COMPARISON OF PRODUCTION, SURVIVAL, GROWTH AND FOOD CONVERSION WITH THE MIXED SPECIES OF BLUE, WHITE AND CHANNEL CATFISH

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Abstract

This paper includes a discussion of polyculture studies with blue, white and channel catfish. Ponds containing channel catfish only served as controls.

This data points out that in brackish conditions such as ours and using our stocking ratios the stocking of straight channel catfish would give maximum yield. It is also believed that polyculture is a thing of the future and different species and stocking rates should be explored to obtain maximum production.

Introduction

Catfish culture studies have been conducted at the Rockefeller Wildlife Refuge of the Louisiana Wild Life and Fisheries Commission since 1966. This has been a cooperative venture with the Louisiana State University.

Fisheries research is relatively new to our division. Wildlife studies, consisting mainly of waterfowl and alligator

propagation projects, have been conducted by the Refuge Division for several decades. Numerous projects are presently underway concerning the various aspects of marsh ecology, development and management. We contended that the warmer climate of our vast coastal lands should offer longer growing seasons and possibly thousands of acres of marshlands now idle may possess a potential to catfish farmers. If catfish could be grown in waters unsuitable for any other crop, then a whole new industry awaits coastal waters.

The initial pilot study was in the form of a master's thesis, Perry, 1967. This indicated that under natural conditions both blue and channel catfish were present in marsh waters having salinities up to 11.4 ppt (parts per thousands). It was also found that blue catfish were more common in the more saline waters.

Studies initiated in 1967, demonstrated that channel, blue and white catfish could be successfully grown in coastal marsh impoundments too saline for other agricultural crops. The channel catfish proved to be the best suited for commercial production in coastal areas for one to two year old fish.

This paper reports on the results of our continued studies directed toward the improvement of growth, food conversion, survival and production by stocking mixed species of catfish.

We had hoped that by mixing blue, white and channel catfish

a larger harvest could be obtained. Possibly each of the species would occupy a different niche as it is a known fact that each of the fish have different habits. It has been stated by several workers that stocking 10 percent blue catfish with channel catfish would give added production. Also, some people have stated that by mixing species different growth patterns may be expected.

Study Area

The research ponds used in our experiments are located on Rockefeller Wildlife Refuge in the coastal marshes of Southwest Louisiana (Figure 1). The 84,000 acre refuge is owned and managed by the Louisiana Wild Life and Fisheries Commission. This area is wedged in between the Gulf of Mexico and the stranded beach ridge complex of Grand Chenier, Louisiana.

The research ponds, one-tenth acre each, were constructed in such a manner as to allow freshwater-saltwater manipulations in order to obtain desired salinity concentrations. Pond bottoms have a high organic content identical with the surrounding chenier plain marshes. The average depth is four feet.

Study Methods

Stocking.

Three stocking combinations were selected for this study. Each combination had three replications including the control ponds which were 100 percent channel catfish. A total of 12 ponds were

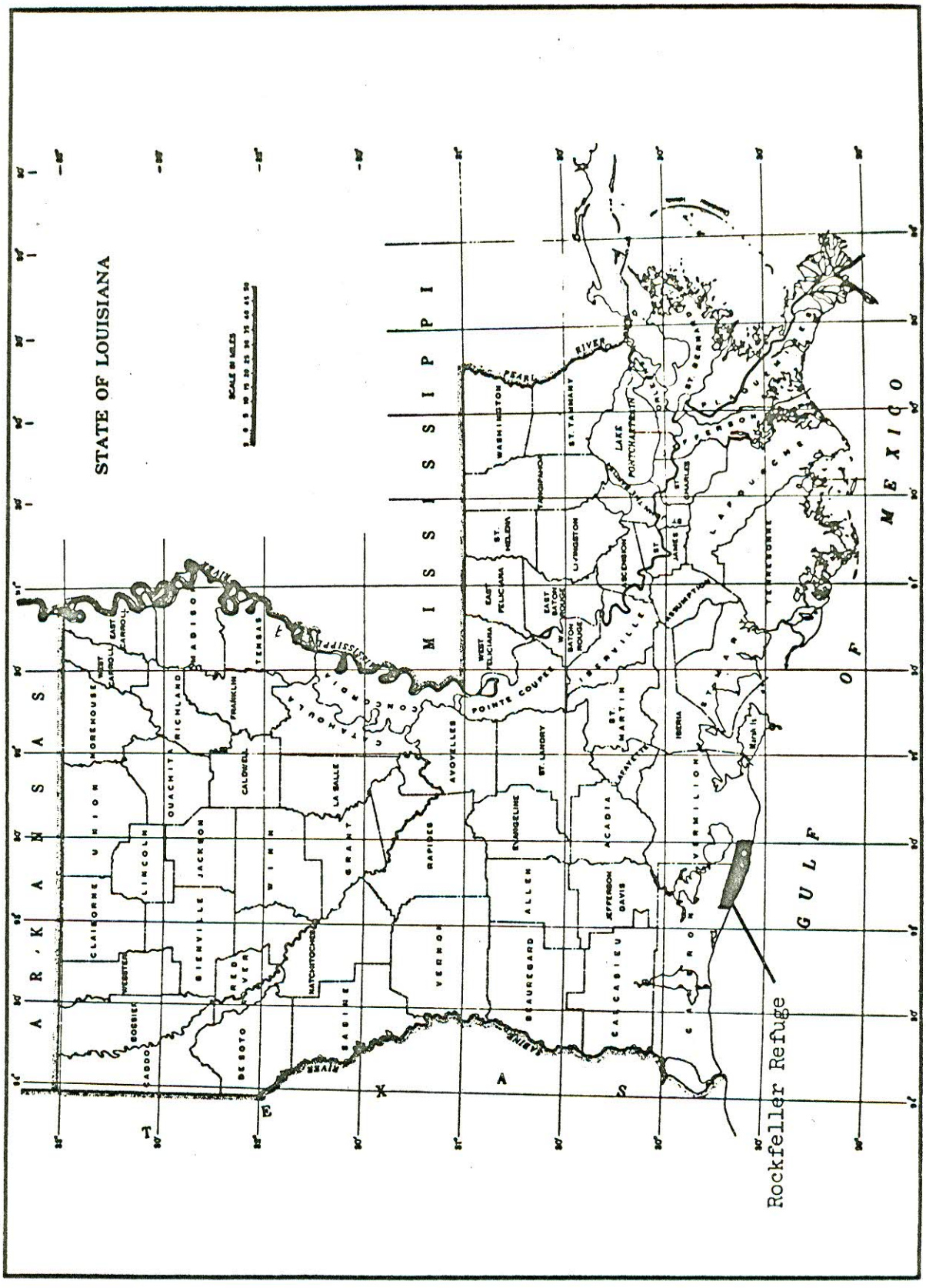
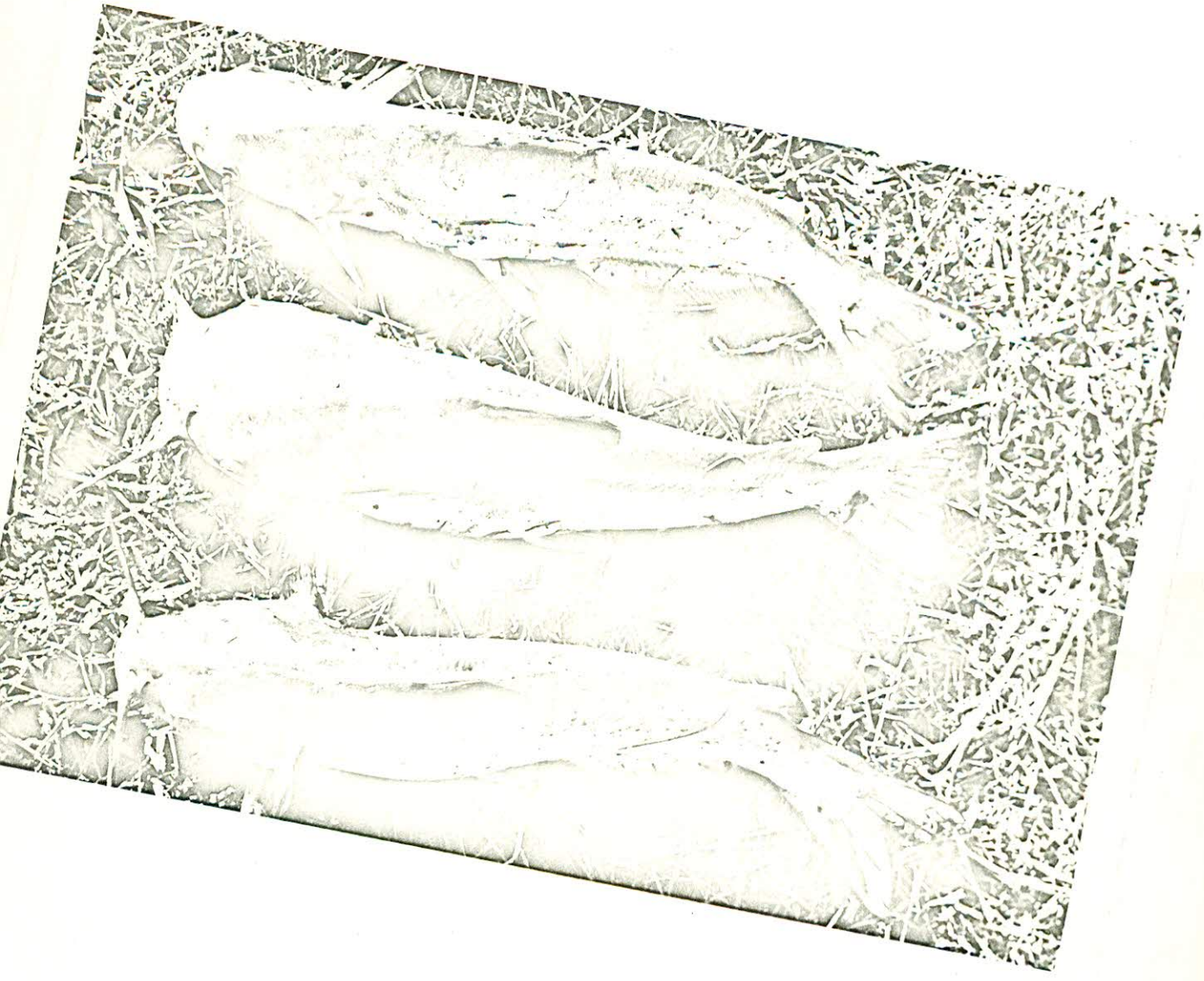


Figure 1. Rockefeller Wildlife Refuge, Grand Chenier, Louisiana

used for the study. The three stocking combinations selected were as follows: (1) 68 channel, 66 blue, 66 white catfish; (2) 100 channel, 50 blue, 50 white catfish; (3) 180 channel, 20 blue, 20 white catfish and the control consisted of 200 channel catfish per pond (Figure 2). Each pond was stocked with the equivalent of 2,000 fish per acre.

On March 19, 1970, fingerling white catfish were obtained from Auburn, Alabama and transported by truck to the refuge ponds. The fish ranged from 3 to 5 inches in total length and averaged 4.5 inches. The average weight was 10 grams. The fingerling blue catfish ranged from 5 to 7 inches and averaged 6.5 inches in total length. These fish averaging 23 grams were transported from Dumas, Arkansas, March 24, 1970. The channel catfish were given to us by the Richland Development Corporation Fish Farm located in Monroe, Louisiana, April 2, 1970. These fish were uniform in total length ranging from 3.75 to 5 inches. The average total length was 4.75 inches. The average weight of the channel catfish was 10 grams. Thus, all of the catfish stocked originally came from freshwater hatcheries and were stocked into our brackish water ponds with equal amounts of acclimation. Also, a prophylactic treatment of 15 ppm (parts per million) formaldehyde and 1 ppm acriflavine was given to the fish during transport to the ponds.

selected for our studies were blue, white and channel catfish (pictured from top to bottom).



Feeding.

Feeding was begun on March 20, 1970 and continued for approximately 218 days. Initally the fish were fed a 0.2 pound mixture of one-fourth floating and three-fourth sinking feed rations until they were accustomed to the floating. At this time the feeding rate was dropped to the standard 3 percent body weight of a floating feed. We did not use 100 percent sinking feed because we think the sinking feed would not have been accessible to the fish due to the mucky nature of the pond bottoms and the presence of a possible oxygen deficient or dead layer in the deeper areas. A 30-foot nylon bag seine was used in obtaining fish for the recalculation of feeding rates.

Water Chemistry.

A Model R-S-5 Beckman salinity meter was used during the study for salinity determinations. Oxygen concentrations were periodically checked using both the Winkler titration method and a Precision Galvanic Cell oxygen analyser. A Taylor Model 76J temperature recorder was used throughout the study. Records of minimum-maximum temperatures were recorded at a depth of 3.5 feet below the surface. This gave a more accurate picture of the temperature that the fish actually experienced in the shallow ponds. Portable Colormetric Hach pH Test Kits Nos. 17N and 17H were used for pH determinations.

Harvest.

The water had to be pumped from the ponds since they were constructed below sea level. The fish were then collected with dip nets and held in separate holding tanks until the ponds were empty. Then total and standard lengths were measured to the nearest millimeter and weights were recorded to the nearest gram for a comparison of the catfish species (Figure 3).

Results and Discussion

The average pond salinity was 3.4 ppt when the fish were stocked (Table 1). An average high of 6.2 ppt existed in August which declined to 3.6 ppt at harvest. The average salinities per pond was rather constant among the ponds throughout the growing season. Water temperature of the relatively shallow ponds fluctuated considerably (Figure 4). Temperatures were always above 45° F. and below 90° F. The pH values varied from 7.5 to 9.0.

With supplemental feeding the straight channel catfish pond gave the best returns (Table 2). The S-conversion of 2.4 was considerably better than the other three treatments. Treatment 3 (180 channel, 20 blue, 20 white) was the nearest with an average S-factor of 2.7. The channel catfish only pond had the highest average percent survival of 90 percent. Treatment 3 was next with an average survival of 85 percent. The control ponds also had the largest average size of fish, 0.72 pound. Treatment 2 (100 channel,

Figure 3. At the termination of the study, data such as total length, standard length and weight was recorded for production comparisons.

TABLE 1. SALINITY DATA IN PPT (PARTS PER THOUSAND) OF CATFISH PONDS, ROCKEFELLER WILDLIFE REFUGE, 1970.

Pond	March	April	May	June	July	August	September	October	November	December	Average per Pond
B-18	3.2	3.4	4.1	6.0	6.1	6.7	6.6	4.0	3.9	3.2	4.7
B-19	3.4	3.5	4.5	6.9	6.2	8.6	8.7	4.1	4.0	3.8	5.4
B-20	3.4	3.5	4.5	5.7	5.0	5.0	5.1	4.3	4.0	3.8	4.4
B-21	3.5	3.5	4.7	5.0	5.2	5.9	5.8	4.9	4.8	4.1	4.7
B-22	3.6	3.5	3.9	6.5	5.7	7.9	7.8	4.1	4.0	3.9	5.1
B-23	3.5	3.5	4.3	5.9	5.4	5.8	5.7	4.0	4.0	3.8	4.6
B-24	3.5	3.4	4.0	5.6	5.2	5.6	5.5	3.9	3.8	3.7	4.4
B-25	3.4	3.5	4.5	5.5	5.1	6.0	6.1	4.5	4.4	3.6	4.7
B-26	3.7	3.6	5.0	5.6	5.2	9.2	8.9	4.6	4.4	3.2	5.3
B-33	3.2	3.1	3.0	3.3	3.5	4.2	4.3	4.2	4.1	3.0	3.6
B-34	3.4	3.5	3.6	3.7	3.3	4.1	4.1	4.0	3.6	3.4	3.7
B-44	3.4	4.2	4.9	4.4	5.0	5.2	5.0	4.9	4.1	3.8	4.7
Monthly Average	3.4	3.5	4.2	5.3	5.1	6.2	6.1	4.3	4.1	3.6	4.6

FIGURE 4. MONTHLY MINIMUM-MAXIMUM RANGE OF TEMPERATURES RECORDED 3.5 FEET BELOW THE SURFACE OF ROCKEFELLER RESEARCH PONDS, 1970.

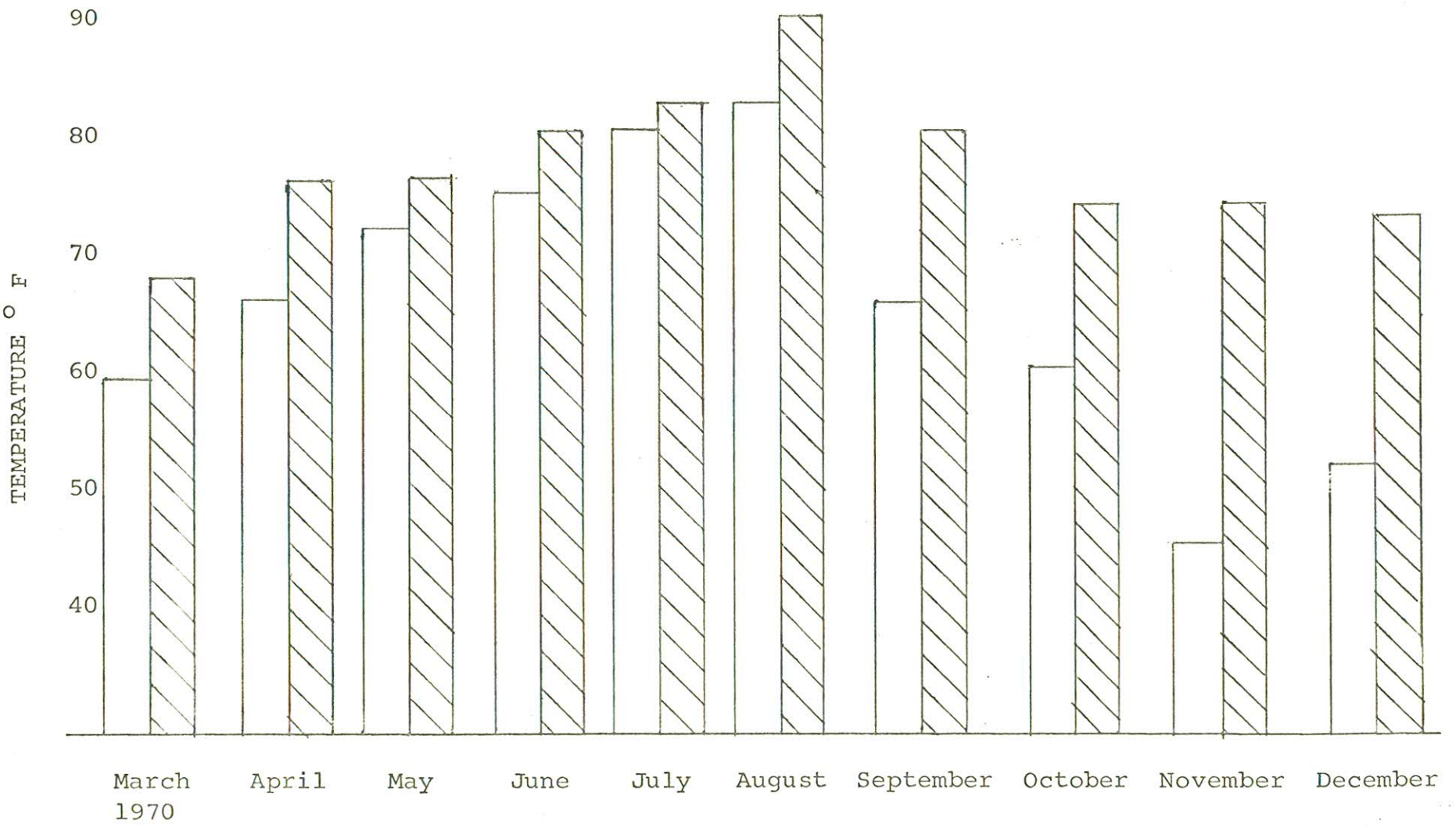


TABLE 2. AVERAGE GROWTH DATA FOR MIXED SPECIES OF BLUE, CHANNEL AND WHITE CATFISH GROWN IN 0.1 ACRE PONDS, ROCKEFELLER WILDLIFE REFUGE, 1970.*

	Treatment 1	Treatment 2	Treatment 3	Control
Number Stocked per Pond				
Channel	68	100	180	200
Blue	66	50	20	0
White	66	50	20	0
Average Weight Stocked (lbs.)	6.5	6.0	5.0	4.7
Average Size of Fish Stocked (lbs.)	0.03	0.03	0.02	0.02
Average Weight Recovered (lbs.)	114**	111	128	130
Average Size Recovered (lbs.)	0.64	0.71	0.68	0.72
Survival Percent	59	78	85	90
S Conversion	4.1	3.3	2.7	2.4

*Three ponds used for each treatment and the controls.

**Not including the pond that had 100% mortality due to oxygen deficiency.

50 blue, 50 white) was a close second with 0.71 pound. The average total weight harvested was 1,300 pounds per acre for the channel, 1,280 pounds per acre for Treatment 3, 1,110 pounds for Treatment 2, and 760 pounds per acre for Treatment 1 (68 channel, 66 blue, 66 white).

It should be pointed out that the difference in size of the fingerlings at the time of stocking did not affect the results apprecably. In our 1967 studies, the blue fingerlings were a little smaller than the others and in 1968 they were larger. Both years they gave the least amount of production. The blue catfish were twice as large as the channel and white catfish at stocking in 1970. Table 3 indicates what happens among species when such ratios are used and that blue catfish were last in every treatment. Our growth data showed that the blue catfish remained ahead in growth until July at which time the white and channel catfish caught and passed them. The channel catfish proved to be an important factor in our production data. The ponds containing the larger number of channels resulted in maximum production.

We have records of channel catfish production in brackish water since 1966 and this catfish has consistently proved to be a top producer when stocked in ponds.

With supplemental feeding the channel, white and blue catfish gave an average net production of 1,344, 890 and 430 pounds per

TABLE 3. PRODUCTION AND GROWTH DATA BY SPECIES OF BLUE, CHANNEL AND WHITE CATFISH GROWN IN POLYCULTURE STUDIES, ROCKEFELLER WILDLIFE REFUGE, 1970.*

Species Stocked	Treatment 1			Treatment 2			Treatment 3			Control
	Blue	Channel	White	Blue	Channel	White	Blue	Channel	White	Channel
Number Stocked per Pond	66	68	66	50	100	50	20	180	20	200
Average number Recovered per Pond	35	45	38	30	88	37	14	157	16	180
Percent Survival	53	66	58	60	88	74	70	87	80	90
Average Size Fish Stocked (lbs.)	0.05	0.02	0.02	0.05	0.02	0.02	0.05	0.02	0.02	0.02
Average Weight Recovered per Pond (lbs.)	19.8	34.2	22.3	18.9	65.1	27.7	5.7	108.0	14.5	129.5
Average Size (lbs.) Fish Recovered	0.56	0.76	0.59	0.63	0.74	0.75	0.41	0.69	0.91	0.72

*Three ponds used for each treatment and control.

**This treatment includes a pond that had 100% mortality due to oxygen deficiency.

acre, respectively in 1967, Perry, 1968. The channel catfish outgrew the rest averaging 1.3 pounds, had the best S-conversion factors, and had the highest percent survival with the blues having the lowest of these. The 1968 results followed the same general pattern. The channel, white and blue catfish gave an average net production of 1,808, 1,511 and 1,121 pounds per acre, respectively. A top pond production of 1,960 pounds per acre was obtained in a channel catfish pond, Perry, 1969.

Summary

Some workers are achieving better production by mixing such species of fish as fat head minnows, buffalo and catfish. Other researchers are stocking such exotic species as tilapia with catfish. The authors, presently, shy away from the latter as the tilapia is not found naturally in our state's waters. There are state laws which prohibit the possession, sale or importation of ~~one~~ ANY species of tilapia without a permit. There is still a lot to be learned about the life history of this species before it can be indiscriminately scattered about. One very productive species, Tilapia aurea, is presently being studied at Rockefeller Refuge in an effort to determine the effects of our winter temperatures upon survival.

In summary, it may be concluded from this study that the stocking of channel catfish only in brackish water conditions

resulted in greatest yield. It should also be pointed out that we believe polyculture to be a tool of the future. Different species and combinations of these species should be studied to obtain a maximum yield.

Acknowledgements

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