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PRELIMINARY OBSERVATIONS OF THE EFFECT OF TEMPERATURE ON STRIPED BASS EGGS AND SAC FRY

EUGENE H. SHANNON and WILLIAM B. SMITH
Division of Inland Fisheries
North Carolina Wildlife Resources Commission
Raleigh, North Carolina



ABSTRACT

Data gathered at the Weldon Striped Bass Hatchery, Weldon, North Carolina, during the years 1960-1967 indicated that the optimum spawn-

ing temperature range for striped bass in the Roanoke River was between 62° F. and 67° F. The minimum recorded temperature at which spawning has occurred was 55° F. and the maximum was 71° F.

Preliminary bioassays conducted at the hatchery during the 1967 spawning season substantiated this optimum temperature range, and further revealed that at temperatures of 74° F. to 80° F., the percent hatch dropped from 80 to 60 and the frequency of dead and malformed fry increased from 48 percent to 100 percent. At these higher temperatures, none of the fry, normal nor malformed, survived for more than 70 hours after hatching. Eggs incubated and hatched, and fry held, in water at 70° F., evidenced no mortality for 76 hours following hatch.

The bioassays also revealed that at water temperature ranging from 60° F. to 85° F., the incubation time of striped bass eggs was reduced from 58 to 25 hours, respectively.

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Background data for this paper were gathered from records compiled at the Weldon Striped Bass Hatchery of North Carolina between 1960 and 1967. The hatchery water supply is obtained from the City of Weldon, which draws from Roanoke Rapids Lake (a hydroelectric impoundment of the Roanoke River). Temperature differences between the hatchery water and the river were found to be negligible. Incubating temperatures in the hatchery, consequently, were assumed to be the same as the recorded river temperatures. Daily river temperatures recorded at Weldon during the period April 22 to May 31 for the years 1960 to 1967 have been graciously supplied by the Albemarle Paper Company, Roanoke Rapids, N. C.

The number of ripe (sexually mature) striped bass females brought to the hatchery per day by river fishermen was used as the index for estimating the intensity of spawning activity in the river. While this index did not reveal the true extent of the spawning intensity, it did appear to be directly correlated. On this basis, the dates of maximum spawning over the eight-year period has occurred between May 7 and May 24 (Figure 1).

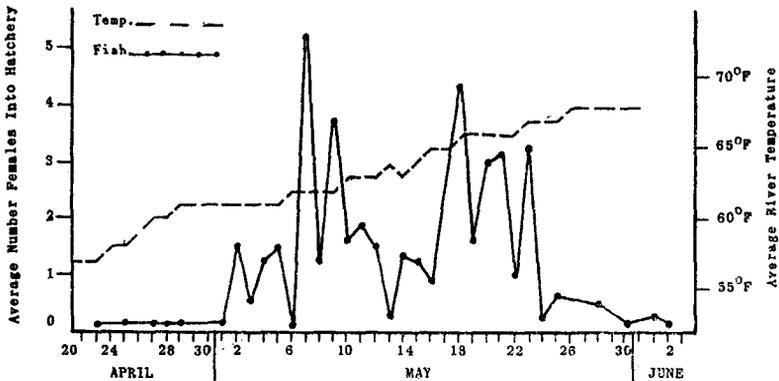


FIGURE 1. AVERAGE TEMPERATURES OF ROANOKE RIVER WATER FOR THE YEARS 1960-1967 DURING WHICH RIPE FEMALE STRIPED BASS WERE BROUGHT INTO WELDON HATCHERY

It was assumed that the range of optimum spawning temperatures would coincide with the dates of maximum spawning activities in the river. By comparing the average daily river water temperatures with the average number of sexually mature female fish brought to the hatchery during the eight-year period, it was determined that the optimum

spawning temperature range was between 62° F. and 67° F. The minimum river temperature during the study period at which a ripe female fish was brought to the hatchery was 55° F. and the maximum was 71° F.

The optimum spawning temperature range also appeared to include the temperatures most desirable for egg incubation (Table 1). By comparing the average daily river temperatures (April 22 to May 31) with the average hatch per season for each of the years studied, it was found that during the two years when the average daily water temperature fell outside the optimum temperature range the seasonal percentage egg hatch also was well below the normal range.

TABLE 1—THE RELATIONSHIP BETWEEN AVERAGE DAILY RIVER TEMPERATURES AND AVERAGE PERCENT HATCH IN THE WELDON HATCHERY FOR YEARS 1960-1967.

Year	Average Daily River Temp. from April 22 to May 31 (°F.)	Average Percent Hatch in the Weldon Hatchery
1960	61.4	40.4
1961	61.2	38.9
1962	64.1	62.7
1963	64.2	48.3
1964	64.6	68.0
1965	65.6	69.6
1966	63.7	57.2
1967	63.4	52.2

During the 1967 striped bass season at Weldon, continuous flow-type bioassays were used to observe the effects upon the development of striped bass eggs and sac fry when incubated at temperatures above the optimum range. The temperature of the water taken from the hatchery supply was elevated by passage through a constant temperature water bath and the heated water used directly in the egg tubes and holding flasks. Following fertilization, a random sample of 116 to 209 eggs taken from a single female was placed into the experimental tubes and incubated to hatching. Sac fry emerging from the tubes were held in flasks screened to prevent escapement. Temperatures used for testing were: 70° F., 74° F., 75° F., and 80° F. Eggs used in the 70° F. and 75° F. tests were placed into the egg tubes immediately following fertilization, whereas the eggs used in the 74° F. and 80° F. tests were incubated for 15 hours at 67° F. before being placed into the experimental tubes.

Five observations became apparent from the bioassay data analyses:

1. The percentage of fry hatched decreased as the incubation temperatures increased from 74° F. to 80° F. (Table 2).

TABLE 2—RESULTS OF TEMPERATURE BIOASSAYS USING STRIPED BASS EGGS AND SAC FRY AS TEST ORGANISMS.

Data	Temperature (°F)			
	70°	74°	75°	80°
Percent Egg Hatch	68	80	71	60
Percent Normal Fry	60	52	35	0
Percent Dead and Malformed Fry at Hatch	40	48	65	100
Percent Fry Survival to 70 Hours Following Hatching	100	0	0	0

2. The percent of normal fry hatched decreased with each increase in the test temperature (Table 2).
3. The percent of dead and malformed fry at hatch increased with successive increases in test temperatures (Table 2).

4. At 70° F., all fry were alive at 76 hours following hatch whereas at 74° F., 75° F., and 80° F., all fry were dead within 70 hours following hatch (Table 2).
5. Increases in water temperature decreased the time of incubation (Table 3).

TABLE 3 — THE EFFECT OF INCREASED WATER TEMPERATURE UPON INCUBATION OF STRIPED BASS EGGS.

Temperature (°F.)	Incubation Time (Hours)
60	58
70	34
74	30
75	28
80	25

COMPARISON OF GROWTH AND SURVIVAL RATES OF STRIPED BASS AND STRIPED BASS X WHITE BASS HYBRIDS UNDER CONTROLLED ENVIRONMENTS

By H. J. LOGAN

South Carolina Wildlife Resources Department

ABSTRACT

During the spring of 1967, 240,000 striped bass and striped bass X white bass hybrid fry were stocked in four one-acre dirt ponds. Each pond received 30,000 striped bass and 30,000 hybrids.

At the end of a 71-day period, approximately 23,187 were harvested in three ponds, 12.88 percent of the original number. A total kill occurred in the fourth pond one week prior to harvest.

Results indicate the hybrid having faster growth and higher survival rates.

INTRODUCTION

Using eggs from the striped bass and sperm from the white bass, hybrids were first produced at the Moncks Corner Hatchery in the spring of 1965 and have also been produced each succeeding season.

Attempts were made in South Carolina during 1965 and 1966 to rear hybrids in dirt ponds. Efforts in 1965 were quite limited and were unsuccessful. Based on experience gained in 1965, hybrids were raised successfully in 1966. From observations it appeared the hybrids exhibited a faster growth rate; however, without exposing both species to identical environmental conditions, conclusions could not be made.

PROCEDURE

During the spring of 1967, four one-acre ponds at the Heath Springs Hatchery were selected for continuance of the study. This phase of the study was designed whereby the hybrids and striped bass would be stocked in the same pond thus exposing both to an identical environment.

On March 13 all ponds were treated with "Nox-Fish" (containing five percent rotenone) at the rate of 1 p.p.m. Each pond was treated for backswimmers on March 27 using five gallons of fuel oil per pond.

For successful survival past experiments with striped bass and hybrids have indicated that sufficient zooplankton must be available at the time mouth parts become functional; this is usually six to ten days following hatching.