Striped Bass Culture Program Report 1990

by
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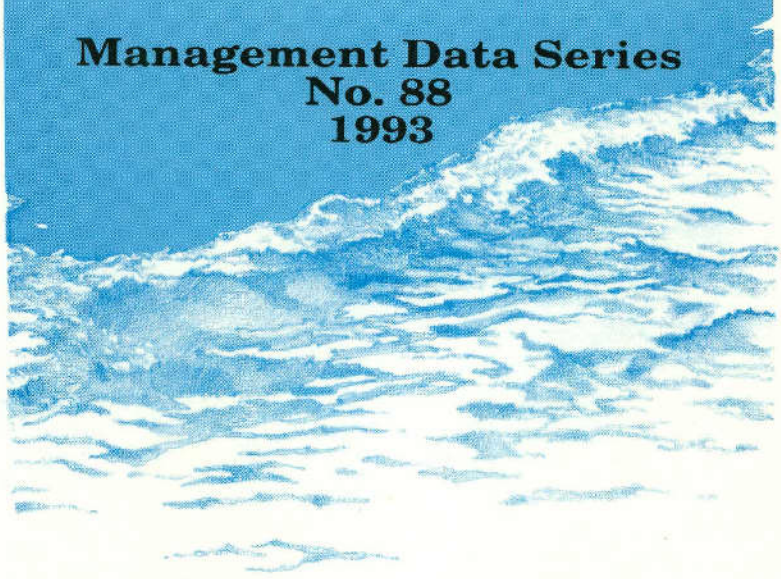

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ACKNOWLEDGEMENTS

This report was compiled through the efforts of all the personnel at the A. E. Wood, Dundee and Possum Kingdom hatcheries. From collecting fish, to preparing ponds and harvesting, to data collecting, writing and editing, every member's contribution was important and very much appreciated.

ABSTRACT

This report documents the 1990 Texas striped bass (Morone saxatilis) and hybrid striped bass (M. saxatilis x M. chrysops) production and compares 1990 data to those collected in previous years.

INTRODUCTION

Striped bass (Morone saxatilis) were once common along the Gulf Coast from Florida to Louisiana and Texas (Stevenson 1893), but now only remnant populations are found in this part of their historical range (Gulf States Marine Fisheries Commission 1986). In 1967, striped bass and hybrid striped bass (M. saxatilis x M. chrysops) larvae from out-of-state sources were brought to Texas. Although methods used for induced spawning of striped bass were developed by Stevens in 1966, Texas did not use them until 1972 when mature broodstock were found in Lake E. V. Spence (Follis 1973). Broodfish from this source were then used to produce striped bass and hybrid striped bass fingerlings.

This report documents 1990 striped bass and hybrid striped bass production. Data from 1990 are compared to those collected in previous years.

METHODS AND MATERIALS

Striped bass broodstock were collected by gill netting in Lake Toledo Bend and by hook-and-line near the Lake Toledo Bend intake structure at the power generating facility. Striped bass broodfish were also collected by hook-and-line in the tailrace waters below Lake Possum Kingdom.

Striped bass broodstock collections occurred at Lake Toledo Bend on 18, 19, and 20 April. Collections at the Lake Possum Kingdom tailrace were started on 23 April and continued until 01 May.

A collection attempt by electrofishing was made in the tailrace of Lake Granbury on 10 April, in the Lake Livingston tailrace on 18 April and in the Lake Kemp tailrace on 23 April. Other collection attempts were made by gill netting in Lake Buchanan on 21 April, Lake Kemp on 23 April and Lake Possum Kingdom on 28 April.

Three times in March collections were made for white bass broodstock males in the Brazos River above Lake Granbury. Collections were also made in Lake Possum Kingdom Lake on 20 March. All broodstock were shipped directly to the Possum Kingdom State Fish Hatchery and held in ponds containing forage fish.

The striped bass males and females collected were taken to shore by boat and placed in 1.8-m diameter circular tanks containing 15 mg/l MS-222. After the fish were anesthetized, their sexes were determined by inspection of the urogenital vents and palpation of the abdominal regions. Egg samples were removed from females immediately after capture using a 3.0-mm O.D. glass catheter (Rees and Harrell 1990). Eggs samples were then viewed with a binocular microscope and classified as either mature or immature. Mature females that were eligible for induced ovulation were weighed, tagged and injected with 68 IU/kg human chorionic gonadotropin (HCG). Mature males were weighed, tagged and injected with 34 IU/kg.

After injection, broodfish were loaded immediately on transportation vehicles which were equipped with aeration and compressed oxygen. Transportation media contained 1% NaCl, No-Foam®, and 1 mg/l oxolinic acid.

White bass males were also collected by electrofishing, transported to shore, sexed and loaded immediately into a transportation vehicle. The transportation media was the same as for striped bass broodstock.

When striped bass broodstock arrived at the hatchery, they were tempered 2 C every 30 min until the transportation water and the holding water temperatures were the same. The females were placed in 1.8-m diameter circular fiberglass tanks at three or four fish per tank for easy recapture. Males were placed in circular tanks or raceways.

A second egg sample was removed 20 - 28 hours after the initial hormone injection for prediction of ovulation. Ovulation was predicted using a set of photographs depicting hourly changes in striped bass eggs as they progressed toward ovulation (Bayless 1972). Manual palpation of the abdominal region was used to verify ovulation (Rees and Harrell 1990).

Spawning, egg and larval incubation, fry and egg enumeration, fingerling culture and transportation procedures were done as recommended in the striped bass culture guidelines (Warren in preparation) and were conducted at the A. E. Wood, Dundee and Possum Kingdom state fish hatcheries. To remove eggs, each female was anesthetized with a solution of 21 mg/l MS-222, applied to the gills as a spray. After the female was anesthetized, pressure was applied to the abdominal area, releasing eggs into a clean pan containing water, and milt from two striped bass males per female, or five males per female for hybrid production, was added.

Eggs were estimated before being placed into hatching containers using the water displacement method (Rees and Harrell 1990). Eggs were placed in 6-l McDonald hatching jars at 200,000 per jar. The percentage of eggs fertilized was recorded at 6 h post-fertilization.

At 1 to 3 days post-hatch, larvae counts were estimated using a volumetric method (Rees and Harrell 1990). Striped bass and hybrid striped bass prolarvae (1 to 4 days old) were held in various types of containers, from 113-l glass aquaria to 75-l fiberglass vats. Water flow in holding containers was sufficient to maintain water quality and keep the larvae suspended. While being held in containers, larvae were given daily formalin baths at 125 mg/l for 30 - 45 min to control fungus. Compressed oxygen was supplied to static containers when formalin treatments were given. Eggs and larvae were transported in sealed plastic bags with 3.8 l of water and enough oxygen to fill the bag when sealed.

Rearing ponds were prepared by spraying bottoms with an approved herbicide 10 - 15 days prior to flooding to prevent nuisance vegetation. Water used for filling ponds was passed through a 500-micron mesh filter to prevent fish eggs, small fish and fish pathogens from entering the pond. To provide time for adequate plankton development, filling of ponds was begun 10 to 14 days before stocking.

Ponds were fertilized with 280 kg/ha cottonseed meal at filling and then at 56 kg/ha beginning 5 days after the initial application and then twice weekly for 4 weeks (Geiger 1983). Liquid inorganic fertilizers were diluted with pond water and broadcast on the windward side of ponds at a rate of 0.5 mg/l nitrogen

as ammonium nitrate (33-0-0) and 1.0 mg/l phosphate as phosphoric acid (0-54-0). Liquid fertilizers were applied three times weekly prestocking and twice weekly for three weeks poststocking. Organic fertilizers were not applied when the minimum dissolved oxygen level was below 4.0 mg/l, and ponds with Secchi disk readings less than 24 cm did not receive applications of inorganic liquid fertilizers (Boyd 1979). The recommended rate for lined ponds at the Possum Kingdom hatchery was one-half of the earthen ponds.

Larvae were stocked into rearing ponds when their mouthparts were functional and when the fish were swimming horizontally (3 - 5 days post-hatch depending on water temperature). Striped bass larvae were stocked at a rate of 714,411/ha and hybrid striped bass larvae were stocked at 172,862/ha. Tempering at stocking took place in holding containers when possible. For the first 5 min, the exchange rate of pond water to holding container was 1 l/min, for the next 10 min, the rate of exchange was increased to 2 - 3 l/min.

Supplemental feeding was begun 14 days after stocking and a 50% protein salmon ration was used. The fish were fed three times daily at a rate of 4.5 kg/ha/d. Feeding rates were adjusted according to survival.

Harvest operations were completed in the early morning and fresh water was put into the harvest area to cool the pond temperature and attract fish. The fish were netted from the harvest area into a temporary holding tank at the pond site containing a medium of 1% NaCl, oxolinic acid, and No Foam®. Compressed oxygen was supplied to the holding tank to maintain dissolved oxygen levels.

Five samples of 20 fish each were weighed during the harvest operation. An average mean weight was calculated from the samples and used to calculate the total number of fish harvested.

Fingerlings were held overnight in holding troughs and transported early the next morning. Hauling units contained a medium of 1% NaCl, 1 mg/l oxolinic acid, and an anti-foaming agent. Dissolved oxygen levels were maintained with compressed oxygen. To prepare for stocking, fish were slowly acclimated by tempering with the water into which they were to be stocked until the two temperatures were equalized.

RESULTS

Broodstock Collection

A total of 71 striped bass broodfish, weighing 219 kg was collected (Table 1), while 254 white bass males were collected for anticipated hybrid striped bass production (Table 2). A total of 36 striped bass males and 35 striped bass females was collected. Female striped bass and male striped bass were shipped to the Dundee and Possum Kingdom state fish hatcheries for the production of fry and fingerlings (Table 1, Figure 1).

Insufficient numbers of striped bass females prevented the production of striped bass hybrids during 1990.

A total of 16 males was shipped to the Dundee State Fish Hatchery, and 20 males to the Possum Kingdom State Fish Hatchery. Eleven females were shipped to the Dundee State Fish Hatchery, and 18 females to the Possum Kingdom hatchery. Collection attempts at lakes Kemp and Buchanan were unsuccessful.

Egg and Fry Procurement

A total of 11.5 million striped bass eggs (Table 3) was collected from the 29 female striped bass collected (Table 1). At Dundee a total of 6.9 million striped bass eggs was collected, which produced 2.2 million fry for a 32% hatch rate, yielding a mean of 99,169 eggs/kg of female and 31,269 fry/kg of female (Table 3). Of the 2.2 million Dundee fry, all were stocked into culture ponds.

The Possum Kingdom State Fish Hatchery collected 4.6 million striped bass eggs, and 3.2 million fry were hatched for a 70% hatch rate (Table 3). A mean of 76,375 eggs/kg of female and 53,261 fry/kg of female was produced. All of the 3.2 million fry produced were stocked into culture ponds.

Pond Culture

Dundee produced a total of 704,516 striped bass fingerlings from eight ponds covering 3.15 ha. Possum Kingdom produced a total of 871,491 striped bass fingerlings from 19 ponds covering 5.68 ha. The 1990 striped bass production data indicated slightly higher productivity when compared with 1985-1989 data (Table 4).

Stocking Data

Ten lakes were stocked with approximately 1.4 million striped bass fingerlings (Table 5). Of the total number of fingerlings stocked, 514,201 were produced at the Dundee fish hatchery and 870,752 were from the Possum Kingdom hatchery.

Three Texas bay systems were stocked with a total of 337,724 striped bass fingerlings which were produced by the federal hatchery system (Table 5).

DISCUSSION

Problems were encountered in the 1990 collection of striped bass broodfish. Excessive water flow rates below lakes Livingston and Granbury (≥ 90,000 c.f.s) prevented timely collection of broodfish.

The number of striped bass fingerlings produced per ha was slightly below the 5-year mean, while kg/ha, kg/ha/day and percent survival were above the 5-year mean (Table 4).

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Table 1. Locations, number, and distribution to hatcheries of striped bass broodfish collected in Texas in 1990.

1990 Date	Site	Temp. (C)	Males			Females			Total			Hatchery Distribution			
			No.	Total Wt. (kg)	Mean Wt. (kg)	No.	Total Wt. (kg)	Mean Wt. (kg)	No.	Total Wt. (kg)	Mean Wt. (kg)	Dundee		PK[a]	
												♂	♀	♂	♀
10 April	Granbury	15.0	8	27.0	3.4	6[b]	39.0	6.5	14	66.0	4.7	8	-	-	-
18, 19, 20 April	Toledo Bend	17.2	4	16.6	4.2	7	45.4	6.5	11	62.0	5.6	4	7	-	-
23 April-01 May	P.K.[a]	17.0	24	54.0	2.3	22	75.2	3.1	46	91.2	2.1	4	4	20	18
	Total	-	36	97.6	-	35	159.6	-	71	219.2	-	16	11	20	18
	Mean	-	-	-	2.7	-	-	4.6	-	-	3.1	-	-	-	-

[a]Possum Kingdom

[b]All females were ineligible.

Table 2. Locations, number, and distribution to hatcheries of white bass broodfish collected in Texas in 1990.

1990 Date	Site	Temperature (C)	Males			Distribution to Hatcheries
			No.	Total Wt. (kg)	Mean Wt. (kg)	
13 March	Granbury	14.0	150	81.8	0.5	Possum Kingdom
16 March	Granbury	14.6	21	11.5	0.5	Possum Kingdom
20 March	Possum Kingdom	17.0	37	9.2	0.2	Possum Kingdom
21 March	Buchanan	20.0	46	13.6	0.3	A. E. Wood
	Total	-	254	116.1	-	-
	Mean	-	-	-	0.5	-

Table 3. Striped bass egg and fry production from fish collected in 1990.

Source of Broodstock	Hatchery	Females (kg)	Number of Eggs (millions)	Number of Eggs/kg Female	Number of Fry Produced (millions)	Number of Fry/kg Female	Hatch Rate (%)
Possum Kingdom	Dundee	23.9	2.4	100,329	1.1	45,592	45
Possum Kingdom	Possum Kingdom	60.7	4.6	76,376	3.2	53,261	70
Possum Kingdom Total		84.6	7.0	83,142	4.3	63,977	61
Toledo Bend	Dundee	45.3	4.5	99,696	1.1	24,068	24
Summary for All Fish		129.8	11.5	88,968	5.4	41,698	47
Hatchery Totals:							
	Dundee	69.7	6.9	99,169	2.2	31,269	32
	Possum Kingdom	60.7	4.6	76,375	3.2	53,261	70

Table 4. Striped bass production from rearing ponds during the period 1987 through 1990.

Year	Surface Area (ha)	No./ha	Weight Harvested			Survival (%)	Total Fingerlings (millions)
			kg	kg/ha	kg/ha/d		
1985[ab]	10.5	198,865	1,103	105	3.9	39	2.0
1986[ab]	17.6	119,855	880	50	1.7	19	2.1
1987[ab]	15.0	118,214	1,035	69	2.3	21	1.7
1988[a]	14.4	252,238	1,642	114	2.0	37	3.6
1989[a]	14.2	190,140	1,051	74	1.7	26	2.7
1990[ab]	8.8	172,367	832	94	2.5	29	1.6
5-Year Mean 1987-89	-	175,862	922	82	2.3	28	2.4
Comparison with 1990	-	- 3,495	-	+12	+0.2	+1	+0.8

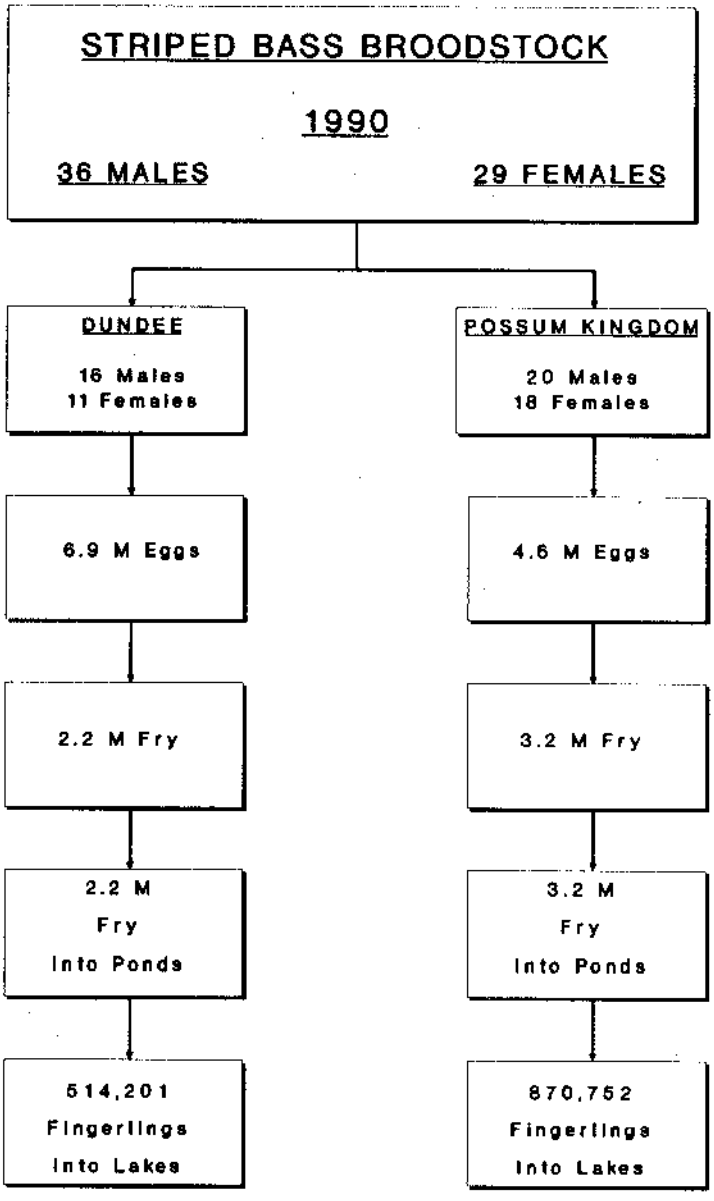
[a]Dundee
[b]Possum Kingdom

Table 5. Striped bass fingerling stocking data, 1990.

Hatchery	Site Stocked	Stocked
Dundee	Buffalo Springs	5,110
	Corpus Christi	237,745
	Lewisville	123,827
	Whitney	147,519
Possum Kingdom	Buchanan	238,908
	Canyon	41,985
	E. V. Spence	152,136
	Granbury	93,315
	Houston	122,879
	Possum Kingdom	221,529
	Total Inland Lakes	1,384,953
Inks NFH	Sabine Lake	5,644[a]
	Trinity Bay	11,316
Tishomingo NFH	Galveston Bay	131,600
	Sabine Lake	135,600
	Trinity Bay	53,564
	Total Stocked in Coastal Waters	337,724
	Grand Total	1,722,677

[a]Fish were tagged with coded wire tags.

Figure 1. Distribution of broodfish, eggs, fry and fingerlings.


STRIPED BASS BROODSTOCK
1990
36 MALES
29 FEMALES
DUNDEE
16 Males
11 Females
6.9 M Eggs
2.2 M Fry
2.2 M
Fry
Into Ponds
514,201
Fingerlings
Into Lakes
POSSUM KINGDOM
20 Males
18 Females
4.6 M Eggs
3.2 M Fry
3.2 M
Fry
Into Ponds
870,752
Fingerlings
Into Lakes

PWD–RP–N3300–393–2/93