HOLDING STRIPED BASS LARVAE IN CAGES UNTIL SWIM-UP

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Abstract: The need to suspend newly hatched striped bass (*Morone saxatilis*) larvae until swim-up prompted comparison of holding techniques. Fingerling returns were tabulated over a 3 yr period from fry held in aquaria vs. returns from fry held in Saran cages in rearing ponds. Mean production for a 3 yr period from ponds stocked with fry held in cages was better overall than other methods. The success of holding cages resulted in a substantial saving in manpower as constant care of fry was not needed. The cage holding method is only 1 of many facets of striped bass rearing and is only a contributing factor to high production, not a critical factor such as the quantity and quality of food available. This technique would apply to those situations where unsuitable temperature, turbidity or limited facilities make the tank or aquaria method impractical.

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Advancements in striped bass fingerling culture created a need to hold larvae for several days prior to stocking. Larvae less than 5 days old are incapable of swimming continuously and must be kept suspended to prevent smothering. Stocking larvae directly into earthen ponds prior to swim-up resulted in poor survival which was probably caused by the effects of silt on pond bottoms.

Harper (1971) suspended larvae in large aquaria by bubbling air through stones to create currents. Jones (1966) held larvae suspended in rectangular tanks by introducing water through jets to maintain circular water movements. Each of these techniques require constant observation to ensure continuous operation of compressors and to adjust water and air flow.

Some investigators have retained swimming larvae in Saran covered cages for several days to assess losses subsequent to stocking (Harper 1971). This technique showed promise as an alternative to holding fry in aquaria or tanks until swim-up as it eliminated or reduced potential losses from equipment failures, handling, and environmental changes. The technique is referred to in a recent publication but no comparative data relative to its effectiveness are presented (Bonn et al. 1976).

METHODS AND MATERIALS

Cages used in the evaluation were 0.9 m x 1.2 m x 0.9 in size, constructed of 1 in. x 2 in. white pine, and covered with Saran. Larvae shipped via commercial airline from the East Coast were stocked directly into the cages and aquaria upon arrival. Each cage received the estimated number of fry required for stocking a particular pond. When larvae had developed the ability to swim freely, the cages were submerged allowing the larvae to escape. Estimations of mortalities were made by visual observation. The holding period, which ranged from 2 to 5 days, was dependent on the age of larvae upon arrival.

Striped bass larvae were held in aerated aquaria for comparison purposes during the period 1972-74. In 1974 they were also held in cages suspended in tanks. Agitation was provided by wooden paddles. Fry held in this manner were also compared with the pond holding method. Aquaria were continuously observed to prevent larvae from "piling-up" and smothering. Mortalities were estimated by visual observation and sample counts taken prior to transfer of the 5 to 6 day old larvae to rearing ponds in plastic lined tubs.

RESULTS AND DISCUSSION

The cage method fulfilled all expectations in alleviating the necessity to "baby-sit" larvae to the free-swimming stage.

Returns from individual ponds reflect the variables encountered during rearing of striped bass fingerlings (Tables 1, 2, and 3). In 1972 and 1973, no returns are credited to Pond 10C. Each year, however, this pond yielded a few hundred small and emaciated fish. Consequently, these fingerlings were discarded and not counted as production. The probable contributing factor for the poor growth was the development of a large, dominant colonial rotifer in the pond. This particular rotifer was too large to be eaten and

Table 1. Striped bass fingerling production in 1972 for fry held in cages or aquaria until "swim-up" stage.

Pond No.	Pond size (ha)	Holding method	No. fry stocked	No. fingerlings harvested	Return (in %)
	0.3	Cage	91,000	18,500	20.3
10C	0.3	Cage	91,000	0[a]	0.0
15C	0.6	Cage	120,000	96,300	80.3
4B	0.3	Aquarium	91,000	37,200	40.9
9B	0.4	Aquarium	91,000	4	0.1
9A	0.4	Aquarium	91,000	29,200	32.1

[a]Fingerlings not counted due to small size and weakened condition.

Table 2. Striped bass fingerling production in 1973 for fry held in cages or aquaria until "swim-up"stage.

Pond No.	Pond size (surf. ha)	Holding method	No. fry stocked	No. fingerlings harvested	Return (in %)
8	0.9	Cage	185,000	48,600	26.3
10C	0.3	Cage	60,000	0[a]	0.0
15B	0.4	Cage	100,000	91,200	91.2
10B	0.3	Aquarium	80,000	26,040	32.6
15A	0.5	Aquarium	135,000	64,800	48.0
15C	0.6	Aquarium	75,000	10,350	13.8

Fingerlings not counted due to small size and weakened condition.

Table 3. Striped bass fingerling production in 1974 for fry held in cages, aquaria and holding tank cages until the "swim-up"stage.

Pond No.	Pond size (surf. ha)	Holding method	No. fry stocked	No. fingerlings harvested	Return (in %)
15A	0.5	Cage	100,000	52,800	52.8
14	0.6	Cage	150,000	52,320	34.9
10A	0.3	Cage	100,000	16,150	16.2
9C	0.4	Cage	100,000	7,560	7.6
10B	0.3	Aquaria & Holding Tank	100,000	0	0.0
11B	0.3	Aquaria & Holding Tank	100,000	19,040	19.0
9B	0.4	Aquaria & Holding Tank	100,000	11,220	11.2
7	0.7	Aquaria & Holding Tank	200,000	12,324	6.2
5½	0.4	Aquaria & Holding Tank	100,000	9,025	9.0
16	1.0	Aquaria & Holding Tank	200,000	38,900	19.5
18	0.4	Aquaria & Holding Tank	100,000	15,300	15.3

is suspected of limiting the quality and quantity of more acceptable food organisms. Another probable cause for low yields in other ponds may have been the populations of fairy, clam, and tadpole shrimp that commonly occur at this station.

Returns from rearing ponds are affected by many factors such as quality of fry, quantity and type of food organisms available, temperature, etc. Our data show that the cage holding technique is at least as successful as the aquaria method and results in a substantial savings in manpower.

There were no indications of larvae "piling-up" when cages were observed with an underwater viewer. The estimated mortality in cages was comparable to losses in aquaria. Losses in either aquaria or cages were probably more dependent on fry quality than the holding technique itself. The tempering process required approximately the same length of time regardless of the method used. Cages were more difficult to stock because of their location in ponds. Lighting during tempering proved to be a problem as larvae were generally received after dark.

Table 4 compares the mean percentage return per pond for the 3 yr test period. Mean production from ponds stocked with fry held in cages was better overall than that obtained by other methods. However, the holding method was undoubtedly only 1 of the many factors contributing to production. Average production over a 3 yr period utilizing numerous ponds probably tends to balance some of the variables. To obtain reproducible data, a much large sample is needed. Results from this study suggest that the cage holding method can be used to enhance fingerling production. Also, the technique would apply to those situations where unsuitable temperature, turbidity, or limited holding facilities makes the tank or aquaria method impractical.

Table 4. Mean production returns for striped bass fry held in cages vs. aquaria and tanks until "swim-up."

	Aquaria or holding tank (in %)	*Cages (in %)*
1972	24.3	38.0
1973	34.9	40.5
1974	11.8	28.6
Three year average	18.6	35.7

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