

# Growth of *Tilapia mossambica* Peters in different salinities

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## INTRODUCTION

IN an earlier work (Canagaratnam, 1959) it was shown that some species of fish which could tolerate wide ranges of salinity grow better in the more saline environment. The cichlid, *Tilapia mossambica* Peters, a truly fresh water form, has been reported to grow and reproduce in brackish waters up to a salinity of about 2%. (Brock and Takata, 1955). Hickling (1950) stated that *T. mossambica* imported to Singapore from Java in 1943 by the Japanese was cultivated in fresh water and in brackish waters up to 2% salinity. Hora (1955) found that this euryhaline fish could tolerate, grow and breed in brackish waters up to a maximum of 3.5%. However, the author has not been able to find any references on the rate of growth or sizes attained by this fish in brackish waters.

The present experiment was conducted to study the rate of growth of this euryhaline species in fresh water and in different salinities and also test whether this fish attains a larger size in the more saline medium.

## MATERIALS AND METHODS

*Tilapia* fry were obtained from the Beira Lake in Colombo by means of a plankton net. Five lots of about 50 fry each were placed in tanks and the four lots to be introduced into the various saline media were gradually acclimatized to the desired salinity. After two days 15 fry were removed from each lot and transferred to five tanks of 10 gallons capacity each. These five tanks contained fresh water, 25%, 50%, 75% and 100% sea water respectively. The various concentrations of sea water used in this experiment were made up by diluting sea water which had a salinity of 3.5%.

The fry were fed thrice daily with 'pabulum', yeast and brine shrimp nauplii and the bulk of the material fed made up roughly 10% of their body weight. During later stages yeast was omitted from the diet and the quantity of brine shrimp nauplii increased. Although the Beira Lake is rich in plankton this was not used in feeding these fish, for tests of the salinity tolerance of this plankton showed that survival in saline media was of very short duration. On the other hand brine shrimp nauplii survived up to about 12 hours in fresh water and for many days in all concentrations of sea water. Since most of the brine shrimp nauplii were consumed within a few hours it was decided to use it as the main source of live food.

The fry were weighed initially and thereafter fortnightly. The method of weighing was similar to the one described in Canagaratnam (1959).

## RESULTS

The initial average weight per fish fry in each group of 15 was 0.20 g., 0.22 g., 0.21 g., 0.25 g., in fresh water, 25%, 50%, 75% and 100% sea water respectively. The numbers of fish surviving at the end of the fourth week were fresh water (10), 25% sea water (13), 50% (8), 75% (9) and 100% sea water (8). The experiment was terminated after eight weeks when all the fish in the fresh water tank died and only two fish were left in the 50% sea water tank. However, fish in 25% and 100% sea water were kept for several weeks longer to observe maturity and reproduction.

The average growth rate in the various media is expressed as a percentage of the initial average weight (Table I). The percentage increase on the initial average weights in the fresh water, 25%, 50%, 75% and 100% sea water at the end of the fourth week was 100, 150, 150,

190 and 100 and at the end of the eighth week it was 250, 491, 817, 876 and 512 respectively. The percentage increase was greater in the saline media than fresh water and the greatest recorded was in 50% and 75% sea water. The percentage increase in the four sea water media, at the end of the eighth week, is very significant. The growth curves (Fig. 1) distinctly show steeper slopes for the saline media indicating faster growth than in fresh water.

The fish in 25% and 100% sea water which were kept after termination of the experiment showed sexual dimorphism after the 14th week. These fish were 6-7 cm. in length at this time. The rich dark blue or velvety black body of the male was adorned with brilliant patches or streaks of red or crimson. The intensity of colouration was a manifestation of the height of courtship. As there were more males in the 25% sea water tank courtship activity was very pronounced. In both tanks the males dug the beds in the sand. About four days after the beginning of courtship 14 newly hatched fry were observed in the 100% sea water tank. No fry were observed in the 25% sea water tank. The fry in the 100% sea water tank survived for many weeks and grew to about the size of the parents.

### DISCUSSION

The result of this experiment further support the hypothesis that many euryhaline fishes grow better in saline media. All the saline media promoted faster growth of *Tilapia* than fresh water. The percentage increase in weight at the various intervals suggest that the intermediate concentrations of sea water seem to be more favourable media.

The relative sizes attained in the aquaria cannot be compared with that attained in the natural environment. Vaas and Hofstede (1952) observed that this euryhaline fish thrives and reproduces equally well in fresh and brackish water up to 3% salinity. From 3% to 4% its growth is satisfactory but it does not reproduce. However, in this experiment the growth was better in the saline media and reproduction was observed in 100% sea water (3.5%). The latter observation supports Hora's (1955) finding that this fish breeds in brackish water up to a maximum of 3.5% salinity.

The practical importance of growing *Tilapia* in brackish waters, where the saline concentration varies from 3% to 3.5%, is in its use as live bait. *Tilapia* has been experimentally used as a bait fish in tuna fishing operations in Hawaiian waters with good results (Brock and Takata, 1955; and Elliot, 1955). Hida et al. (1952) reared *T. mossambica* in fresh water up to the desired bait size and acclimatized before introducing them into sea water. Owing to the euryhalinity of *Tilapia* and the facility with which it breeds this fish could be cultured in brackish water, thereby, eliminating the need for acclimatization before being used as live bait in tuna fishing. It is also expected, from the results of this experiment, that growth to the desired bait size could be attained earlier in brackish waters.

### SUMMARY

*Tilapia mossambica* was found to grow better in saline media than in fresh water. The fish not only grew to maturity but were able to reproduce viable fry in 100% sea water.

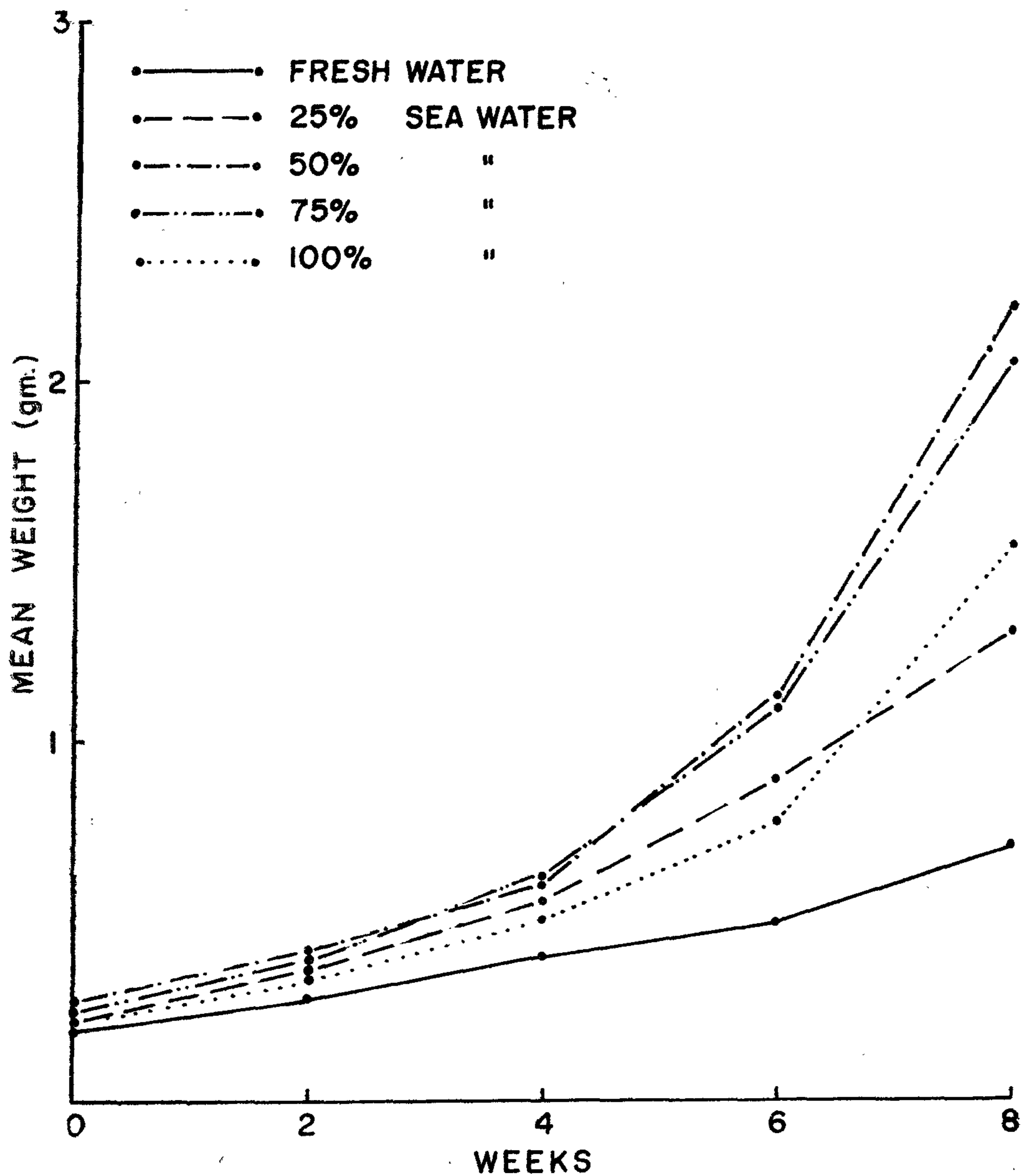


FIG. I. MEAN FORTNIGHTLY WEIGHT OF *Tilapia mossambica* PETERS IN FRESH WATER AND IN THE VARIOUS SALINITIES.

## References

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TABLE I

Initial average weight of *Tilapia mossambica* and the percentage increase in weight at the end of the 4th and 8th week. The number of fish surviving at each stage is indicated in brackets

		Initial average weight		Weight at end of 4th week		Percentage increase	Weight at end of 8th week		Percentage increase
		g.	No.	g.	No.		g.	No.	
Fresh water	..	0.20	(15)	0.40	(10)	100	0.70	(7)	250
25% Sea water	..	0.22	(15)	0.55	(13)	150	1.30	(13)	491
50% Sea water	..	0.24	(15)	0.60	(8)	150	2.20	(2)	817
75% Sea water	..	0.21	(15)	0.61	(9)	190	2.04	(5)	876
100% Sea water	..	0.25	(15)	0.50	(8)	100	1.53	(7)	512