NYLON MATS AS SPAWNING SITES FOR LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, LAC.

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ABSTRACT

A commercially available nylon mat material was tested as a spawning site for largemouth bass. Of 90 mats installed in five ponds during a two-year period, spawns were observed on 68. In the 1965 experiment, 71 percent of the 80 spawns observed in three ponds were on the spawning mats.

Three efforts to transfer mats bearing eggs to rearing ponds for incubation and growth were successful to some degree, although acceptable production was obtained in only one of the three trials. In this instance a per-acre production of 37,600 two-inch fingerlings weighing 54.3 pounds was measured.

Two attempts at hatching the eggs under controlled conditions followed by transfer to a rearing pond were only partially successful as the fry failed to survive after being hatched successfully in a paddlewheel hatching trough and a Downing type hatching jar.

INTRODUCTION

During the past 30 years, propagation methods for largemouth bass fingerlings have evolved into a highly specialized technique of fish culture supplying millions of fish annually for use in stocking ponds, lakes and reservoirs. In spite of cultural advances which enabled federal hatcheries to produce almost 26 million largemouth bass during F.Y. 1964,[1] additional improvements are needed to make use of the reproductive potential of this species.

Each year one or more Federal fish hatcheries in the southeast report lowered production of bass fingerlings because of disease, unseasonable weather and other factors. The primary cause of the lowered production is a lack of control over the spawning and hatching process employed in propagating largemouth bass. While this is characteristic of methods employed in the culture of virtually all warm-water fishes, the largemouth bass is particularly vulnerable to environmental influences because of an early spring spawning season.

The idea of removing bass eggs from the pond nesting site for the purpose of hatching them in a controlled environment is not new (Birge, 1907). Fish culturists have observed the fact that male bass seem to prefer root masses, fibrous vegetation and similar materials as nesting sites under natural conditions. In a study of bass nesting habits in a Minnesota lake, Kramer and Smith (1962) found that of 99 bass nests observed, 95 were established on mats of low needlerush (*Eleocharis acicularis*). Promise of achieving more control over bass spawning was further evidenced by Green's (1962) observation that largemouth bass would use an artificial medium, rubberized hair upholstery material, as a nesting site in a vegetation-free pond.

MATERIALS AND METHODS

Introduction of a commercially available product of more durability, flexibility, and possibly lower cost than rubberized hair motivated further testing of the concept of manipulating bass spawns by means of a portable nesting medium. The material tested was a nylon mat material which was designated "conservation web" by its manufacturer.[2]

A preliminary experiment in 1964 established that the material was acceptable to largemouth bass adults as a spawning site. Sixteen pieces of material, rectangular in shape, of two sizes (18" x 18" and 18" x 38") were placed in two spawining ponds. The mats were located

[1] 1964 Annual Report, Division of Fish Hatcheries, Bureau of Sport Fisheries and Wildlife.
[2] Minnesota Mining and Manufacturing Company, St. Paul, Minnesota.

on the slope of the pond dyke with the top edge about one foot beneath the water surface. Pieces of heavy wire bent into a "U" shape were employed to affix the material to the pond bottom. Of the 16 mats installed, 11 were used as nesting sites by the spawning fish. One spawn was only partly deposited on the mat and because of this, the smaller size, 18" x 18", was considered too small.

More extensive testing was conducted in 1965. Three, 0.8 acre, bass spawining ponds on the Marion National Fish Hatchery were employed in the study. Pond depth was 2½ feet minimum, 5½ feet maximum. Prior to filling, nylon mats measuring 18" x 38", ⅜-inch thick, were staked to the bottom of the slope of the dyke with the top edge of the mat about ten inches below the normal pond water level. The long axis of the mat extended down the slope of the dyke. In one of the three ponds, the mats were alternately placed at depths of ten and 30 inches beneath the surface to see if depth location was a factor in utilization of the prepared sites.

Details of the installations are shown in Table 1. Spacing of the mats was varied to correspond with the size fish being employed. In one pond, two-year-old fish averaging slightly more than two pounds each were stocked, while one-year-old fish having an average size of one pound were stocked in the other two ponds. For the smaller fish, the mats were spaced 15 feet apart, with a spacing of 20 feet being used in the pond stocked with two-year-old fish. Spacings and locations were based on observations as to nest locations of spawning bass in similar ponds during previous years.

Table 1. Use of Nylon Mats as Spawning Sites

Pond No.	Stocking Males	Stocking Females	Size	No. Mats	Total Spawns Observed	Spawns On Mats	Percent On Mats
S-2	17	24	2 lbs.+	22	12	9	75
S-9[3]	24	27	1 lb.	28	25	14	56
S-35	24	28	1 lb.	24	43[4]	34	79
Total	65	79		74	80	57	71[5]

Filling of the ponds with water was completed on March 20, 1965, and brood fish were stocked on March 23. The ponds were given preflooding applications of simazine (Snow, In Press) for inhibition of vegetation and fertilized with three applications of an 8-8-0 grade fertilizer at a rate of 100 pounds per acre per application applied at weekly intervals following flooding. Ground meat scrap was the nitrogen source material, while phosphorus was supplied by ordinary superphosphate.

Sexing was done employing a technique described by Snow (1963), with more female than male fish being used. Sex ratios are shown in Table 1.

Observation of the ponds was commenced immediately after stocking the adult bass and continued each day from March 24 until April 26. Generally, each mat installation was examined and the remainder of the visible portion of the bottom scrutinized at 6:00 a.m. and at 12:30 p.m. Most observations were made from shore although attempts were made to use a boat to a limited extent. Wind action and plankton turbidity restricted observation of the deeper water to some degree in all ponds. An effort was made to utilize a shocking boat similar to that described by Sharpe (1964) as a light source on one occasion without success. A diving face mask and snorkel was employed for viewing on one occasion.

The aid most helpful for underwater observation was a "viewer" constructed from an aluminum tube 4 feet long and 4 inches in diameter. A four-inch magnifying glass was attached to one end by

[3] Depth mats were located was varied, alternating between 10 and 30 inches.
[4] Obviously some were partial spawns.
[5] Average mat spawning percentage.

means of a clamp and sealed with rubber weatherstripping. The opposite end was fitted with a light shield of rubber gasket material and handles were mounted to the tube about a foot from this end. Use of the "viewer" rendered the pond bottom and mat installations clearly visible even on windy, cloudy days.

RESULTS

Results of the observations are shown in Table 1. Spawns observed on the prepared nesting sites totaled 57 in the three ponds compared to 23 noted off the spawning mats. Undoubtedly a few spawns were deposited in areas of the pond where the bottom could not be observed.

Two facts suggest that the number of unobserved spawns was quite low. Observation of bass spawning ponds of the design utilized on the Marion Hatchery over a period of years indicates that virtually all nesting is done around the perimeter of the pond on the slope of the dykes. Furthermore, 80 spawns were observed in the three ponds during the observation period. Since only 79 female fish were stocked (assuming that the sex was accurately established) either most of the spawning was accounted for or a large number of females spawned more than once. Also 65 male fish were placed in these ponds and established 80 successful nests which is a reasonable figure for a month spawning period.

In pond S-35, 79 percent of the spawns observed were on the mats. This pond also had the best conditions for observation during the period. The lowest number of spawns deposited on the mats occurred in the other pond stocked with one-year-old fish (S-9). Here, it appeared that dead grass which had been growing around the margin of the pond the previous year may have been as attractive a place for nesting as the nylon mat, since 10 of the 11 spawns observed off the nylon mats were on clumps or patches of dead grass.

Depth of mat location was also varied in pond S-9, with half being approximately 18 inches deeper than the other half. The one-year-old fish appeared to prefer to spawn at shallower depths, since nine spawns were on the mats at shallow depths compared to five at the deeper locations. This is further evidenced by the fact that of 25 spawns observed in this pond, 19 (9 on mats, 10 on grass) were in water less than 24 inches deep.

The feasibility of transferring eggs after they had been deposited on the nylon mat was considered in some preliminary experiments. In 1964, two mats bearing eggs were removed from the pond and placed in a mechanically agitated trough ordinarily used to incubate catfish eggs. The eggs hatched satisfactorily and several thousand fry were transferred to a rearing pond. The transfer was unsuccessful, presumably because of a toxic residue in the tub employed as a container.

In 1965, 23 mats were moved in four separate transfers. One spawn which was deposited on the nylon material was removed from the pond, washed from the mat and placed in a hatching jar (Downing type). Approximately 95 percent of the eggs hatched, producing about 12,000 fry. Three days later these fry were transferred to a rearing pond. The pond had been filled with water almost a month which would have allowed competitive or predatory animals to develop to harmful levels. The fry failed to survive as none were seen following stocking.

Three transfers of mats bearing eggs were attempted. All resulted in some survival of embryos to fingerling size although only one could be classed as an unqualified success.

In one trial, six mats bearing eggs were transferred to an 0.8 acre pond which had recently been filled with water. They were placed on the slope of the dyke about one foot beneath the surface and anchored with wire staples. Part of the water used in filling was pumped from an adjoining pond which was supporting a plentiful supply of zooplankton. Fertilization was also begun at this time and continued at weekly intervals, employing 100 pound applications of 8-8-0, to maintain the food supply. After 28 days in production the pond was drained and found to be supporting a crop of 37,600 fish per acre, weighing 54.3

pounds. The bass were almost two inches long and numbered about 700 per pound.

In a second egg transfer attempt, 10 mats carrying an estimated 80,000 eggs were moved to a 0.9 acre pond which had been filled with water about 21 days previously. The mats were placed in screen wire boxes for protection during the incubation process. The pond was fertilized but became infested with a mixture of *Hydrodictyon* and *Pithophora* which required treatment before the fish crop could be harvested. Karmex at one pound per surface acre was ineffective as an algicide, so simazine at 0.5 ppm was applied about 10 days later. The latter treatment stopped growth of the weeds but did not cause a decay of the vegetation present. The delay needed for treatments and the presence of weed growths may have influenced the outcome of this trial, as the yield was only 4,600 small fish per acre weighing 7.4 pounds. Seine samples from the pond about ten days prior to draining indicated that a larger number of bass was present at that time than was obtained at draining.

In a third trial of egg transfer, a 0.5 acre pond was stocked with six mats bearing eggs. In this test the mats were placed on the slope of the dyke in water about 18 inches deep without anchoring them to the bottom. Most were floating within five hours of the transfer. In spite of this and the fact that the pond had been filled with water for two months before the transfer, a few of the eggs hatched and the fish grew to a size of about five inches. An undetermined number, possibly as many as 50, was recovered when the pond was drained seven weeks later.

DISCUSSION

Findings of this study indicate that largemouth bass will spawn on an artificial medium to an extent which will enable the fish culturist to gain control of a substantial portion of the eggs deposited in spawning ponds. Limited success in rearing fingerling bass from eggs placed on the nylon mats indicates that further investigation along the lines of incubating and caring for the newly hatched embryos may enable techniques to be developed which will provide a greater degree of control over the early stages of the bass rearing process than exists with present methods.

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