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SUMMARY OF ATTEMPTS TO RAISE WALLEYE FRY AND FINGERLINGS ON ARTIFICIAL DIETS, WITH SUGGESTIONS ON NEEDED RESEARCH AND PROCEDURES TO BE USED IN FUTURE TESTS

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INTRODUCTION

During the past several years, a number of attempts have been made to raise walleye fry and fingerlings on artificial diets at various state, federal, university, and provincial hatcheries and testing centers. Reports are available from the Gavins Point (South Dakota), New London (Minnesota), Senecaville (Ohio), and Valley City (North Dakota) National Fish Hatcheries, Linesville (Pennsylvania) and Wolf Lake (Michigan) State Fish Hatcheries, University of Wisconsin at Madison, and White Lake Rearing Station (Ontario).

This paper is a summary of the methods and procedures used in the various diet trials, the many problems that have beset the investigators, and the results (or lack of results) obtained. Based on these past experiences, some suggestions are made for improving testing procedures. Areas that require more testing are proposed.

WALLEYE FRY

As in 1972, the attempts to raise walleye fry on various "artificial" diets in 1973 were uniformly unsuccessful (1, 2, 6, 10).[1] Essentially, no fry being fed an artificial diet survived beyond 17 days after yolk sac absorption. Diets presented on the walleye fry in 1973 included the W-4 and W-5 (Spearfish) formulation dry pellets, Oregon Moist pellets, a pelleted Atlantic salmon diet, a liver slurry, egg yolk, and an egg yolk and Farina slurry.

In most tests automatic feeders periodically dispensed various amounts of feed into troughs, tanks, or aquaria containing the walleye fry. In some cases, hand feeding at frequent intervals was attempted. Typically, many of the walleye fry never showed any interest in the food. The more agressive fry would sometimes grab a pellet, spit it out, then "eye" another pellet. Much cannibalism occurred, in the form of "tail grabbing." None of the artificial diets which have been tried to date have been accepted by walleye fry.

At Wolf Lake State Fish Hatchery, Michigan (2), walleye fry were raised in fiberglass troughs; in 32 days they grew from an average length of 0.28 inch to an average of 0.90 inch, on a combination of brine shrimp and

[1] See literature cited, at end of this paper. Reports which are summarized here are cited by numbers.

daphnians, but survival from 48,000 sac fry was only 3.9%. In 1974 at Wolf Lake, infusorians will be added to the diet of walleye fry in hopes of increasing the early survival rate.

WALLEYE FINGERLINGS

Artificial diets presented to walleye fingerlings have include PR-6 trout granules (8), Oregon Moist pellets (4, 9), and the W-3, W-4, W-5, and W-6 dry diets developed at the Federal Diet Testing Development Center in Spearfish, South Dakota (1, 3, 4, 5, 7, 9). Generally, walleye fingerlings have accepted to some degree all of the tested artificial diets. However, many problems concerning factors such as rearing containers, water quality, fish diseases, light intensity and periodicity, intensity and periodicity of food dispensation, control of cannibalism, etc., must be resolved in order to make meaningful evaluations of the artificial diets and achieve maximum growth and survival of walleye fingerlings.

Rearing Containers

Attempts to raise walleye fingerlings have been made in aquaria, troughs, tanks, and raceways of various capacities, designs (including circular), and construction (including glass, aluminum, steel, and concrete). To date, no particular rearing container has proved to be significantly better than another. Ideally, the container should provide screening for crowding the walleyes into a section of the container with minimal turbulence, to enhance feeding. Obviously, water flow through the container should be adjusted to provide a relatively quiet section. Covers may be necessary to prevent fish from jumping out of the container. Walleyes are very excitable, and tend to flee from any outside activity, including hand-feeding operations. Screens or plastic curtains may be installed to isolate the walleyes from disturbing activities.

Water and Fish Diseases

Here it should be repeated that the flow of water must be regulated so that the rearing container has a quiet section where walleyes can feed without having to swim continually against a current. In one test (5) the optimum water temperature for maximum growth of walleye fingerlings was 22°C (71.6°F). Fingerlings grew nearly as fast at 26°C, but almost one third less at 18°C. Poor water quality and/or problems with various fish diseases have caused disruptions in practically all of the walleye feeding tests. How much of the abnormally high incidence of diseases is related to attempts to feed pelleted food is hard to determine. It often takes some 10 days to condition the walleyes to accept pelleted food. Somewhat starved, weakened fingerlings would obviously be more susceptible to diseases than more healthy fish. Since meaningful feeding tests cannot be conducted with diseased fish, much effort must be made to keep experimental fish free of disease organisms. Rearing containers should be cleaned several times a day if necessary to remove excess food, feces, and dead fish.

Light Intensity and Periodicity

More research is needed on both light intensity and periodicity in relation to walleye feeding. In one test (5), light periodicity (8-hr. period vs. 16-hr. period) seemed to have little influence on feeding intensity, but fingerlings ate and swam more actively when light from a 15-W aquarium light was "reduced." In another test (2), walleye fingerlings in fiberglass troughs fed more intensively when a 100-W incandescent lamp was suspended over the trough and lit for a 9-hour period.

Food and Feeding

It has been suggested (3) that walleyes should be at least two inches in length before starting on a dry diet. However, very little diet testing has been done with walleyes in the one- to two-inch size range. Possibly walleye fry could be raised to one-inch size in troughs on brime shrimp and plankton; then switched to pelleted food.

It usually takes about ten days for fingerlings to adapt to pelleted food. Acceptance of pellets may be hastened by first introducing a natural food such as daphnids, and finally by hand-feeding the pellets while the walleyes are consuming the daphnids. There is some disagreement on the quantity of food to be fed, and on the frequency of feeding. In one test (5), better efficiency in conversion, and in weight gain, was obtained by feeding at three percent of body weight per day, rather than at five or seven percent (fish were fed twice per day). Another investigator (4) suggests feeding "large amounts" of food at one time, and feeding only a few times a day. In yet another test (3) the most successful method was hand-feeding a few particles at a time, as many as 24 times per day. Obviously more testing is needed to determine the amount and periodicity of feeding pelleted food.

The use of automatic feeders seemingly is a much more practical method of feeding pelleted food, than is hand-feeding. It permits feeding on a 24-hour basis, and eliminates much of the disturbance to the walleyes caused by periodic hand-feeding. One major problem with automatic feeders has been a tendency to plug up, especially with the smaller-sized pellets and with starter mash. The feeders should be protected as much as possible from splashing water, and from moisture condensation. A plastic cover is handy in keeping the food fairly dry.

The limited information available suggests that there is relatively little difference in acceptability to walleye fingerlings, of the W-4, W-5, and W-6 diets (3). No one compared these diets with the W-3 diet. In two tests (4, 9), walleyes seemed to prefer OMP pellets to the dry W-3 and W-4 pellets. In Ontario (8), walleye fingerlings are raised successfully on No. 4 trout granules. It is suggested that future feeding tests include direct comparisons between "trout crumbles," OMP, and the cool water fish dry diets, so an evaluation can be made of the comparative merits of each type of artificial diet. For instance, the W-4 diet should be tested along with the trout granules and/or the OMP diet, using walleyes of the same size and condition.

When raising walleyes with artificial food, either on a production basis or during extended food tests, frequent grading of walleyes by size is necessary to minimize cannibalism.

Because of the many differences encountered from test to test (such as with size of fish, diets, water temperatures, diseases, length of tests) it seems pointless to compare test results as far as growth and survival are concerned. It is safe to say, however, that walleye fingerlings can be raised to a length of 4 inches on artificial diets, with survival proportional to the success of the fish-culturist in controlling water quality, diseases, outside disturbances, light intensity, water flow commensurate with rearing container size, and the other limiting factors mentioned in this summary.

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