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Use of Carp Eggs as a Feed for Fingerling Largemouth Bass¹

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ABSTRACT: Fingerling largemouth bass (*Micropterus salmoides*), 20 mm total length, readily accepted carp eggs and reached a length of 43 mm in 25 days at a water temperature of 27°C. Survival was 52%. Carp eggs were more acceptable than moist feed to largemouth bass fingerlings 43 to 50 mm long. An average of 49% of the fish that refused to accept moist feed during the first training period accepted carp eggs and later accepted moist feed. Training success was greatest at the highest water temperature considered.

The production of fingerling largemouth bass (*Micropterus salmoides*) at high density by artificial feeding not only reduces the difficult problems of maintaining first zooplankton and then forage fish in the ponds, but also reduces cannibalism, a characteristic of this species in pond culture. Snow's (1975) method, as currently practiced, involves retaining fish in culture ponds until they have attained a total length of 40 to 50 mm. The fish are then harvested and concentrated in tanks, where they are trained to accept artificial feed. Duration of the training period is 7 to 14 days.

Several difficulties may arise with the application of this method. Frequently the fingerling bass deplete the zooplankton in the culture ponds before the fish reach 40 to 50 mm; it is then necessary to move the fish to another pond to reduce cannibalism. Although in some trials as many as 90% of the fish learn to accept artificial feed (Snow 1975; Edelen 1977), training success varies, and may be 30% or less (Nelson et al. 1974; McCraren 1974). During the training period the nonfeeders become emaciated and weak and must either be sacrificed or returned to the pond.

To date, the food used for training fingerling largemouth bass has been either Oregon Moist Pellet (Snow 1975) or a similar moist feed. Bruce Tetzlaff (Fisheries Research Laboratory, SIU-Carbondale, personal communication) suggested that fish eggs might be a suitable food for fingerling fish too small to accept artificial feed. Our preliminary investigation demonstrated this to be true, and in this early work we also observed that temperature and training success appeared to be related. In the present study we investigated the use of the eggs of carp (*Cyprinus carpio*) as a

food for fingerling largemouth bass in tanks, attempted to restore the health and vigor of nonfeeders so they might be subjected to a second training period, and attempted to determine the relation between training success and temperature.

Materials and Methods

To determine whether carp eggs are a suitable food for largemouth bass, we stocked eight 24-L aquaria with 100 fingerling bass 20 mm average total length (range, 16 - 26 mm), rather than fish of the 40-mm length specified by Snow. Temperature was maintained at about 27°C. The fish were offered carp eggs exclusively for 25 days.

A comparison was made between reconditioning non-feeding bass with carp eggs versus moist feed. Emaciated fish (nonfeeders) in 12 experimental tanks were offered carp eggs only for 5 days, and moist feed only for an additional 5 days. To isolate the nonfeeding fish for this reconditioning experiment, we subjected three populations of fish 45 to 50 mm long to training on moist feed for 7 to 10 days. The percentages of nonfeeders ranged from 58 to 76. Fish were designated "feeders" or "nonfeeders" depending on acceptance or nonacceptance of moist feed.

To determine the effects of temperature on training success, six lots of fish (50 fish per lot) were offered carp eggs (experimental) at 22 and 25°C, six lots were offered moist feed (control) at 22 and 25°C, and six lots were offered carp eggs (experimental) at 27°C. Fish were not offered moist feed at 27°C.

The moist feed was a mixture of ground gizzard shad (*Dorosoma cepedianum*) and Silver Cup salmon feed, to which a vitamin mixture (ICN Pharmaceuticals, Inc., Cleveland, Ohio) was added at a rate of 1% by weight. The feed was kept frozen until the time of feeding. The fish were fed four times daily at 15% of their body weight, as recommended by McCraren (1974).

¹ This paper is based in part on theses submitted in 1978 by A.M. Brandenburg and M.S. Ray to Southern Illinois University, Carbondale, in partial fulfillment of the requirements for the M.A. and M.S. degrees, respectively.

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Carp ovaries were obtained from fish taken in local waters. Some of the ovaries were processed fresh and others were frozen and stored until needed. The eggs were processed for feeding by separating them into individual eggs and small clumps of eggs by forcing them through a 5-mm Vexar screen under a stream of cold water. The eggs passed through the screen and the ovarian tissue remained on the screen. Care was taken that the eggs did not break or become infected with fungus. The carp eggs were fed four times daily at a rate of 0.1 mL of processed eggs per fish per feeding.

Results

The experiment designed to test the feasibility of raising 20-mm fingerling bass on carp eggs was concluded after 25 days, when length of the fish averaged 43 mm. Total survival in the eight aquaria ranged from 40 to 71% and averaged 52%. All of the survivors were observed feeding on carp eggs. All of these surviving fish were converted to moist feed within 3 days.

The initial response of the fish to carp eggs was excellent, even during the first few feedings. Most of the fingerlings either ate the eggs or showed an interest in them. The mortality which occurred in these populations was from malnutrition among the nonfeeders, an outbreak of a trematode (*Dactylogyrus* sp.) and cannibalism. The *Dactylogyrus* was controlled by two 3-h treatments with Dylox at 0.25 mg/L active ingredient. Cannibalism was partly controlled by removing the obvious cannibals.

Within a given temperature trial, reconditioning with carp eggs versus continuing moist feed resulted in nearly doubling the training success; total survival was about the same (Table 1). Training success was greatest at 27°C (the highest temperature); success at 22 and 25°C was similar (Table 1).

Table 1. Percentages^a (mean, and in parentheses, range) of nonfeeding bass fingerlings that accepted moist feed after being reconditioned with carp eggs, as compared to nonfeeding fingerlings (controls) that were continued on moist feed only.

Temperature (°C)	Experimental ^b		Control ^c	
	Feeders	Total survival	Feeders	Total survival
22	64 (50-74)	96 (94-100)	34 (28-40)	98 (96-100)
25	61 (52-68)	82 (80-84)	29 (18-40)	88 (84-90)
27	86 (76-92)	98 (96-100)	— —	— —

^a Each value is the average and range for six lots of fish (50 fish per lot).

^b Experimental fish were reconditioned with carp eggs and then fed moist feed.

^c Control fish were fed only moist feed.

Discussion

The possibility of maintaining bass as small as 20 mm in tanks by feeding them carp eggs alleviates certain problems posed by Snow's method. To produce bass fingerlings 40-50 mm long, one often must transfer the fish from one pond to another before removing them for training. If the fingerlings can be transferred to the tanks when they are as small as 20 mm, they can be produced in nursery ponds at a very high density with little danger of depleting the food supply before they are transferred. Although our study established that fingerlings averaging 20 mm can be maintained on carp eggs, it did not establish the minimum size for which carp eggs may be satisfactory.

Carp eggs, in addition to being readily accepted by bass fingerlings, also appear to be nutritionally satisfactory, since in our study the fingerlings maintained on carp eggs grew from 20 to 43 mm in 25 days. Further, the eggs are naturally encapsulated, which prevents loss of nutrients by leaching, and reduces water pollution in the training tanks.

The apparently greater training success at the maximum temperature (27°C) was probably related to increased activity and aggressiveness of the fish, and to their increased digestion rate. Niimi and Beamish (1974) found that with an increase in temperature up to 30°C there was a corresponding increase in swimming speed, and Molnar and Tolg (1962) described a negative curvilinear relation between the time required to evacuate the stomach and water temperature. The fact that training success at 22 and 25°C was similar, whereas success at 27°C was greater, suggests that the relation between temperature and training success is not linear, but rather that a threshold value is involved.

The use of carp eggs to restore the vigor of nonfeeders

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