CULTURE OF STRIPED BASS

Roccus saxatilis (Walbaum)

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ABSTRACT

Prolarvae striped bass *Roccus saxatilis* (Walbaum) were brought to Oklahoma for experimental rearing in culture ponds. Postlarvae were stocked in ponds which were rich in plankton and later fed 246.5 pounds of prepared foods. Samples were taken periodically for detailed examination of growth and food habits. A preliminary examination indicated that prepared foods were utilized by these fish. The ponds were stocked with adult *Tilapia* and no small individuals of this species were found at the time of draining. The striped bass harvested after two months with a 15 to 60 percent recovery of the number stocked.

The large populations of rough fish, which usually develop in large reservoirs within a few years following impoundment, have been a chronic problem to fisheries workers. Chemical control of these species is usually too expensive due to the magnitude of the area needing treatment, and the rough fish population normally redevelops within a short period leaving the fishery worker with the same original problem. A biological control, such as a predator species which is capable of utilizing these rough species in sufficient quantities to control their numbers, has been sought by fisheries workers since the early days of reservoir management.

The striped bass began to receive considerable attention as a possible predator species for the inland waters following the discovery, in South Carolina, that the striped bass had successfully reproduced and become established under land-locked conditions. Early attempts to establish the striped bass in inland waters in North Carolina, Tennessee, Oklahoma, Nebraska, Arkansas, and Florida, by stocking adults in spawning conditions, were unsuccessful. The recent discovery, in North Carolina, that the striped bass had been established in Kerr Reservoir by annual stockings of fry over an extended period, and the development of methods by fishery workers in South Carolina to obtain large numbers of striped bass fry, brought renewed interest in this species.

The Kerr Reservoir, North Carolina, population of striped bass is the only known population in inland waters established by stocking. Fisheries biologists working on the Kerr Reservoir introductions concluded that the extended period required to develop an established population was due to the low survival obtained from the annual stocking of one million fry into the existing fish population. As a result, several annual stockings were required to provide adults in sufficient numbers which would reproduce in the quantities large enough that the survival from that reproduction would provide an expanding and established population. The time element involved in developing a sufficient population of spawning adults might be reduced considerably if the survival rate could be increased by rearing the fry under hatchery conditions to a size where predation from an existing population would not be excessive. If rearing techniques could be developed, states far removed from the source might possibly obtain and transport striped bass fry in sufficient quantities to establish populations. The Oklahoma Department of Wildlife Conservation and the North Carolina Wildlife Resources Commission joined in a cooperative effort during 1965 in an attempt to develop methods of rearing striped bass.

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PROCEDURE

Approximately 125,000 striped bass prolarvae were shipped, via private airplane, from the Weldon Fish Hatchery, Weldon, North Carolina, to the Medicine Park Fish Hatchery, Medicine Park, Oklahoma. The fry were shipped in a five-gallon polyethylene bag inside a styrofoam ice chest in approximately two gallons of water. The bag was squeezed down to remove the existing air. Oxygen was forced into the bag through a tube to inflate the bag to capacity. The top of the bag was twisted tight and sealed with the use of rubber bands. Approximately one quart of water was poured between the bag and chest to act as a cushion. Two hands-full of crushed ice were placed on top of the bag to prevent an excessive increase in temperature. The prolarvae were placed in the container for shipment approximately one hour prior to the departure of the airplane.

Upon arrival at the Medicine Park Hatchery, the contents of the polyethylene bag were slowly tempered to the temperature of the hatchery water by removing the bag from the ice chest, placing it into a number 2 wash tub, and the top of the bag opened to expose the contents to the outside air temperature.

The pH of the bag contents was adjusted to the pH of the hatchery water, after the contents reached the hatchery water temperature, by slowly pouring hatchery water into the bag.

The fry were divided into approximately equal numbers and placed into troughs, 11.5 inches wide and 96.75 inches long. The water depth in the troughs was controlled at 8.5 inches with the use of riser pipes which had been covered with 1 mm x ½ mm mesh seran cloth to prevent escape of the fry. Water was introduced into the troughs with perforated rubber tubing placed along the bottom of the trough to provide circulation from the bottom of the trough to the surface. During the early portion of the experiments, water was also sprayed on the surface of each trough to insure adequate oxygen. The water spray was discontinued on the second day because of suspected injury to the prolarvae.

Approximately 300 prolarvae were placed into aquaria to facilitate observations of growth and food habits. Microscopic observations were made with the use of a binocular magnifer and a hand lense.

The fry were retained in the troughs inside the hatchery building until their development reached the stage capable of ingesting food. At this stage, approximately three-fourths of the surviving larvae were transferred to two hatchery ponds selected for the experiment. The remaining larvae were held in the troughs and aquaria in the hatchery building for study of growth and food habits.

Ponds No. 48 and No. 49 were selected for the experiment. Pond No. 48 contains 0.71 acre, with an average depth of 1.5 feet. Pond No. 49 has an area of 0.56 acre and an average depth of 3.5 feet. Plankton fauna was developed in the experimental ponds in the same manner as used during the normal hatchery operation for the culture of largemouth bass. Rye was seeded in the ponds during the fall of 1964. Pond No. 48 received six tons of cow manure, and No. 49 received eight tons during January 1965. The ponds were filled during April 1965, with the inlet pipe screened with one millimeter mesh seran cloth to prevent introduction of fish from the water source. Each pond was equipped with a walkway to facilitate feeding and visual observations.

Pond No. 48 was stocked with approximately 40,000 striped bass larvae and 20,000 stocked in Pond No. 49. The contents of each container used to transfer the larvae to the ponds were slowly tempered to the temperature of the pond water before the introductions were made.

Plankton was collected from hatchery ponds with plankton nets, of 75 meshes to the inch, and introduced into the troughs and aquaria as the initial food supply when the postlarvae developed to the stage of ingesting food. The feeding program was begun at the same time with applications of powdered milk in the troughs and aquaria. The powdered milk was discontinued due to fouling of the water. The

feed was changed to "LIV," but this too was discontinued in the troughs and aquaria due to fouling of the water. "LIV" and powdered milk were continued in the pond feeding for a period of seven days. Ground Purina No. 1 Trout Chow was applied for approximately the next three days, and a blend of "LIV" and Purina No. 1 Trout Chow was continued until the termination of the experiment. Plankton introductions, collected from hatchery ponds with plankton nets with a mesh of 1 mm x 0.5 mm, was continued in the aquaria until the experiment was terminated.

Adult *Talapia mossambica* were placed in the experimental ponds, when the striped bass were 34 days old, to provide additional forage. Four pairs were placed in Pond No. 48 and five pairs in Pond No. 49. Small *Talapia* were placed in the aquaria three days later, and a supply was maintained in each aquarium through the remaining study.

All samples collected were preserved in Lovdowsky's formulation of FAA.

RESULTS

The 125,000 striped bass prolarvae used during the study hatched May 13, 1965. They were approximately 34 hours old and 4.5 mm long when the shipment was prepared at the Weldon Fish Hatchery. They remained in the shipping container for approximately 14 hours, including the tempering process.

The polyethylene bag expanded as the airplane gained altitude. It was deemed necessary for the plane to remain below 9,000 feet to prevent rupture of the bag. The contents arrived at the Medicine Park Fish Hatchery in good condition with only a few dead prolarvae being noted in the container. The temperature of the contents was 63° F. upon arrival. The tempering process required three hours to bring the contents up to the 71.25° F. of the water in the troughs.

No effort was made to areate the contents. The temperatures of the bag and the trough were taken with an electric therometer which provided a continuous and quick reading.

The pH of the contents was 7.1 on arrival, and the Medicine Park water was 7.4. Adjustment of the pH was made by the addition of hatchery water to the polyethylene bag. This was done after the temperature of the bag had reached the temperature of the trough water. The prolarvae were placed in the toughs at that time.

During the third and fourth days, deaths of the prolarvae caused an oil slick to develop on the surface of the troughs and aquarium. The droplets of oil united to form a film on which particles of dust and small insects adhered. This accumulation on the surface was removed by the use of toilet tissue. Strips of tissue, four or five squares long, were laid on the surface and immediately lifted off. This was found to be an effective means of removing the oil and flotsam. A count and estimate of the number of droplets per-square-inch of surface provided an estimate of the amount of loss. It must be noted that the overflow riser carried off many oil globules which were not observed during this period. Approximately 40,000 prolarvae were estimated to have been in each tough following these losses.

When the prolarvae were five days old, they displayed a development of pectoral fins, a large yolk sac and oil globule, and the mid and hind gut. Peristalsis moved through the mid gut, but did not continue into the hind gut. During the sixth day, the yolk sac was absorbed and the stage of postlarva began. Peristaltic waves characterized the activity of the body cavity during the next day. However, it was not until the eighth day after hatching that ingestion was observed.

The postlarvae were about 8 mm long and had taken in as many as four early instars of copepoda which appeared to pass through the alimentary tract untouched by the digestive juices. On the following day, the gut contents were darker and altered by digestion. These were transparent and showed up clearly under magnification. The postlarvae selected early instars of cladocera and copepoda, and at the beginning,

avoided the larger female cyclops which they appeared to examine and pass up.

The postlarvae were observed to move toward a source of light. The aquaria placed along windows opening to the north had one of their sides more illuminated than the others. During daylight hours, the postlarvae were concentrated on the side with the most light. During darkness, a light source was placed so that a hand lense with focal length of 5.75 could be used to observe feeding habits. In the metal troughs, observations were limited to the upper surface.

On June 10th, at 8 P.M., the first observation of small stripers were seen in Pond No. 48 at the intake point of the pond. These fish averaged 25.6 mm in length. Food was placed in the flow of the intake with the hope that it would be used; however, feeding was not observed at any time in this pond. The continuous feeding was conducted in the ponds even though the fish were not observed to feed.

On June 18th, *Tilapia* were fed to the stripers in the aquaria. The *Tilapia* were approximately 7 mm long and the stripers approximately 60 mm long (about 2⅓ inches long). Stripers 85 mm long fed on *Tilapia* approximately 12 mm long.

On July 12th, during the feeding operations in No. 49, the activity on the surface was thought to be that of *Tilapia*. However, a check was made using the quadrate method by incircling the fish with a ten-foot minnow seine. This showed them to be striped bass fingerlings rather than *Tilapia*. Thirty-one striped bass, weighing .75 pound, were captured in one pass of the seine. The feeding activity continued to increase each succeeding day. Samples collected during the last day of the experiment revealed Purina No. 1 Trout Chow in eighty percent of the stomachs examined (Table 1).

On July 20th, the sixty-first day after stocking, Pond 48 was drained. Draining was done slowly so that a minimum of handling would be necessary and the bulk of the fish could be removed from the drain box. The average size of striped bass in Pond No. 48, based on fifty specimens taken at random, was slightly more than 53 mm with an average weight of 1.5 grams. The length range of these fish was from 47 mm (1.85 inches) to 62 mm (2.44 inches). There were approximately 6,000 stripers taken from this pond and placed in Pond 49 to be taken out on the following day.

On July 21, sixty-two days of being stocked, Pond No. 49 was worked. The bulk of the drawdown was done during the night to avoid the high temperatures of a July day.

Pond No. 49 produced more and larger fingerlings. The length range was from 55 mm to 90 mm with an average length of 71.8 mm (2.83 inches), with an average weight of a little more than four grams. These data represent measurements from 550 fish. About 54% of the fingerlings were longer than the 71.8 mm average length for the group. A sample of 930 fingerlings had an average weight of 6.68 grams and another group of 1,800 plus fish had an average weight of approxi-

Table No. 1. Striped Bass Fingerling Stomach Contents

Total Length mm	Weight in Grams	Stomach Contents				
		Prepared Food	Cladocera	Vegetable Matter	Copepoda	Insecta
68	2.6	x	x			
72	3.3	x	x	x		x
72	3.6	x	x	x	x	x
72	3.6	x				
73	3.7	x	x	x	x	
75	3.9	x				
75	4.2	x	x			
76	3.5		x		x	
77	4.2			x		x
85	6.6	x	x	x		

mately 3.5 grams. About 18,000 fish were produced by the two ponds. Length range data indicates that the bulk of the production was that of Pond 49, since only 1.26% of the 550 fish measured were in the length range of Pond 48.

CONCLUSION

The obvious conclusion is that striped bass can be cultured in ponds; that prolarvae, postlarvae, larvae and small striped bass fish display positive phototropism; that plankton can be used as food prior to release into culture ponds; that artificially prepared food was utilized by the young fish; that among individuals of one hatch cannibalism is unlikely; that morsel size is very small compared to the body of the postlarva and small fish; that striped bass will utilize a forage form; that pond culture of this species is a feasible venture.

PRELIMINARY REPORT

THE USE OF TRANQUILIZERS AS A POSSIBLE SAMPLING TOOL

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INTRODUCTION

In recent years game management has made tremendous use of tranquilizers in capture and treatment of wild animals. In comparison little work has been done with tranquilizers in regard to fishes. McFarland (1959, 1960) made an extensive study of anesthesia, with emphasis on long term exposure to facilitate transportation. Bayliff and Klima (1962) used four anesthetics, quinaldine, MS 222, Dormisan, and tertiary amylalcohol in tagging anchovetas.

Florida's success in tranquilizing turkeys and geese plus the availability of various drugs led to this experimentation with fishes. It is theorized that knowing the limitations of rotenone, and that in most rotenone samples almost half of the fish sink before being picked up, perhaps some tranquilizer could be found that would act as a surfacer. This would not only give greater reliance to a sample but would allow returning the desirable fish to the water.

Another desirable aspect of taking samples with tranquilizers is the possibility that bottom organisms would be only slightly or not at all affected by their use.

Lumb (1958), devoted four pages of his book, "Small Animal Anesthesia" to anesthetizing teleosts. He discusses using; ether, sodium amytal, tricane methanesulfonate (MS 222), carbon dioxide, cerethane, and cresol. Of all mentioned the merits of MS 222 are easily recognized as most desirable.

Anesthetics Used

Alpha Chloralose	Fisher Scientific Co., Fair Lawn, N. J.
Sodium Pentobarbital	Vitamin Pharmaceuticals, Philadelphia, Pa.
Innovar — Fentanyl 0.4 mg. droperidal 20 mg.	McNeil Laboratories, Fort Washington, Pa.
RO 4-0403	LaRoche Laboratories, Nutley, N. J.
Librium	LaRoche Laboratories, Nutley, N. J.
Ethinamaie	Eli Lilly & Co., Indianapolis, Ind.
Tribromoethanol	Winthrop Laboratories, New York, N. Y.
Anileridine Chloride	Merck & Co., Rahway, N. J.

Of these eight drugs, Alpha chloralose was found not to be water