

ON THE MOUTH-BREEDING CICHLID, *TILAPIA MOSSAMBICA* PETERS

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INTRODUCTION

WHILE suggesting the possibilities of developing the low lying coastal areas into artificial marine fish farms, Panikkar (1952) stressed the need for selecting quick growing species for introduction into Indian waters so that a profitable yield will be possible within a reasonably short period. Species of *Trichogaster* and *Tilapia* were recommended for this purpose for the several saline coastal lagoons, more particularly the latter, as it can establish itself successfully in a variety of environmental conditions satisfying most of the requirements for culture in salt water. Since then efforts have been made to introduce the fish in South Indian waters. The first experimental consignment was brought by the Central Marine Fisheries Research Station from Thailand with the permission of the Government of India and the second by the Madras Fisheries Department from Ceylon. The need to formulate a national policy before the exotic *Tilapia* is introduced into our waters had also been pointed out by Panikkar (*loc. cit.*) in view of the possible far-reaching consequences of such introduction without an adequate knowledge of the various interacting ecological factors.

Some information on the habits of this fish is already available, but as there appear to be divergent views on its suitability for culture in Indian waters, a critical study of the habits of the fish was felt desirable before definite steps were taken to culture it. In the following pages a general account is given of its so far known habits and some of our observations with particular reference to its food and feeding.

THE GENUS *Tilapia*

Tilapia belongs to a dominant group of perch-like fishes of the family Cichlidæ which includes fresh- and brackish-water species common in Africa including Madagascar, and extending to Syria, India and Ceylon and also to Central and South America. Its abundance in many of the Great Lakes of Africa gives it considerable economic importance in that continent. The only genus belonging to this family represented in our waters is *Etilapia* which is also found in the Middle East. Of the two species *E. maculatus* and *E. suratensis*, the latter, popularly called the Pearl Spot, is highly esteemed as a food fish growing to a length of over 12 inches while the former rarely exceeds 3 inches.

According to Copley (1952) there are 60 species of *Tilapia* and 30 species of *Paratilapia* distributed over a large part of Africa, the maximum size of the fish varying with the species. *T. nilotica* and *T. galilæa* attain a size of about 21 and 17 inches respectively. *T. mossambica* is known to grow to a maximum length of 14 inches while many other species are even below this size. However, all of them find a favourable market where they occur.

In their natural surroundings *Tilapia* species are omnivorous feeders with special preference for diatoms or algæ.

Sexes are separate and can be usually distinguished by the brighter colour of the males. Elaborate courtship is observed in the fish just before spawning time. The eggs are laid in pits made at the bottom from where they are picked into the mouth by either the male or the female and carried about until the embryos hatch and the young ones are able to fend for themselves. Only four exceptions among the species to the general habit of oral incubation of eggs which has earned them the name 'mouth-breeder' are known, namely, *guinasana*, *spaarmanii*, *melanopleura* and *zillii*. In others the eggs are incubated by either of the parents or by both. The references to the breeding habits of 18 species of *Tilapia* are shown in Table I below:

TABLE I

No.	Species	Breeding habits	Authority
1	<i>guinasana</i>	Not a mouth-breeder	.. Roloff (1938)
2	<i>spaarmanii</i>	do.	.. Hey (1945)
3	<i>melanopleura</i>	do.	.. Bertram <i>et al.</i> (1942)
4	<i>zilli</i>	do.	.. Bade (1923); Arnold and Ahl (1936); Bertram <i>et al.</i> (1942)
5	<i>simonis</i>	Eggs incubated by the female	Bodenheimer (1927)
6	<i>dolloi</i>	do.	.. Arnold and Ahl (1936)
7	<i>nilotica</i>	do.	.. Boulenger (1908)
8	<i>galilæa</i>	do.	.. Irvine (1947)
9	<i>mossambica</i>	do.	.. Roloff (1937); Seleuthner (1941)
10	<i>macrochir</i>	do.	.. Huet (1952)
11	<i>microcephala</i>	Incubation by the male	.. Schreitmüller (1920)
12	<i>macrocephala</i>	do.	.. Stoye (1935)
13	<i>discolor</i>	Incubation by male or both sexes	.. Irvine (1947)
14	<i>huedeloti</i>	do.	.. Irvine (1947)
15	<i>shirana</i>	do.	.. Barnard (1941)
16	<i>nigra</i>	do.	.. Barnard (1941)
17	<i>squamipinnis</i>	do.	.. Barnard (1941)
18	<i>multifasciata</i>	Sex of incubating parent not known	.. Irvine (1947)

Tilapia mossambica—EXISTING KNOWLEDGE AND PRESENT OBSERVATIONS

On August 7, 1952, a batch of 50 fingerlings of *Tilapia mossambica* was brought to the Central Marine Fisheries Research Station.^{1, 2} These were first flown from Bangkok to Calcutta in an oxygenated tin container and thence transported by rail in a mud pot. The fingerlings, 47 to 64 mm. in length, successfully survived the transport by air and rail. On arrival at Mandapam they were kept under observation in different glass aquaria and ponds.

Adaptability to salinity.—Although *Tilapia* is normally an inhabitant of fresh-water, it can tolerate a fairly wide range of salinity, except sudden changes from fresh-water to water of high salt concentrations which are harmful and cause a large percentage of mortality. Thus its behaviour in waters of varying salinities is somewhat different from that of the milkfish *Chanos chanos* which, though normally a marine species, is able to withstand abrupt changes in the salt content of the environment (*cf.* Panikkar, Tampi and Viswanathan, 1953). Ten individuals were subjected to a gradual change from fresh water to sea water (salinity 34.5 parts per thousand) in three stages during the course of a week. All of them remained in a healthy state in running sea water and reproduced in the normal way. Vaas and Hofstede (1952) found the fish tolerating salinities up to 6.9 per cent. and spawning in waters of salinity ranging from 3.0 to 4.8 per cent. It is, however, clear that the fish can thrive in brackish waters with salinity equal to about 20 parts per thousand.

Food and Feeding.—*Tilapia* species are known to be vegetable feeders in their natural habitat. Worthington (1932) found *T. exculenta* feeding on phytoplankton. Fish (1951) made a critical study of the contents of the stomach and rectum of the same species and came to the conclusion that only diatoms, amongst the phytoplankton, were digested, the blue-greens and the green algæ passing through the gut undigested. Huet (1952) found *Tilapia* feeding on encrusting Chlorophyceæ and diatoms and occasionally on higher plants, insect larvæ, worms, crustaceans and even detritus. According to him *T. melanopleura* is a herbivore and so also the young ones of *T. macrochir* which feed exclusively on vegetable micro-organisms. Le Mare (1951) found in them a preference for planktonic crustacea, notably

¹ The consignment was obtained through the courtesy of Dr. Boon Indrabarya. Arrangements for sending the fish to India were made by Dr. G. L. Kesteven. Our grateful thanks are due to them and also to Shri S. K. Banerji for the care bestowed in bringing the fish to Mandapam from Bangkok.

² It may be pointed out in this connection that this is the first introduction of *Tilapia* into India. The import of the fish by Devadas and Chacko (1953) took place later.

larval Penæids and larval *Acetes*, in well-fertilized ponds in estuarine areas in Singapore. Recently Vaas and Hofstede (1952) after examining the gut contents of more than 500 individuals from over 30 localities, came to the conclusion that *Tilapia mossambica* is a vegetable feeder.

Our observations give no precise indication of the fish being a planktonic feeder. Several of the smaller zooplankters (the planktonic copepods) are usually not eaten while slightly larger types like amphipods, larval shrimps and worms are chased on detection. The stomach contents of young fish invariably showed a large number of diatoms and Chlorophyceæ which seem to form the major items of food besides weeds. In one of the experimental tanks a group of fish (with an average length of 45 mm.) was kept with a variety of green algæ and water plants like *Hydrilla* and *Chara*. The fish were found to nibble at some of these plants, particularly the leaves of *Hydrilla*, but at the end of several days the fish began to grow emaciated and started dying one by one on account of starvation as evidenced by the scanty stomach contents. The fish fed well on *Wolffia*, both in ponds and in the aquaria. But it was observed that the growth of the fish living in a pond with plenty of microflora (mainly species of *Cælastrum*, *Cælosphaerium*, *Chroococcus* and Nitzschioid diatoms),³ flagellates and other protozoans was not satisfactory as compared to that reported from their more natural habitats. This may be, as Fish (1951) has pointed out, due to the fact that the fish are unable to digest some of these swallowed in the absence of the right type of diatoms.

In the aquaria and in ponds individuals of *Tilapia mossambica* readily take to artificial food unlike *melanopleura* which does not eat artificial food until it decomposes and promotes a rich growth of phytoplankton (Huet, 1952). Thus it is easy to keep them in the aquarium in a healthy state on a mixed diet consisting of minced clams, flour and sheep liver. Occasionally very early stages of insect larvæ and fish larvæ may also be eaten, although not habitually. Thus, *T. mossambica* can grow very well in the same tank along with the fry of the milkfish, mullets and carps. Though in small aquaria the adults prey on newly liberated fry of the same species, they are not normally cannibals.

Sex differentiation and Gonads.—Sexes can be distinguished when the fish are about 35 mm. long. The male slowly develops blackish brown pigmentation all over the body and a reddish colour along the fringe of the dorsal, caudal and anal fins. The opercula become bright yellow in colour and the eyes become darker. The female does not show much change in

³ Determined by Dr. F. Thivy, to whom our grateful thanks are due.

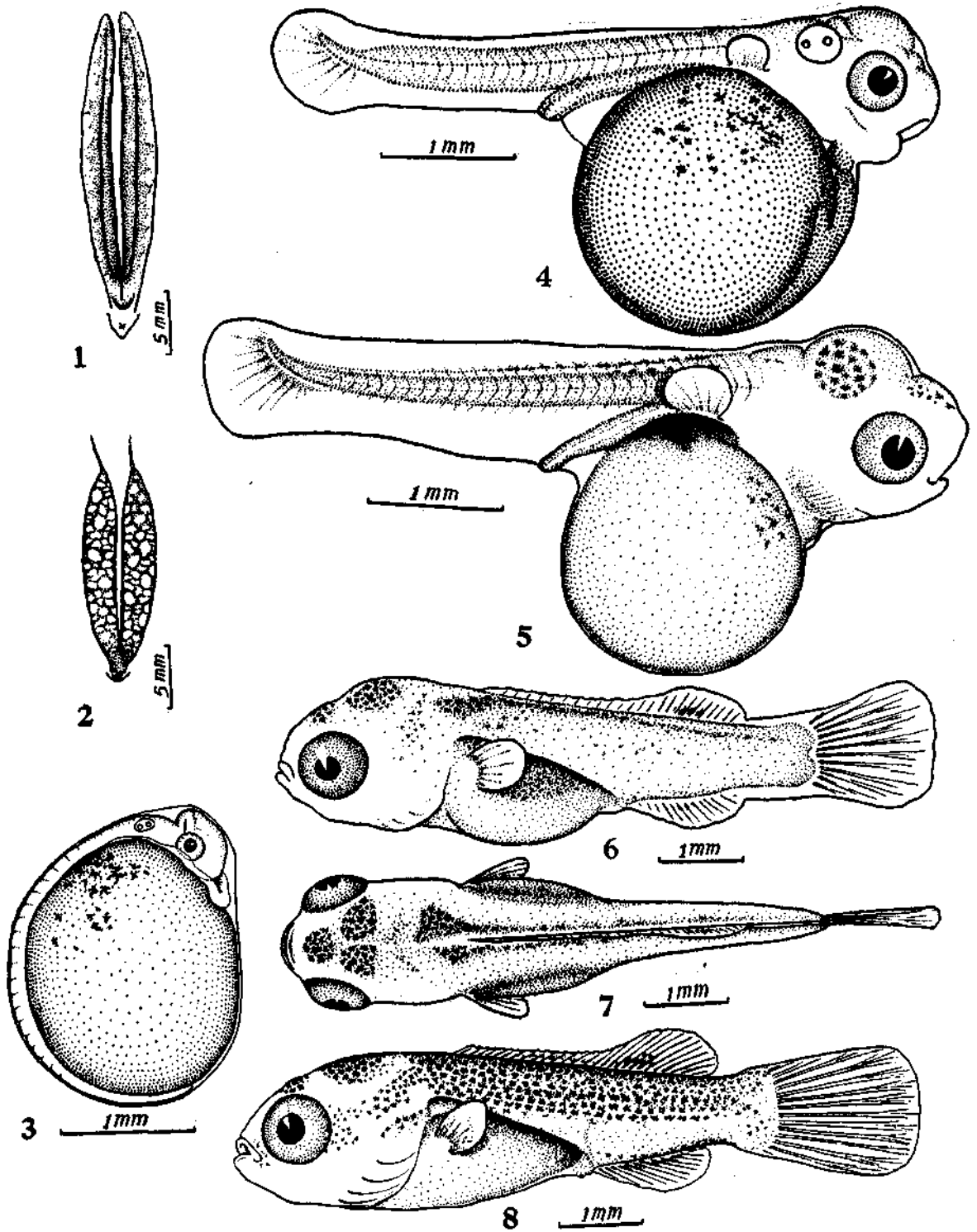
coloration except that the vertical bands towards the dorsal region of the body become more prominent (Plate V).

In the same brood the males usually grow faster than the females and are invariably the largest fish in the tanks. Differences in size between the sexes among *Tilapia* are known to exist as in *T. melanopleura* and *T. macrochir* (De Bont and De Bont-Hers, 1950). Vaas and Hofstede (1952) found the males of *T. mossambica* growing faster than the females and that spawning and mouth-breeding interfered with growth as in the case of many other mouth-breeders. Graham (1929) found no great difference in size between the sexes in *T. esculenta*. Similarly in *T. saka*, *T. squamipinnis* and *T. lidole* the males and females were found to grow at the same rate (Rosemary, 1952).

The testes and ovaries in mature fish have been examined. The testes of a fish of 105 mm. in total length (Fig. 1) are 22 mm. long and nearly 3 mm. broad. The two testes are equally well developed, almost flat and gently tapering at either end. They are free except at the posterior end where they are united. A short 'genital tube' (comparable to the genital papillæ in other fishes) is present which protrudes during courtship as a white conical structure.

The right and left ovaries are equally developed. In a fish 80 mm. long the ovary which is cylindrical attains a length of 15 mm. (Fig. 2) or much larger when the eggs are mature. The arrangement of the ovarian eggs within the ovary bears no relationship to the stages of their development or to their sizes. The ovaries are yellowish in colour when distended with eggs and open at the tip of the genital tube which is less prominent than in the males.

Breeding habits.—Breeding usually starts when the fish are about two months old and are 9–10 cm. long (Vaas and Hofstede, 1952). Fish of 55–60 mm. size have been observed to carry embryos in their mouth. The breeding habits are in general agreement with those of *T. macrocephala* as described by Aronson (1945 and 1949). Baerends *et al.* (1950) have dealt with the behaviour of *T. mossambica* in a monograph. The males make a shallow circular pit 25 cm. in diameter and 6 cm. deep by scooping out mouthfuls of sand and depositing them near the margin of the pit. Occasionally the pit is also deepened by vigorously fanning the bottom with the fins. Very elaborate courtship as observed in *T. macrocephala* is also seen in *T. mossambica* during which the eggs are extruded by the female. The male then "passes-nest" rubbing its genital tube over the newly laid eggs,



FIGS. 1-8

FIGS. 1-8. Fig. 1. Testes of *T. mossambica* (from a fish of 105 mm.). Fig. 2. Ovaries from a fish of 80 mm. Fig. 3. Developing embryo before hatching. Fig. 4. Larva 17 hours after hatching. Fig. 5. 2nd day after hatching. Fig. 6. 5 days old larva. Fig. 7. The same, dorsal view. Fig. 8. Fry, the stage at which it is liberated by the parent.

fertilizing them. The female approaches the eggs and picks them up in its mouth after the male moves away. Sometimes the eggs are picked up by the female after the lapse of two or three minutes. In one instance the eggs were not picked up at all and subsequent examination proved that they were unfertilized.

The number of eggs laid by a single individual often varied from 32 to 66, the maximum number so far met with in a single instance being 104. Aronson (1949) observed that the larger females of *T. macrocephala* tended to lay a greater number of eggs than the smaller, attributing this difference to the age factor. Up to 287 eggs have been found in the mouth of *T. squamipinnis* and 324 young ones in the mouth of *T. karongæ* (Rosemary, 1952).

Important differences between the breeding habits of *T. macrocephala* and *T. mossambica* are given below:

<i>T. macrocephala</i>	<i>T. mossambica</i>
Nest-building is first observed only after intensive courtship has been in progress for several hours or even days.	Courtship and nest-building are performed almost side by side.
Oviposition is completed in 2-4 cycles during which the male intermittently "passes-nest".	All the eggs, irrespective of their number, are laid in one batch before they are fertilized by the male.
Oral incubation is done by the male. When the number of eggs is too large for the male to accommodate, the female also helps by picking up the rest.	Eggs are usually incubated in the mouth of the mother.

The eggs and their incubation.—The eggs are yellowish in colour, somewhat pear-shaped, and measure 2.0×1.75 mm. During the period the eggs are incubated (10 to 12 days) the mother does not feed. The incubating parent can be recognised by its distended throat full of eggs, and in the aquarium, by its aloofness from other fish. On release from the mouth at the end of the incubating period the young fry swim together by the side of the mother which guards the fry carefully, until at the approach of danger they dart back into the mouth of the mother to be released again. In *T. macrocephala* the eggs which are hatched in 5 days are retained in the mouth of the parent for a further period of 2-15 days during which the larvae

continue to develop. Aronson (1949) found considerable variability in the number of days of incubation and was of opinion that the broods carried longest were the ones to be furthest advanced in development. According to Vaas and Hofstede (1952) "The time of incubation seems to differ considerably; it lasts until the yolk is wholly absorbed. . . . For *mossambica* the data are ranging from 13–21 days. According to Baerends, the first young are ejected after 10–12 days. Our findings indicated in most cases 10–14 days, for the total time from spawning till the moment the young are no longer taken into the mouth, and 3–5 days necessary for the eggs to hatch within the mouth. Hickling (*l.c.*) mentions 10 days for *mossambica* grown in Malaya." In *T. saka* and *T. squamipinnis* Rosemary (1952) observed that the eggs and young are brooded for three or four weeks.

Fertilized eggs retrieved from the mouth of the mother and kept in fresh-water tanks hatched and developed in the normal way. 25 out of 26 embryos thus taken from a fish hatched out and survived without mortality. It has been possible to study the developmental stages from the embryos thus hatched in the laboratory. Although a detailed account of the development is available in the paper by Vaas and Hofstede (1952) details useful to workers in India are given here.

Larval stages.—As the development of the embryo progresses a few small brown chromatophores appear on the surface of the yolk (Fig. 3). The egg membrane bursts, the tail of the embryo comes out first and by its lashing movements the embryo wriggles out. The newly hatched larva is transparent with a round yolk attached to the ventral side. The eyes are pigmented and a few branching chromatophores (dark brown in colour) are visible on the yolk. Rudiments of the pectoral fin and a continuous fin-fold extending from the dorsal side around the caudal fin to the anus are present (Fig. 4). The larva is 5 mm. in length. On the second day after hatching the embryo has grown to 5.8 mm. in length with a slight reduction in the size of the yolk. A dense accumulation of black pigment on the dorsal side of the yolk just below the position of the pectoral fins appears and a few stellate chromatophores also persist. Pigmentation on the head and body starts appearing. The mouth is also formed (Fig. 5). The actively wriggling larvæ are unable to swim about freely near the surface because of the heavy yolk. On the third, fourth and fifth days there is a gradual increase in the length of the larva and a general increase in body pigmentation. The chromatophores on the head and the dorsal side of the body assume more or less definite patterns on the fifth day (Figs. 6 and 7), and the pigmentation on the dorsal surface of the yolk also persists. Further

reduction in the size of the yolk is noticed and the larva is able to swim about more actively with the mouth opening and closing regularly. The dorsal fin slowly becomes divisible into the spiny and soft dorsal portions and the anal fin also grows prominent; but these are still connected with the caudal by the remnant of the fin-fold over the caudal peduncle. At the base of the soft dorsal, the beginnings of a dark spot characteristic of the later stages appear. At the end of the fifth day the larva is 8.0 mm. long, swims about near the surface of water and feeds on tiny particles of food (wheat flour and yolk of egg) supplied to it. The yolk of the embryo is gradually absorbed.

Under normal conditions where the eggs are incubated in the mouth of the mother, the fry are set free usually only after the yolk is completely absorbed. At the time the fry are liberated they are usually 8.0 mm. long. The dorsal side of the body is covered with stellate chromatophores while the ventral is silvery white. Dark pigmentation of the peritoneal membrane as also the dark spot at the base of the soft dorsal are characteristic of this stage (Fig. 8).

It has not been possible to ascertain the precise frequency of spawning in the fish. The first spawning since its introduction to Mandapam on 7-8-1952 was noticed on 16-10-1952. Under aquarium conditions we have not been able to make regular observations to establish the number of broods which the same pair of fish can produce in the course of a year. According to Vaas and Hofstede (1952) "Mature females were observed to lay eggs at intervals of 30-40 days. As is the case in African lakes situated near the equator, spawning can take place the whole year round." Judging from this there should be at least eight broods during a year. In Southern Taiwan (China) Tung-Pai Chen (1953) observed that this species spawned at an interval of 22 days and that one fish had about 11 spawnings within the course of a year. The interval between successive spawnings in the related species *T. macrochir* is reported to be 4-5 weeks while in *T. melanopleura* it is 7 weeks and the number of broods during the year is 6 and 4 respectively (Huet, 1952). We have found that *T. mossambica* breeds when it grows to a total length of 55-65 mm. which is attained in about five months in the aquaria. The reproducing size as given by Vaas and Hofstede (*loc. cit.*) for this species is 8-9 cm. at an age of approximately 2-3 months. The aquarium conditions under which our observations have been based are obviously responsible for this difference. For the two species *T. macrochir* and *T. melanopleura*, Huet (*loc. cit.*) reports 20 cm. as the reproducing size which is reached in 10-11 months.

SUITABILITY OF *T. mossambica* FOR CULTURE IN INDIAN WATERS

The information gathered so far at Mandapam and elsewhere on the behaviour of *T. mossambica* seems to bring out many points in favour of its suitability to our waters. These may be examined here in greater detail.

(i) *Adaptability*.—Although *Tilapia* is not as adaptable as the milkfish, it is beyond doubt that the fish can tolerate a wide range of salinity from purely fresh-water to water of as high a salt concentration as 3.0–4.8 per cent., and can grow and breed under these conditions. The great advantage in this salt tolerance can be appreciated when we consider the fluctuations in salinity to which many of the natural lagoons along our coast are subjected during different seasons of the year.

(ii) *Feeding habits*.—As in the absence of its usual plant food (diatoms and algæ) the species is able to feed on larval crustacea, insect larvæ and worms, it has better chances of thriving than a purely vegetarian or carnivorous species. In the case of the milkfish *Chanos chanos*, the specific preference for particular types of microflora shown by the fish may sometimes be a disadvantage for satisfactory growth. Excepting for occasional larvivorous propensities exhibited by the fish in captivity, *Tilapia* do not show predatory habits and have not been found to harm other fish which are allowed to grow along with them. Even in small ponds at the Fisheries Station *Tilapia* have been reared successfully along with the fry of the milkfish, mullets, carps and prawns.

In many of the eastern countries the practice seems to be to culture *Tilapia* along with other species of fish and prawns. In Java, *Tilapia* is hardly ever grown alone in large fresh-water ponds because of its suitability to be raised as an additional crop together with other species. The experiences of fish culturists of these countries may be recounted here. Le Mare (1953, unpublished report) found that in brackish-water ponds in Penang where prawns and *Tilapia* are cultured together, the prawn yield was affected to some extent although the increased yields of *Tilapia* probably more than counterbalanced the loss of prawns. A community of *Tilapia*, common carp (*Cyprinus carpio*) and the Goramy (*Osphromenus olfax*) seemed to work extremely well. He further states "We have found that nowhere in this country has *Tilapia* proved inimical to any other fishery, but has established itself only where culture methods have been carefully followed" (Private communication). In Thailand (communication from Dr. Boon Indrambarya, 1953) the population of small fresh-water shrimps in the ponds does not seem to be affected by the presence of *Tilapia*. Fish farmers in China seem to have felt some unwelcome effects of cultivating *Tilapia* in *Chanos* ponds.

Chinese carp culturists in Singapore consider *Tilapia* even as a pest. Apart from competition for food, it is stated that *Tilapia* by its feeding and breeding habits tend to break up the vital layer on the substratum which provides sustenance for *Chanos* (*I. P. F. C. Reports*, 1953). In a pamphlet recently issued on the culture of *Tilapia* Ling (1953) states that *Tilapia* require no particular kind of feed and live on all kinds of small aquatic plants and animals.⁴

(iii) *Quick breeding and rapid growth.*—The fish starts to propagate at the age of about two months, an amazingly short period compared to many of the tropical fish. Their parental care also ensures a good percentage of survival of the fry. Owing to the frequent spawning by the fish, overcrowding in the ponds may occur. In Indonesia a pond which had been stocked with 14 fish measuring 3–4 cm. was found to have 3,000 fry after one-and-a-half months; at the end of two-and-a-half months the number of fish rose up to 14,000. Restocking of the ponds does not therefore appear to be necessary. On the other hand, the larger fish should be periodically removed to prevent overpopulation.

Tilapia has been classified as a quick-growing species. At Sabandar, Tjiandjur (Java), it was found that fingerlings weighing 3–5 gm. grew to an individual weight of 15–25 gm. in 40 days (Vaas and Hofstede, 1952). Similarly Devadas and Chacko (1953) found that the fingerlings grew to 135 mm., in about 3 months. It was pointed out earlier that the fry of the fish when liberated by the mother are on an average 8 mm. long. In our aquaria they attained the sizes of 15, 28, 35, 39 and 55 mm. at the end of the first, second, third, fourth and fifth months respectively. Since then their growth has been less marked and by the end of twelve months the maximum size of the fish was only 150 mm. The stunted growth of these fish is readily explainable by the very artificial conditions under which they have been reared at Mandapam.

Among other advantages, mention may be made of the utility of *Tilapia* to keep down the hatching of anopheles mosquitoes in brackish-water ponds, as the fish eat away masses of filamentous green algæ which are the usual hiding places of mosquito larvæ (Hofstede and Botke, 1950).

⁴ We are indebted to the various fishery experts for communicating information on *Tilapia* in their respective areas. Special mention may be made of Dr. Vaas (Indonesia), Dr. Hardenberg (Indonesia), Dr. Miles (Thailand), Dr. Boou Indrambarya (Thailand), Dr. Serene (Viet Nam), Mr. Le Mare (Malaya), Mr. Dom-Saveun (Cambodia) and Dr. Villadolid (Philippines). We are also grateful to Dr. H. S. Rao for reading through the paper and for his comments.

According to Tung-Pai Chen (1953), the experimental culture of *Tilapia* in the paddy fields in southern Taiwan (China) has given generally satisfactory results. The indiscriminate feeding habits of the fish, tolerance to nearly all kinds of conditions in shallow waters and small ditches and quick growing qualities have been mostly responsible for its successful culturing in those areas. The yield of paddy in such fields also has not been seriously affected by the introduction of the fish in these places.

A serious handicap to fish cultural practices in India is their dependence on naturally available fry which appear only during certain seasons and at certain places. The entire carp industry depends on the efficient collection and distribution of fry for stocking. A fish which can breed easily in captivity will thus be a boon to Indian fish culturists provided that it is as good as our indigenous carps and other useful fishes and does not harm the existing fisheries either by its predaceous habits or by competing with them for the same type of food. It is fairly certain that this fish is not a predator. Young *Tilapia* and Carps from Tanjore (*Labeo fimbriatus*) have been growing together in the same aquaria as well as in small fish ponds, but large-scale field experiments may be necessary to confirm that they do not affect other fish.

Instead of the fish being a predator, it appears to us to be one which is easily preyed upon by carnivorous species. In India, we have several species of highly esteemed fresh-water and estuarine fish of carnivorous habits. In areas where *Tilapia* is not the principal object of culture, the possibility exists for its being used as a forage fish. In that case the fish has equal value because it will then be a useful species for developing 'balanced' fish populations in fish ponds. Further work on these lines is essential.

In our extensive saline coastal lagoons where factors like salinity, temperature and availability of food are bound to vary according to seasons, the success of a species largely depends on its ability to adjust itself to the environment and also to survive and reproduce under these conditions. These features are found in *Tilapia mossambica*, but whether it is *T. mossambica* which is most suitable for India or other species like *T. nilotica* (which has also these advantages combined with a larger maximum length) is an aspect which deserves attention and should not be lost sight of in the enthusiasm to introduce *T. mossambica*. Consumer preferences will also largely determine the success of the fish in India. *T. mossambica* has been found to be a fairly good edible fish, but it does not stand comparison with good class table fishes from the sea or inland waters.

Tilapia mossambica, Fig. 1, male and Fig. 2, female

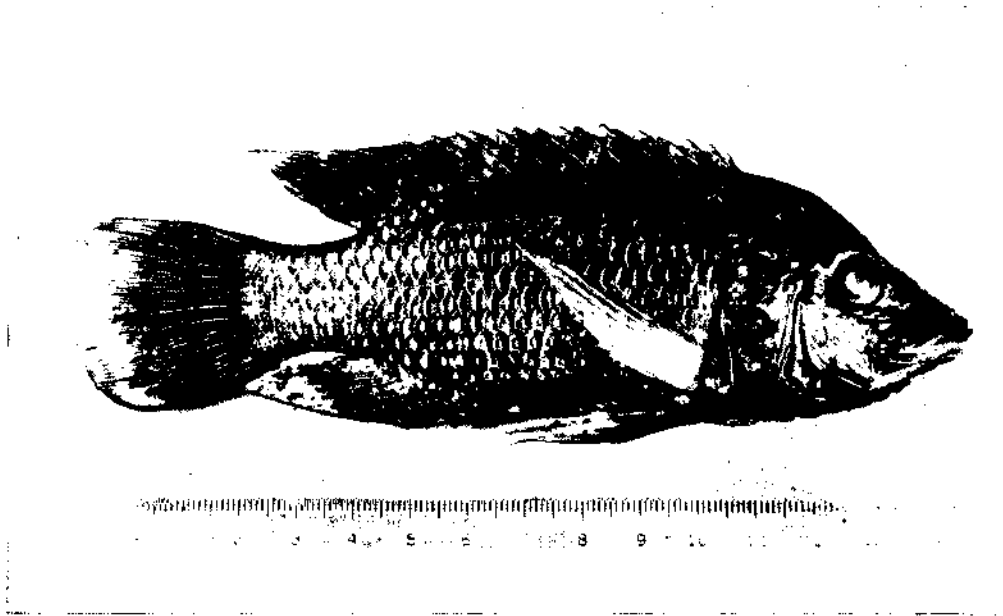


FIG. 1

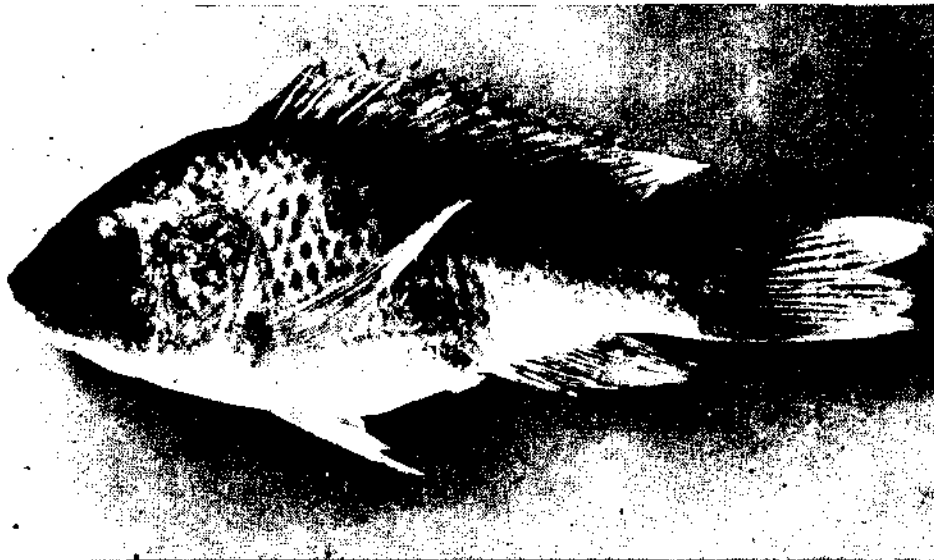


FIG. 2

SUMMARY

A brief account is given of our existing knowledge and some new observations on the mouth-breeding Cichlid fish, *Tilapia mossambica*, with reference to its adaptability, food and feeding, sex differentiation, breeding habits and larval stages. This fish exhibits remarkable adaptability to brackish-water conditions. Other advantages are its omnivorous habits, rapid growth and quick breeding as compared to many of our indigenous species. These points are briefly discussed and the suitability of the fish for culture in India based on information gathered so far, is examined.

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