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DEVELOPMENT OF POND CULTURE TECHNIQUES FOR STRIPED BASS *MORONE SAXATILIS* (WALBAUM)

by

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ABSTRACT

The increasing demand for striped bass fingerlings has established a need for improved pond culture techniques for this species. Standard guidelines were developed from methods in use at several production hatcheries. These along with improvements after two production seasons are described.

INTRODUCTION

Artificial propagation of striped bass was attempted in the 1870's with the first published report made by Worth in 1884. The U. S. Fish Commission began experimental striped bass propagation at Weldon, North Carolina, in 1903 and continued this work until 1951 when the hatchery facilities were turned over to the State. Striped bass were being treated as an anadromous species during this period, but with construction of South Carolina's Santee-Cooper Reservoir and the appearance of a landlocked population of striped bass in these waters around 1950, interest began to focus on stripers for inland reservoir management (Fuller, 1968). The increasing demand for striped bass and the lack of natural reproduction in most reservoirs prompted South Carolina to construct its Moncks Corner Hatchery in 1961.

Up to this point essentially all stocking was being done with fry or commercially caught yearlings. In an effort to improve stocking results and increase the availability of larger size stripers, the Edenton NFH began a striped bass rearing project in the spring of 1964 (Anderson, 1966). Approximately 30,000 fingerlings were produced from fry that were provided by the State Hatchery at Weldon. Production techniques have improved over the past 10 years and many other hatcheries, including state, Federal and commercial, have become involved with this work. Federal hatchery production in Region 4 has increased from the 30,000 fingerlings harvested in 1964 to the current level of approximately 4.5 million fingerlings annually. However, the demand for striped bass is much greater than the production capability, and this imbalance is expected to continue for many years. In 1974, the 10 states within the U. S. Fish and Wildlife Service's Southeastern Region requested 8.5 million fingerlings from Federal hatcheries. This was about double the amount we produced.

METHODS

In an attempt to supply the demand for 1- to 2-inch fingerlings and to identify the

best production methods and techniques, guidelines were established for Federal production hatcheries previous to the 1973 season. These represented a composite of procedures which had been associated with past successes at a number of hatcheries. The immediate purpose was to standardize handling and production to a degree that would permit evaluation and at the same time utilize available knowledge as efficiently as possible.

The guidelines were as follows:

1. Fry to be transported to producing hatchery from the hatching facility within 2 days after hatching, in water maintained below 66° F.
2. Fry to be transported in double plastic bags sealed individually to prevent collapsing in transit.
3. Tempering to begin while fry are in the shipping container.
4. Prevent fry from bunching up at the bottom of the shipping bag during the tempering process.
5. Maintain holding facilities in receiving hatchery with appropriate circulation as shown in Figure 1, and hold temperature to not more than 1° F. change per day with final prestocking temperature not higher than 70° F.

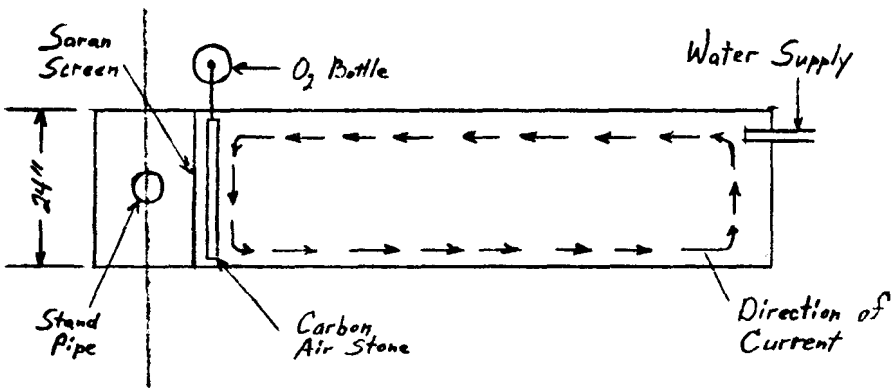

Figure 1. Holding tank equipped to hold fry.

6. Fry to be placed in rearing ponds when there is development of functional mouthparts and peristaltic movement in the lower intestine.
7. Rearing ponds not to begin filling until fry are received. Upon filling, use 400 pounds per acre of shredded peanut or locally available good quality hay. Add 100 pounds per acre per week for the next 4 weeks or as needed. No commercial fertilizers are to be used.
8. Check for fry survival. After fry have been in pond for 5 days, a strong flashlight beam held very still over the pond kettle area is an excellent way to check for survival. This will not give percentage of survival.
9. Initial application of oil within a week after fry are stocked to control predaceous insects. A second application to follow 2 weeks later or as required.
10. Where applicable, place saran bags over the water supply pipes to prevent larger organisms and fish from entering the ponds.

The above guidelines were provided to each hatchery manager with instructions to use them as such during the production season and then report problems and recommended changes. The following pond culture techniques resulted after two seasons of this procedure.

DISCUSSION

Striped bass fry are usually shipped in plastic bags containing 75,000 to 100,000 fry, 2 gallons of water and about 1 cubic foot of oxygen. Conditions vary, but most hatcheries receive fry that are 1 or 2 days old and still too immature for direct stocking. The fry are not stocked until there is development of functional mouthparts and peristaltic movement in the lower intestine. This usually requires 4 to 8 days, depending on water temperature. Where adequate water supplies exist, pond filling should not begin until the fry are received.

Fry are tempered for a period of 30 to 45 minutes before they are placed in troughs or other holding facilities. Tempering is usually accomplished by using plastic aquarium tubing of ¼ inch O.D. as means of siphoning water from a holding trough into the shipping bag. A bag will fill in approximately 30 minutes with this size tubing, but siphoning time can be increased considerably with the use of smaller tubing (⅛ inch O.D.). This method of tempering has the advantage of moderating both temperature and water chemistry differences at the same time. Caution should be used during the entire tempering process to prevent the fry from bunching up in the bottom of the bag and suffocating. Air stones have occasionally been placed in the bags to help safeguard against this possibility.

Water in holding troughs should be circulated so the fry will remain suspended without bunching. The temperature should not exceed 70° F., and it should be regulated if there is a possibility of excessive variation. As a rule some type of aeration device is also employed.

Prestocking mortalities may be reduced by painting the holding tank with black paint or by lining it with black polyethylene. If the polyethylene is used, it may prove of secondary value in facilitating fry removal.

Many fish culturists feed brine shrimp during this prestocking period to verify feeding activity and provide early nourishment. It may not be advisable to maintain the fry on this diet for an extended period of time, however, since brine shrimp alone does not appear to be a nutritionally complete diet (Wirtanen and Ray, 1971). As soon as the yolk sac has been absorbed and the mouthparts are functional, the fry are ready to stock.

Moving fry from the holding facilities to the ponds warrants the same careful tempering as given initially. The stocking rate should be 80,000 - 100,000 per acre.

Once the fry are stocked out, a gross check of survival can bemade after dark with the use of a strong flashlight. The beam is directed into the kettle area and held very still. Within 5 minutes fry should appear within the lighted area. This technique has proven convenient and effective, but its usefulness is limited to a short period beginning about 5 days after stocking. Later checks must be done with a seine.

Studies conducted at the Edenton National Fish Hatchery during 1967 and 1968 indicated that striped bass less than 50 mm in length feed primarily on zooplankton. Attempts to improve survival at this size by supplemental feeding of ground fish or dry feeds were not successful (Regan, Wellborn and Bowker, 1968; Bowker et al., 1969). There is also ample evidence that fingerlings will quickly starve in the absence of suitable food. Maintaining an adequate zooplankton bloom is therefore of major concern during this phase of striped bass culture.

There has been no development of a universal fertilization technique that will assure a sustained bloom under all conditions. Each fish culturist must be guided somewhat by experience in selecting fertilizers which will produce the best results at a given hatchery.

Introduction of organic materials, especially in the spring, has the immediate effect of providing the necessary nutrient base for bacterial production and release of suspended organic particles, both useful in stimulating a zooplankton bloom. Reduced phytoplankton production, however, occasionally results in excessive growth of filamentous algae and the need for chemical treatment. Treatment with diquat was

proven effective and safe, but it is also relatively expensive. Water quality, cost and past experience will dictate the best method of control.

Many hatchery managers commonly plant their ponds in rye grass during the fall for erosion control and to provide fertilizer when the pond is refilled. Rye grass fertilization has proven valuable in some cases; but in others, a large crop of the grass has been known to decay rapidly causing oxygen depletion and a loss of fish. This can usually be prevented by mowing the rye grass a few days before filling to allow curing and drying of the hay crop. Best results are usually obtained from ponds allowed to produce vegetative growth in the late summer and then placed in production the following spring while the bottom is covered with a preponderance of dry grass and weeds. The slower decay of dry organic materials appears more conducive to sustained production of zooplankton. Also, the control of siltation and erosion afforded by rooted cover is a positive factor.

During the 1973 production season, national fish hatchery ponds were fertilized initially with either 400 pounds per acre of shredded peanut hay, pelleted hay, meal, or some equivalent; and then 100 pounds of organic fertilizer was added each week as necessary to help sustain the zooplankton bloom. Some inorganic fertilizer was used as a supplement when there was a specific need for it. The fish were harvested at a 1- to 2-inch size and had an overall survival of 29 percent, although survival in individual ponds ranged from zero to approximately 75 percent.

The fertilization schedule is best adjusted by regular sampling of the zooplankton population. This can be accomplished by pulling a tow net around the perimeter of each pond on a weekly basis. The sample should be killed immediately with formalin and allowed to settle 24 hours before measuring. A less accurate method, but one which has been used successfully, nevertheless, is to take the weekly sample in a gallon jar and examine it both macro- and microscopically.

When ponds are filled and fertilized at the time of stocking, the zooplankton population will usually peak in about 30 days and then begin a fairly rapid decline. Harvesting while the zooplankton bloom is still at its peak will ensure healthier fish and maximum yield. The fingerlings usually run about 1000 to the pound at this time.

Standard techniques are acceptable for harvesting striped bass of smaller sizes—with one caution. Striped bass are excitable and can be driven into a fatal shock through rough handling, especially if stressed by poor water quality during or immediately after harvest. This excitability increases when the fish are larger than about 0.10 pound.

The most common method of harvesting striped bass ponds is by draining. It has been noted that when ponds are drained during daylight hours, the fingerlings have a tendency to move into shallow water and become stranded. The ponds should therefore be drained at night and the fish removed early in the morning. Harvesting techniques should assure that the fingerlings remain in the water as much as possible and that only small numbers are handled at any one time. In removing the fish from the catch basin, approximately 10 pounds of fish can be safely placed in a bucket containing 3.5 gallons of water. The fish should be collected in a large truck-mounted tank that is equipped with an agitator. A quick-release valve and use of large-diameter aluminum or plastic pipe will permit removal of the fish without further handling.

Several national fish hatcheries have recently employed the glass V-trap as a means of harvesting fingerlings up to 3 inches in size. This trap was first described in the October 1951 issue of the *Progressive Fish-Culturist*. The advantages of the trap are that it permits quicker harvest with less handling loss, and it also excludes tadpoles and crawfish. Better than 80 percent of the fish can usually be removed from a pond before it is completely drained.

There is no available evidence to indicate that water quality is a limiting factor in striped bass production, provided the supply falls within the normal range for warmwater fish culture. Oxygen levels as low as 3 ppm and pH's as high as 10 have been recorded without any apparent mortalities (Regan et al., 1968).

Predaceous insect control is partially accomplished by not filling the ponds until just prior to stocking. Further control is achieved by "oiling" the ponds within a week after stocking, and then a second application is applied 2 weeks later, or as necessary. Earlier pond filling will require the oiling schedule to be adjusted accordingly. Saran bags placed over the filling pipes will also help prevent larger organisms and fish from entering the ponds.

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PROGRESS WITH *MORONE* HYBRIDS IN FRESH WATER

by

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ABSTRACT

A brief history of developments with *Morone* hybrids is given. Two of these fishes have shown potential as a supplemental sport fish for fresh water lakes and reservoirs.

The original hybrid, white bass male X striped bass female, has provided substantial fisheries in the Southeast. Compared to striped bass, greater returns to sport fishermen, faster early growth, and higher survival has been documented. The threat of backcross deformities appears minimal at this time.

The reciprocal hybrid, striped bass male X white bass female, was successfully cultured in 1973. Early findings have been encouraging, but data is incomplete for conclusive evaluation. First year growth varied between 12 and 14 inches, while average weights were higher than for striped bass of similar sizes. In general appearance, this hybrid resembles white bass.

Life history aspects and culture methods for hybrid production are discussed.

INTRODUCTION

Hybridization of fishes in the *Morone* genus began in 1965 following the breakthrough for artificial spawning striped bass, *Morone saxatilis* (Stevens, 1965). Motivation for these experiments was provided by the relatively slow development of