully washed into small Petry dishes, counted and weighted. Then by dividing the total amount of food by the number of individuals we obtain the average stomach content of given species at the given time under certain temperature and other conditions. Another lot of alive fish should be placed at the same time in a bucket or in some other convenient vessel, filled with water denuded of its plankton content, and placed in the same stream or lake in a protected place in order that temperature of water in this vessel will not change during the period of experimentation. It is not a hard job, then, to examine about ten fish each hour or two and to find out the rates of digestion. Temperature, of course, should be checked. If all the food passes from the stomach to intestine during a period of twenty-four hours and if it has been determined that the fish in question is feeding both day and night, the average stomach content will represent the daily consumption of fish.

In the case of more rapid or more slower digestion the daily consumption could be calculated by means of the following formula:

$$D = A \frac{24}{n} , \quad \text{where:}$$

D = the daily consumption during the time of experiment,

A = the average amount of food in the stomach at time of experiment,

n = number of hours necessary for passing all the food from stomach into intestine (rates of digestion).

Exactness of such determination will depend on the number of specimens examined and this calculation will have value only for the period of experimentation. As such an experiment can be easily repeated each month very valuable information regarding daily, seasonal and annual consumption of many species of fish can be obtained.

Such as estimate is, perhaps, open to criticism and is offered as a suggestion.