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Laboratory Experiments on Raising Tilapia mossambica in Salt Water

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IN 1952 VAAS AND HOFSTEDE, in their "Studies on *Tilapia mossambica* Peters (ikan mudjair) in Indonesia," state that it is eurythaline and thrives and reproduces equally well in fresh and brackish water up to 30 parts per thousand salinity. From 30 parts per thousand to 40 parts per thousand its growth is satisfactory, but it does not reproduce.

The Leeward Islands of the Netherlands Antilles in the southern part of the Caribbean Sea are semi-arid and no fresh water ponds occur there, except temporarily. They are, however, provided with a great number of fairly large salt water inland bays with many arms. These bays are connected with the sea by a small entrance blocked by a bar. Remembering the brackish water fish ponds in Indonesia, called "tambaks," these West Indian bays seem well accommodated for the introduction and rearing of *Tilapia*.

It is highly desirable that a new source of cheap proteins become available to the inhabitants of these islands. Curaçao, with an area of 424 square kilometers, already has a population of 120,000. Moreover, there is a lack of bait fish. Both problems would be solved at the same time if *Tilapia* could be introduced into these bays and would be able to maintain itself.

The inland bays have a temperature varying between 26° and 34° C and a salinity from 36 parts per thousand to 40 parts per thousand. They have an area of one to two square kilometers and a depth of six to eight meters. The bottom is muddy, and sea grass and sea weeds grow along the borders. In the rainy period (November to March) humus from the island is washed into the bays. This may help in the production of bottom algae needed by these fishes.

Because of the high salinity, and with regard to the experience cited by Vaas and Hofstede, it appeared to be necessary before stocking a bay with *Tilapia* to carry on some laboratory experiments on its propagation in water of high salinity. By courtesy of Mr. H. W. Lyding, head of the fisheries in Surinam, on May 17, 1957, eleven *T. mossambica* were taken to Curaçao in plastic bags filled with rain water. All specimens arrived safely, and were placed in aquaria with fresh water, at a temperature of from 27° to 28° C. On June 10th, about 40 young were born. On August 11, ten specimens of this first generation to be born in Curaçao were put into a separate fresh water aquarium, through which a continuous flow of a mixture of fresh and salt water, in the proportion

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3:1, was run. After 48 hours the salinity appeared to be constant. After ten more days, more salt water was gradually added to the mixture until the salinity remained constant at 20 parts per thousand. In the aquarium containing this water, twenty-four *Tilapias* were born on October 4. Only nine specimens survived. Four of these were separated into an aquarium (100 x 50 x 60 cm) with running sea water (salinity 36.2 parts per thousand, temperature about 28° C). In this aquarium the fishes became adapted to their new food, marine algae (*Enteromorpha intestinalis, Cladophora* sp.) instead of fresh water algae. This did not seem to affect the fishes in any way, and their growth was equal to that of fish in the fresh water aquaria. In due time a male got its sexual coloration and started digging a nest. On December 9, a female showed the thick throat indicating that she had the eggs in her mouth. By December 14, twenty-one young had lost their vitelline vesicle and were swimming around in the sea water.

Since that time they have been spawning regularly in sea water at intervals of from twenty-eight to fifty days. This is normal sea water from the Caribbean Sea, flowing constantly through the ducts of polyvinylchloride and then wasted. The housing of the centrifugal pumps is of polyvinylchloride so that the sea water does not come into any contact with metal. The used sea water can be allowed to run to waste because the Institute is so close to the sea that no reservoir is needed.

So far the number of young born in sea water has never been greater than twenty-five. The size of the fish in the aquarium remains rather small, ten to twelve cm maximum, even if only one, two or three specimens occupy an aquarium of the same size. The same number of *Tilapia* raised in a bigger aquarium grow larger, so it appears that it is not only amount of food which determines the maximum size of fish, but the space available seems to be even more important.

In summary, it can be said, contrary to the remarks by Vaas and Hofstede, that *T. mossambica* reproduces well in sea water with a salinity of 36.2 parts per thousand, the growth of the fishes in sea water aquaria is the same as in fresh water aquaria, and that the number of spawnings per year is the same in water with salinities above 30 parts per thousand as it is in fresh or brackish water. The only difference observed is in the size of the fish. Whereas a specimen of *T. mossambica* in fresh water in a jar of 100 x 50 x 60 cm reaches a length of twenty cm and a weight of about 100 g at the age of nine months, the maximum size observed in a salt water aquarium of the same dimensions is ten cm and a weight of fifty g at the age of ten months.

No experiments have yet been made to cultivate these laboratory-born salt water *Tilapia* in the salt water inland bays of the Netherlands Antilles. However, this will be done in the near future.

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