

**PRELIMINARY STUDIES ON CAGE CULTURE OF TWO CICHLID FISH
Etroplus suratensis AND *Oreochromis niloticus*
IN KELANI RIVER ESTUARY.**

by

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ABSTRACT; Preliminary trials carried out showed that *Etroplus suratensis* cultured in cages in the Kelani river estuary at stocking density of 27/ m³ gained an average weight of 50 g and an average length of 14.0 cm for 6 months. These growth rates were higher than the growth rates described for *E. suratensis* grown in ponds in India (Macintosh, 1982). *Oreochromis niloticus* grown in cages in the same estuary at a stocking density of 27/ m³ gained an average weight of 205 g and an average length of 21.0 cm for 6 months. The average daily growth increment for *O. niloticus* was estimated to be 1.14 g.

INTRODUCTION

The culture of fish in ponds has been practised in Sri Lanka since 1950 (Annon, 1950). However fish culture in cages has been a recent phenomenon. Culture of *Oreochromis niloticus* has successfully been conducted in cages in the fresh water reservoir (Wannigama and Weerakoon, 1982). However, published data on the culture in cages of the same species in brackish waters is not available.

O. niloticus and *E. suratensis* are remarkably euryhaline (Chervinski, 1982), an attribute that makes them highly appropriate for estuarine culture sites unsuitable for truly fresh water or marine fish (Macintosh, 1982).

Some preliminary experiments have been reported from the Ivory coast where *O. niloticus* have been cultured in cages placed in coastal lagoons where the salinity may even reach 20‰ (DeKimpe, 1978). Attempts have been made to culture *E. suratensis* in ponds with acid sulphate soils around Negombo Lagoon but without much success (Jayasinghe and de Silva, 1984). The average weight attained by *E. suratensis* in these ponds during a period of six months has been reported to be around 36 g.

Most of the suitable land in the coastal areas in Sri Lanka is unfortunately acidic because of acid sulphate leaching. It will therefore be of great interest to find out whether these fish could be grown successfully in cages in the estuary itself.

The present work which is of a preliminary nature is an attempt to culture these two cichlid fishes in cages in estuarine waters.

MATERIALS AND METHODS

Two hundred fingerlings of *E. suratensis* of 5 cm average length, collected from Negombo were reared in cages of 1.5 x 1.5 x 1.5 m (3.7m³) size in the Kelani river estuary. Two hundred fingerlings of *Oreochromis niloticus* of 4.5 cm average length were also stocked in another 2 cages of the same size. Both species of fish were acclimatized to estuary waters for 3 to 4 days before rearing in the cages. Ten fingerlings were stocked at a stocking density of 27 fish/m³.

The fish were fed twice daily at 5% body weight level. The feed was prepared in the laboratory using chick mash, rice bran and fish meal. The chemical composition of the feed is given in Table 1. The length and weight measurements were done fortnightly in the initial months and thereafter monthly on fish samples collected at random from each cage. The mortalities if any were recorded daily to determine the survival rate. Salinity was determined by using a refractometer. Dissolved Oxygen was measured by using the Winkler method.

Table 1: Bio Chemical composition of the Feed

Ingredients	Percentage (%)
Protein	30
Lipid	1.94
Carbohydrate	60
Ash	8.06

RESULTS AND DISCUSSION

In the Kelani River estuary the water is fresh to slightly saline during the various months (Table 2). These are associated with the monsoonal changes. The highest salinity (5‰) was recorded in July. The dissolved oxygen variations were such that they were not detrimental to fish.

Table 2: Monthly Variation in temperature, salinity & dissolved oxygen in Kelani river estuary during the culture period

Month	Water temperature (°C)	Salinity (ppt)	Dissolved Oxygen (ppm)
April	27.0 - 27.5	0 - 2	3.0 - 3.5
May	27.0 - 28.0	0 - 2	3.0 - 4.0
June	28.0 - 28.5	1 - 3	4.0 - 4.5
July	27.0 - 28.5	1 - 5	4.0 - 4.2
August	28.0 - 29.0	0 - 2	3.2 - 3.8
September	27.0 - 28.0	0 - 1.5	2.5 - 3.5

The present experimental results show (Table 3) that *E. suratensis* attain an average daily growth increase of about 0.28 g. At the end of the culture period the fish attained an average length of 14.0 cm and an average weight of 50 g. The average monthly increment in length and weight amounted to 2.33 cm and 8.33 g respectively. These growth rates were higher than the growth rates described for *E. suratensis* grown in ponds in India (Macintosh, 1982) where the growth rate was 1.98 g monthly using food having a protein content of 35% (Vijayaraghavan et.al 1980). The protein level of the feed used for this present experiment was 30% (Table 1). There was also algae naturally growing in the cages which would have provided additional nutritional matter to the fish.

Table 3: Stocking rate, growth rate and harvesting data for *E.suratensis* in the two cages

Cage No.	Stocking density (No.of fish/ m ³)	Culture period	Survival (%)	Average daily growth incre ment (g)
I	27	6 months	51	0.286
II	27	6 months	48	0.283

The survival rate was about 50% during the study period (Table 3). Morality mostly occurred a few days after introduction in to the cages, possibly due to mishandling and not acclimatizing the fish sufficiently to the water in the estuary.

In cage culture experiments conducted at Udawalawe reservoir *O.niloticus* gained an average weight of 110 g for a period of six months at a stocking density of 100-250 fish/m³ (Wannigama and Weerakoon, 1982). In the present study *O. niloticus* gained an average weight of 205 g and grew to an average length of 21.0 cm during this six month period of study at a stocking density of 27 fish/m³. The average daily growth increment estimated in this study was 1.14 g. Canagaratnam (1966) showed that *Tilapia mossambica* grows better in saline media than in fresh water. During this study period the average salinity in the estuary was around 3.75 ppt. This slight salinity could have probably promoted the growth of this species in this estuary.

Table 4: Growth data of the cage culture of *O. niloticus* in the Kelani River estuary.

Cage No	P _{mi} (g)	B _i (kg/m ³)	B _f (kg/m ³)	G (g/d)	S (%)
I	5.0	0.148	5.92	1.11	75
II	5.1	0.151	6.22	1.16	76

- P_{mi} = mean weight at stocking
 B_i = mean biomass at stocking
 B_f = mean biomass at harvest
 G = Average growth rate of individual fish during the culture period
 S = survival rate

Tilapias are relatively tolerant of low dissolved oxygen. Caged *O. niloticus* in the Ivory coast have survived concentrations as low as 0.7 ppm for several days (Coche, 1979). From recent observations it would appear that a dissolved oxygen of 3 ppm should be considered the limit in cage culture (Coche, 1982). In the present study the maximum dissolved oxygen level was 4.5 ppm during June. The average dissolved oxygen level for the culture period was 3.5 ppm. However, this range of dissolved oxygen would be more or less suitable for the fish like Tilapias which are more tolerant of low dissolved oxygen. Further because of the turbulence in the estuary the dissolved oxygen in the water could have varied considerably.

These experiments are of a preliminary nature. More experimental work is necessary to determine the optimum stocking densities, types of feed etc. These results however, generally indicate these fish could be successfully cultured in cages under estuarine conditions. The fact that there are large unutilized areas of estuarine and lagoon water in Sri Lanka makes these results interesting. Since all the fish in a cage could be harvested without a loss, this type of culture would be superior to pen culture.

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