

Tilapia Growth and Production at the Medicine Park Fish Hatchery

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The quest for a fast-growing, highly prolific forage fish which may be fed economically to game fish has led to many experiments and studies.

The opportunity for testing a potential forage species in southwest Oklahoma was provided the Medicine Park Fish Hatchery (State Hatchery No. 1) in the Spring of 1961 when Dr. Howard Clemens donated thirty-two (32) brooder specimens of *Tilapia mossambica* from the Fishery Research Center at Noble, Oklahoma. This species has been studied in great detail in the area where it is indigenous, both as a forage form and as a food species for humans. For the latter purpose, *Tilapia* have been transplanted to many warm places over the earth, and have been grown jointly with other food species to utilize more completely the productive potential of fish culture ponds (Sarig 1955, Yashouv 1959, Yashouv and Hefetz 1959).

Tilapia is a member of the family Cichlidae which is native to tropical or warm waters of Africa, Madagascar, Syria, India, Ceylon and Central and South America.

In the Transvaal, Union of South Africa, where *Tilapia mossambica* is native, it is recognized by many names by both fishery biologists and anglers. "The kurper or fresh water bream, blue kurper, red finned kurper, Mocambique kurper or three spotted kurper" are some of the more common names. "The anglers refer to the male as the large-mouth kurper and the female as the small mouth kurper or in winter months or when the water is turbid, this fish is so light in color that it is also known as the white kurper", (Lombard, 1959).

The pond selected for the test drains well, is easily "fished", has an area of about 0.23 acre and an average depth of 2.3 feet, with a volume of 0.53 acre foot. The bottom slopes gently from the margins to a depth of six feet at the outlet box, and is of a sandy loam alluvium with a clay subsoil.

The surface temperature of the pond at the time of stocking on April 29, 1961 was 24.5° C (76.1° F) and at a depth of four feet, in the outlet box, was 18.5° C (65.3° F).

The brood stock consisted of fourteen (14) males which had an average weight of 93.55 grams and eighteen (18) females with an average weight of 57.22 grams. The stocking density was only one tenth of the stocking recommended by workers in the Transvaal, who stock 700 brooder fish per one-half acre.

"The female lays from 50 to 1000 eggs depending upon her size. Within three days the eggs hatch and the young are carried in the mouth until the yolk sac is absorbed. Still after liberation, the young may return to the mother's mouth for protection at signs of danger. The young may be cared for in this way for two or three weeks". (Lombard, *loc. cit.*). When small, the young prefer zooplankton but appear to take more algae and other plant material as they gain size. Our experiment, which included some aquaria of small fish, showed that they will take small aquatic insects and their nymphs, as well as dried milk and prepared dried commercial fish foods (Yashouv and Chervinski 1961). It is reported that *Tilapia*

mossambica will attain a size of 5 pounds 9 ounces. A specimen of this size was taken at the Hartebeestpoort Dam in the Transvaal. (Lombard, *loc. cit.*).

The period from stocking the brood pond to removal of the fish was 138 days, April 29 to September 14. Stocking time and the fishing date were determined by the temperature of the water at the hatchery. At each date, the water was well above the critical breeding temperature of 65° F, or the lethal 50° F (Lombard, *loc. cit.*).

Plankton was taken twelve times from samples of thirty gallons of water poured through a plankton net and measured volumetrically after centrifuging. No attempt was made to identify the different plankters. All samples were low in plankton except for one sample taken in vegetation on June 30th. Small *Tilapia* were feeding in the vegetation on this date (Table I).

The pond was "fertilized" with 1210 pounds of prairie hay (wild grass hay) in three applications. Each time it was done, the hay was scattered along the margins in shallow water.

Vegetation, in the form of algae around the walkway and *Potamogeton criapus*, *P. nodosus*, *P. pectinatus* *Chara*, *Najas guadalupensis* and *Polygonum* around the edges and shallows, were treated with copper sulfate and disodium endothal respectively. This step was taken since fishing the pond with these plants present would be difficult, and fish would certainly be lost. Copper sulfate was used on June 1, disodium endothal on June 14th and copper sulfate again on August 22 to remove the algae after death of the large plants and before fishing of the pond in September. Throughout the entire period of 138 days, the turbidity was very low. One sample was 12.5 ppm turbidity, the pH 7.2 and the methyl orange alkalinity 162.5.

The Medicine Park Hatchery production of 260 pounds per acre (Table III) of *Tilapia* compares favorably with production of *Tilapia mossambica* in certain of the natural conditions in the Transvaal where the species is native. There it may be found to produce from 100 to 250 pounds per acre, (Lombard, *loc. cit.*), and it can be made to produce approximately twice as much, by the use of 800 pounds per acre of agricultural lime and 165 pounds (19%) super phosphate or 200 pounds of basic slag (17%) per acre per year. Organic fertilizers, 2 to 7 tons of manure per acre per year, can be used together with phosphate. (Lombard, *loc. cit.*).

On September 14, the pond was drained and all fish were removed, weighed and measured. The most abundant species, *Tilapia mossambica*,

TABLE I — PLANKTON COLLECTION DATES AND VOLUME OF SAMPLE

Date	Cubic Centimeters of Plankton	Date	Cubic Centimeters of Plankton
5/11	2.8	6/30	.1
5/18	.9	7/6	5.0
5/25	3.0	7/13	1.5
6/1	.4	8/3	2.0
6/8	.15	8/10	3.5
6/22	.2	8/29	1.4

8.0 under
vegetation

accounted for about sixty pounds (Table II) of the total production, distributed among 3800 individuals of all sizes. There were many individuals less than one centimeter long which escaped all meshes of the screens and nets which were used in the operation of fishing the pond.

TABLE II — NUMBER OF TILAFIA, THEIR AVERAGE AND TOTAL WEIGHT IN GRAMS

Number of Fish	Average Weight in Grams	Total Weight in Grams
1,702	2.00	3,420
1,391	6.90	9,599
713	19.96	14,234
3,806		27,253
		59.95 pounds

All other species of fishes which occurred in the pond at the time of harvesting came into the pond by way of the water source as very small fry or "eyes". Of these, carp represented 18.21 per cent of the total pounds produced. Next in order by weight were the tadpoles of the bullfrog (*Rana catesbeiana*), included in their weight were a few crayfish. Of the predators present, the white crappie (*Pomoxis annularis*) accounted for 3.2% of the total pounds. The gizzard shad (*Dorosoma cepedianum*) was represented by 2.35 pounds or 2.2 per cent of the total production. The white bass (*Roccus chrysops*), bluegill (*Lepomis macrochirus*), log perch (*Percina caprodes*), green sunfish (*Lepomis cyanellus*) and the warmouth (*Chaenobryttus gulosus*) accounted for a little more than 0.9 per cent (Table III).

TABLE III — PRODUCTION BY SPECIES OF POND USED IN TILAFIA EXPERIMENT

SPECIES	Total Pounds	Per Cent of Total Pounds	Total Numbers	Pounds Per Acre
Tilapia	59.95	57.30	3,806	260.7
Carp	19.25	18.21	20	83.7
Tadpoles	19.00	18.16	Uncounted	82.6
White Crappie	3.40	3.20	179	14.8
Gizzard Shad	2.35	2.2	100	10.2
White Bass	.27		2	1.2
Bluegill	.14		6	.6
Log Perch	.13	.9%	8	.6
Green Sunfish	.07		1	.3
Warmouth	.02		1	.1
	104.58			454.8

The *Tilapia* were sorted and the smaller ones were fed to brooder largemouth bass *Micropterus salmoides*. The larger *Tilapia* were saved to be used as brooder fish in the Spring of 1962. They were taken to the Fishery Research Station where they will be held over winter in water above 70° F.

Table IV shows the increase in both length and weight of the brooders over the 138-day period. The males increased on the average 2.27 inches in length, the females 1.84 inches in length. The males increased their weight 2.26 times and the females increased their weight 53.4 per cent.

TABLE IV — CHANGES IN WEIGHT AND LENGTH OF BROODERS
during
138-DAY PERIOD

Sex	At time of Stocking April 29		At time of Recovery September 14	
	Males	Females	Males	Females
Length Range	6.1 - 7.5	5.3 - 6.2 in.	7.2 - 10.1 in.	7.0 - 8.0
Average Length	6.99	5.84	9.26	7.28
Average Weight	93.35 grams	57.22 grams	211.26 grams	87.78 grams

Since the brood stock gained in length and weight and reproduced as well, it is expected that the experiment will be continued in 1962.

LITERATURE CITED

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