THE COMPARATIVE VALUE OF FOODS FOR RAINBOW TROUT AND OTHER SALMONOIDS

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To demonstrate the comparative value of different kinds of food for young salmonoids with any degree of exactness must necessarily entail very patient and careful investigation. The fishes experimented with will have to be maintained in separate pools, under identical provisions of environment, water supply and area, temperatures, and the possible supplies of natural food carried by or existing in the water or in the pools themselves. Where there exists wide diversity of opinion as to food values for the higher orders of animals, to demonstrate the values of such atomic particles as are collected by the young fish will tax the powers of the most exact scientific analyses. Any demonstration of the maintenance of the fishes will in itself be subject to question as to specific hereditary influences, climatic or aquatic conditions, prevailing habits of the fishes, and many other circumstances for consideration.

After experiments and study covering a period of many years, supplemented by close observation of the fish in small areas of inclosed water, I can suggest no new form of food artificially prepared superior in any respect to that commonly used in most hatcheries where young salmonoids are fed. For fry I should prefer these foods in the order here named:

1. Raw beef liver, finely ground, for the first five days or week.
2. Fresh lean meat finely ground.
3. Any available fresh lean meat mixed with increasing portions of wheat middlings, fed either in the raw state or after being cooked as a mush.

In the preparation of any meat food (after five or six days feeding of raw liver alone to newly hatched fry) the fresh liver and meat should be thoroughly ground together with from one-fourth to three-fourths of its weight of wheat middlings. The middlings, in itself good food which will sustain fish indefinitely, is particularly valuable in absorbing and holding the juices of meats and makes a mixture of about the right consistency and gravity to remain in suspense or slowly sink in water, while it is easily distinguished by the fishes once they are

accustomed to it. It is a cheap and generally available staple. Food prepared as described may be readily dried and preserved for emergencies where a fresh supply of meat is lacking.

That millions of trout and salmon fry have been and are being maintained in overcrowded hatching troughs upon a diet of beef liver would appear to be positive evidence of its great value, while it is commonly as easily and cheaply obtainable as any form of animal food.

The chief object of this paper, however, is to suggest that young salmons and salmonoids reared in captivity should be given the minimum quantity of artificial food and a maximum area and flow of water containing their natural food, for which they should be permitted to forage. Prepared food should supplement the natural supply where water area is overcrowded with young fish, or where drouth, cold, or other climatic conditions interfere with the normal natural supply. In support of this view is offered the following summary of well-known or readily ascertained facts and examples:

1. That along the salmon rivers and trout streams fry existing under natural provisions are commonly in excellent physical condition, mortality among them being mainly caused by abnormal disturbances of the nests, such as floods, drouths, or extraordinary climatic changes, or by the depredations of natural enemies, birds, reptiles, and other animals.

2. That salmonoids are not surface-feeding fishes exclusively, but seek food suspended in the water and on the shores and bottom surfaces accessible to them; and that of necessity they must collect more or less vegetable and sedimentary matter; in fact, that they are rather omnivorous than piscivorous or carnivorous fishes.

3. That under normal natural conditions a continuous succession of seasonable aquatic and insectiverous foods, much of which will embrace vegetable matter in some form, is supplied to the young fish.

4. That owing to the minute particles of food matter collected by newly hatched salmonoids, it is doubtless impossible to distinguish with accuracy the natural or instinctive selections made by them, or to determine nutritive values.

5. That it will appear that suitable natural food for salmonoids is abundant in the waters wherever trout and salmon spawn, and that the most available, economical, and scientific provision for young salmonoids may be made in the preparation and adaptation of sufficient water area in normal natural condition, but subject to control as regards floods, drouths, freezing to extremes, and the exclusion of destructive animals. Controlled areas of stream or prepared runs should provide for the absolute regulation of the water flow, and should contain trap pools or other devices for collecting the fish, excluding them at the end of the spawning season, and finally reducing the flow of water to a minimum for the purpose of capturing the fry or young as may be desired.

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