One pond of five acres was stocked with 2,000 Tilapia mossambica (Peters) and 3,500 Chanos chanos (Forskal). Only organic fertilizers were applied. During the first month 150 Elops hawaiensis and 50 Megalops cyprinoides were introduced. After 165 days 880 kg of marketable fish were harvested.

**Introduction**

Tilapia mossambica is a species native to Africa that was imported to Malaya in 1960 and was later spread over the Pacific islands. Being an extremely hardy fish it became established in many places and produced populations which are practically impossible to eradicate. The species is considered a pest in milkfish (Chanos chanos) ponds in Southeast Asia because of two main reasons: 1. its prolific breeding habits cause overcrowding and stunting and 2. as part of the breeding behaviour, males dig holes that destroy algal pastures of high nutritional value to the milkfish.

Preliminary experiments in Ravi Ravi had shown that T. mossambica has a moderate potential of growth in sea-water under controlled densities and that densities can be regulated by allowing predators (Elops hawaiensis Regan) into the pond.

Milkfish (Chanos chanos) is a hardy fast-growing herbivorous fish that is traditionally cultured in fish-ponds in Southeast Asia. Fry are obtained in large numbers from coastal waters. Substantial stocks of fry were found in Fiji. Preliminary experiments suggested that it may grow together with T. mossambica.

The experiment described here was conducted in view of these preliminary indications.

**Methods**

The experiment was conducted in Ravi Ravi on the north western coast of Viti-Levu. The five-acre pond used for the experiment is one of eight ponds constructed of soil in a reclaimed mangrove marsh. The construction of the pond in the initially acid soil was completed in January 1974. During the first six months of 1974 the pond was continually flushed, coral sand (5 tons) and lime (500 kg) were applied to reduce acidity. The pond was then stocked for an initial period of five months in which it was flushed every two weeks because of low pH readings. After harvesting the pond was prepared for the experiment by exposing it to sun over one month, eradicating the fish present in the ditch and filling it with sea-water.

*) FAO/UNDP Consultant to the project
**) U.S. Peace Corps Volunteer attached to the project
The pond was filled by tidal action through a concrete inlet sluice and drained through a similar outlet structure at the opposite end. Both inlet and outlet were screened with 1 cm wire mesh to eliminate large intruders and loss of fish. During the experiment the pond was flushed monthly to get rid of acid water and waste materials. The pond was initially fertilized with 900 kg of brewery waste and 80 kg of chicken manure and periodically (about twice monthly) with 350 kg brewery waste and 80 kg chicken manure. The total amount of fertilizer added was 3,500 kg brewery waste, 480 kg chicken manure and 5,000 kg mill mud that was applied in four portions during the last three months of the experiment.

The pond was stocked with 3,500 milkfish fingerlings of 10 g over a period of five days (10–15 November 1974) and with 2,000 tilapia on 10 November. The tilapia females ranged from 36 to 56 g (average 45 g) and males from 60 to 120 g (average 85 g). During the first month 200 predators were introduced into the pond. These consisted of 150 *Elops hawaiensis* and 50 *Megalops cyprinoides* (Broussonet) of 10–22 cm (20–50 g). The fish were cropped over a 5-day period starting on 28 April after 160 days of growth.

During the growth period the following physical parameters were recorded: maximum and minimum temperatures (daily), salinity and pH (twice weekly). Salinity was determined through the use of a refractometer and pH using pH paper occasionally calibrated against an electrical pH meter. Plankton tows across the pond were made twice a week. The net used was of 41 cm in diameter and 80 μm mesh size. The pH of the pond bottom soil was taken twice, once before filling and once after draining the pond, using a BDH soil testing outfit.

Fish samples were taken occasionally in an effort to try to follow growth. Stomach contents of fish were checked on one occasion and some food items identified. Observations were made daily for the appearance of tilapia fry and on the behaviour of fish when possible.

**Results**

Water temperature of the pond fluctuated between 27° to 35° C with extremes reaching 25° and 37° C. Values of pH varied between 6.5 and 8.2 with lower readings prevailing during the first two months. This is explained by the improvement of soil pH during the experiment which was expressed also in the pH readings of the soil, 5.5 before filling the pond and 6.5 after draining. Salinities ranged from 24 to 35 parts per thousand depending mainly on the amounts of rain. No extremely high salinities were experienced as the experiment took place during the wet season.

Plankton organisms included mainly spionid polychaetes and copepods with occasional blooms of the rotifer *Brachionus plicatilis*. Total volume of plankton per tow ranged between 2 and 10 cc; the number of organisms per litre was between 1 and 30 and the number of copepods was about 2 per litre.

*°) Brewery waste and mill mud are waste products of beer and sugar industries.
Observations on the behaviour of the fish in the pond suggested that milkfish fed largely on planktonic organisms. The fish were seen in dense schools feeding at the water surface. This is also supported by the fact that the fish continued to grow in periods when practically no benthic algae was present in the pond (after the first week of the experiment). Stomachs of milkfish and tilapia mostly contained very minute particles that were impossible to identify. However, some remains of copepods and spionids were positively identified along with parts of mangrove roots in both species. A lorica of Brachionus plicatilis was found in a gut of a milkfish.

Growth rates of tilapia and milkfish (Fig. 1) differed substantially: tilapia (males and females) grew through the entire period of the experiment while milkfish stopped growing after three months.

Many thousands of newly hatched tilapia fry were seen around the edges of the pond during December 1974. Very few were seen later. Some Elops guts included fry of tilapia of 2–3 cm. No overcrowding with tilapia occurred.

The final crop totalled 880 kg and consisted of the following:

1. 440 kg of tilapia which consisted of 1260 males of 200–330 g (average 244 g) and 760 females of 100–160 g (average 125 g).
2. 395 kg milkfish of 100–160 g (average 125 g).
3. 15 kg predators of 10–30 cm.
4. 15 kg Kafka (Leiognathus sp.) of some 50 g.
5. 15 kg "trash fish", i.e., small tilapia and other small fish, mainly gobies.

All the fish, including predators and trash fish, were sold almost immediately.
Figure 1

BODY WEIGHT (G)

50  100  150  200  250

Nov  Dec  Jan  Feb  Mar  Apr

- T. mesembrinae male
- T. muricata

o. T. mollis hominidiformis female