



MARINE FISHERIES INFORMATION SERVICE

**TECHNICAL AND
EXTENSION SERIES**

No.48
March 1983

**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN, INDIA**

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

FISH CULTURE IN MARINE FARM AT MANDAPAM

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Introduction

It is well known that large-scale monoculture and polyculture of the milkfish, *Chanos chanos* (Forsk.) (Fig.1) are undertaken both in brackishwater and seawater farms in many Southeast Asian countries, particularly in Indonesia, Philippines and Taiwan. In polyculture, milkfish is cultured either with another fin fish (mullet) or with the shellfish (prawn and crab). Milkfish culture in India was initiated by the Madras Fisheries Department. Culture experiments conducted by Tampi (*Ind. J.Fish.* 7 (1): 137-46, 1960) at Mandapam indicated the potentiality of milkfish culture even in an apparently low productive coastal pond of Mandapam area with a moderate biological niche. Further confirmatory culture experiments in this region were hampered because of the total devastation of the farm by the cyclone in 1964. After renovation and remodelling of the ponds at Mandapam, monoculture and polyculture experiments on milkfish were possible only during 1980-82. The present report highlights some interesting and encouraging results obtained during the experiments conducted in 1981-82 and provides further useful information to the culturist on the feasibility of undertaking marine fish culture along the coastal areas of Ramanathapuram District.

Monoculture of milkfish

Pond preparation

The culture experiment was planned in a 0.25 ha pond. Earlier, the water in the pond was completely drained eradicating undesirable fishes and other competitor organisms. It was allowed to dry for a few days before pumping seawater to a depth of 45 cm. This depth was maintained throughout the period of experiment by resorting to daily pumping of seawater.

Stocking

1000 milkfish fingerlings, collected from tidal pools at Pamban and Pillaimadam lagoon were stocked in September 1981 at a stocking rate of 4000/ha. The average length and weight of fingerlings at the time of stocking were 129 mm and 13 g respectively. Supplementary feeding with doughs of rice bran, groundnut oil cake, tapioca powder and fishmeal mixed in equal proportion was done at the rate of 5-10% of body weight. Fish samples were taken once in 30 days from the pond and the length and weight of about 10% of the total stock in the pond were recorded to ascertain the growth rate. Environmental parameters were periodically recorded (Fig.2) for the ten month duration of the experiment.

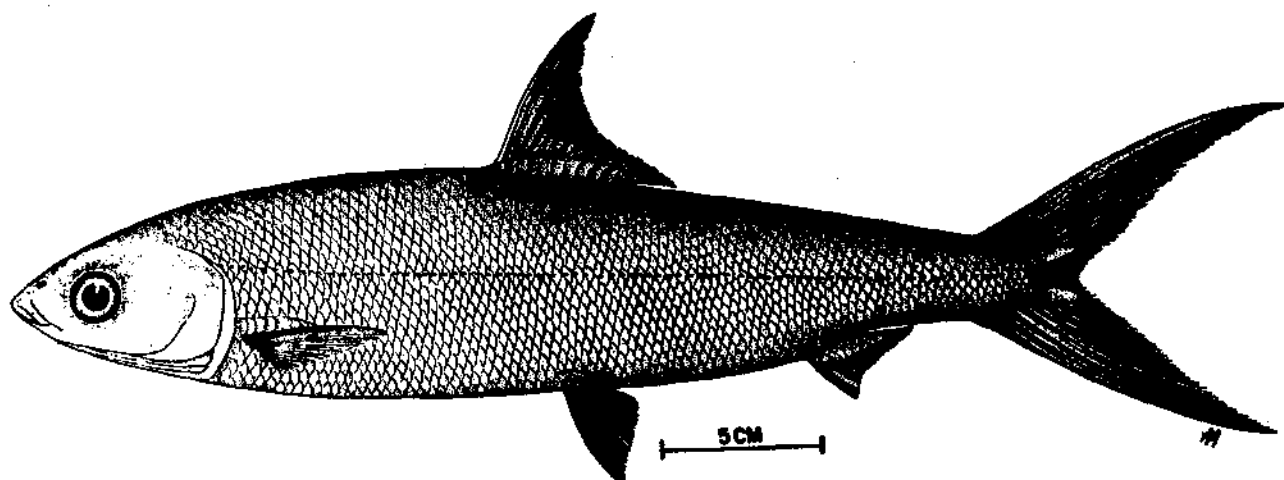


Fig. 1. The milkfish, *Chanos chanos* (Forsk.).

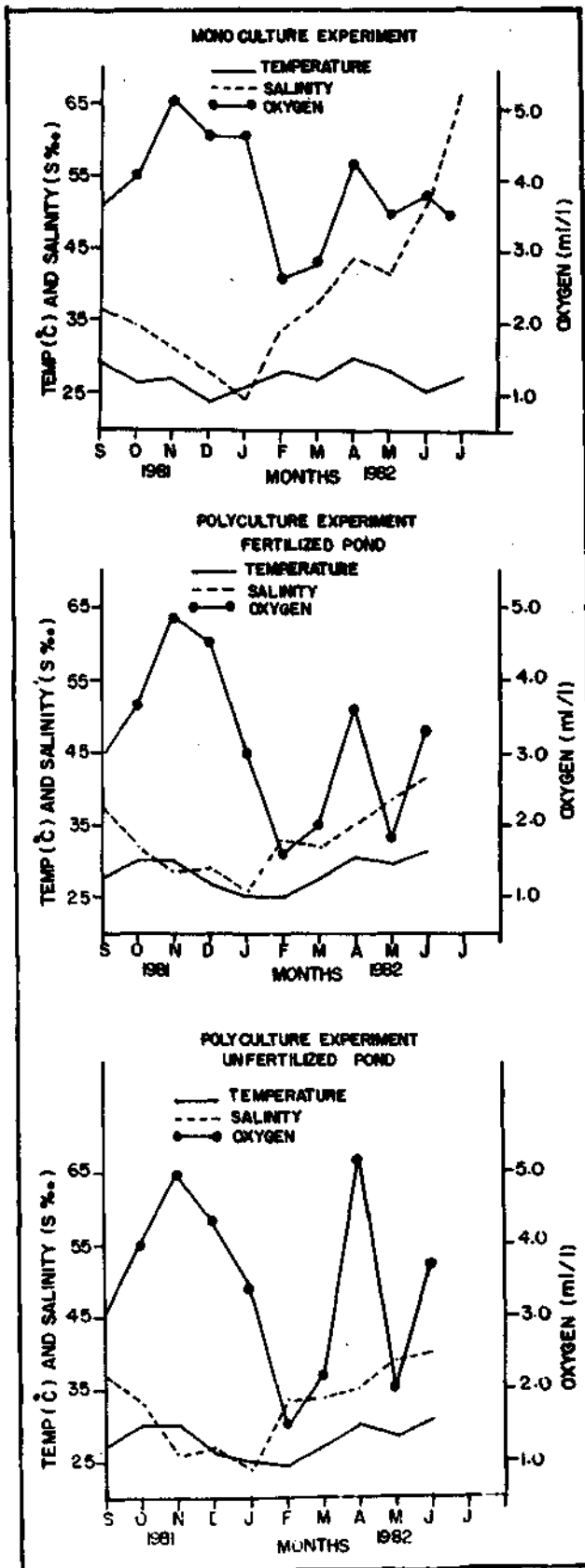


Fig. 2. The environmental parameters of the pond water showing the monthly average of temperature, salinity and oxygen in the monoculture and polyculture of milkfish.

Results

i) Growth

The average length and weight of milkfish recorded in different months are given in Fig.3. The average size of the fish increased from 129 mm (13 g) in September '81 to 250 mm (133.9 g) in three months, 293.7 mm (195.3 g) in six months and 368.7 mm (325.4 g) at harvest (at the end of ten months). The monthly increment in length varied between 1.58 mm and 72.35 mm and the weight between 0.39 g and 88.64 g, with an average of 23.97 mm in length and 31.24 g in weight. Faster growth was observed during the first, third and seventh months of the rearing period. During these ten months, the fish gained a net increase of 239.7 mm in length and 312.39 g in weight indicating 0.8 mm length increase and 1.04 g of weight increment per day.

ii) Yield

The different size groups in length and weight at harvest are shown in figures 4 and 5 respectively. The milkfish at harvest ranged from 240 mm to 494 mm in length and 80 g to 780 g in weight. About 53.5% of the total harvested fish had grown above average size. The harvest yielded 213 kg, denoting a calculated production rate of 852 kg/ha. The survival rate was 63%. A total of 1990 kg of artificial feed was supplied to the fish to achieve a net weight increase of 200 kg. The gross conversion ratio for the feed was 9.95 : 1.

Remarks on the results of 1980-81 experiments:

In the culture experiments conducted earlier in 1980-81, 1000 fingerlings of milkfish were stocked in the same pond in September '80, at a stocking rate of 4000/ha. The average size at stocking was 59.2 mm (1.9 g). Supplementary feeding was not attempted. However, in order to promote algal growth, the pond was manured with 250 kg of organic manure (chicken droppings) before stocking. Subsequent to stocking, 5 kg of inorganic fertilizer NPK (12:24:12), was supplied fortnightly. The size of the milkfish showed an increase from 59.2 mm (1.9 g) to 159.1 mm (32.7 g) in three months, 188.5 mm (54.8 g) in six months and 211.9 mm (60.2 g) at harvest (at the end of ten months). The average monthly growth recorded was 15.27 mm in length and 5.83 g in weight. The yield was 54 kg of milkfish (216 kg/ha) with a survival rate of 89.7%. The minimum and maximum size of milkfish at harvest were 184 mm (44 g) and 248 mm (78 g) respectively. 41% of the harvested fish were found to have grown above the average size.

Polyculture of milkfish with mullet

Pond preparation

During 1981-82, milkfish was cultured along with mullet in two ponds, each of 450 sq.m. Seawater sup-

GROWTH CURVE OF MILKFISH AND MULLET

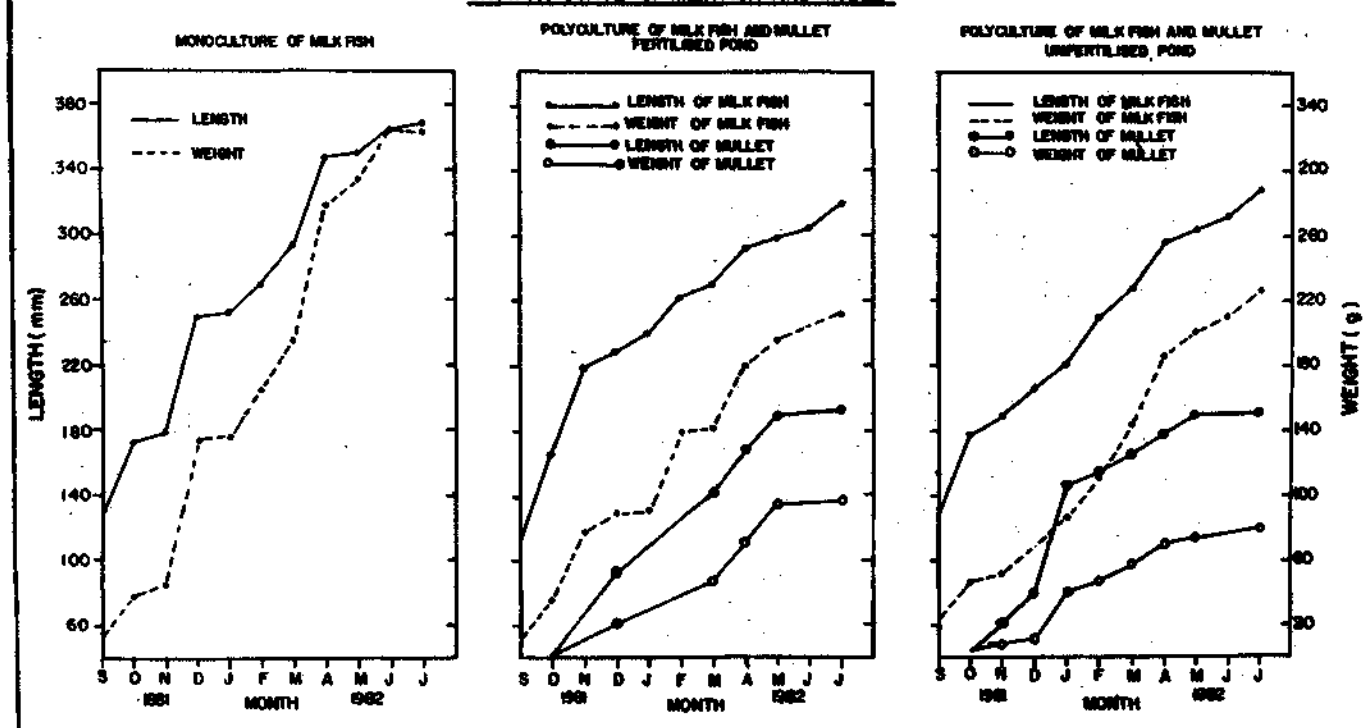


Fig. 3. Growth curve of milkfish and mullet in monoculture and polyculture experiments.

ply to the ponds was maintained by direct pumping. Of the two ponds, one was fertilized with organic manure at the rate of 1000 kg/ha initial application and thereafter once in three months at a rate of 500 kg/ha. The other pond was not fertilized.

Stocking

The milkfish seed were collected from tidal pools and streams at Manoli Island and Pillaimadam lagoon whereas the mullet seed were collected from Thonithurai area along the Palk Bay side of Mandapam. These were reared indoor in 12' dia pools for one month prior to stocking in ponds. In both ponds, 375 fingerlings of milkfish (*Chanos chanos*) were stocked in September, '81 and after one month 350 fingerlings of mullet (*Valamugil seheli*) were stocked at an overall stocking rate of 16000/ha. The stock in both ponds were given (daily once) supplementary feed, of rice bran and groundnut oil cake mixed in equal proportion, in the form of dough, at a rate of 5-10% of the body weight. The environmental conditions of these ponds were regularly monitored (Fig.2). Harvesting was done in July '82. The results obtained from fertilized and unfertilized ponds were treated separately.

Results

Fertilized pond

i) Growth

The growth pattern of milkfish and mullet are given in Fig.3. The milkfish grew to a size of 229.2 mm (88.6 g) in three months, 271.5 mm (143.4 g) in six months and 322.7 mm (213.0 g) at harvest (at the end of ten months) from the initial average size of 109.9 mm (12.8 g). The monthly length increment was from 6.0 mm to 57.0 mm and the weight from 7.0 g to 47.2 g. The average monthly increase worked out to 21.3 mm and 20.0 g in length and weight respectively. Growth was noticed to be better in the first, second, fifth and seventh months.

The mullet attained a size of 88.8 mm (11.7 g) in two months, 170.6 mm (73.4 g) in six months and 195.0 mm (97.6 g) at harvest at the end of nine months from the initial average size of 42.5 mm (2.5 g). The growth per month ranged between 2.7 mm and 27.8 mm in length and 0.8 g and 25.4 g in weight with a monthly average of 16.9 mm and 10.6 g in respect of length and weight.

ii) Yield

Harvest done in July '82 yielded a total of 58 kg of milkfish and 4 kg of mullet which works out to a calculated production rate of 1289 kg/ha for milkfish and 89 kg/ha for mullet. The survival rate of milkfish and mul-

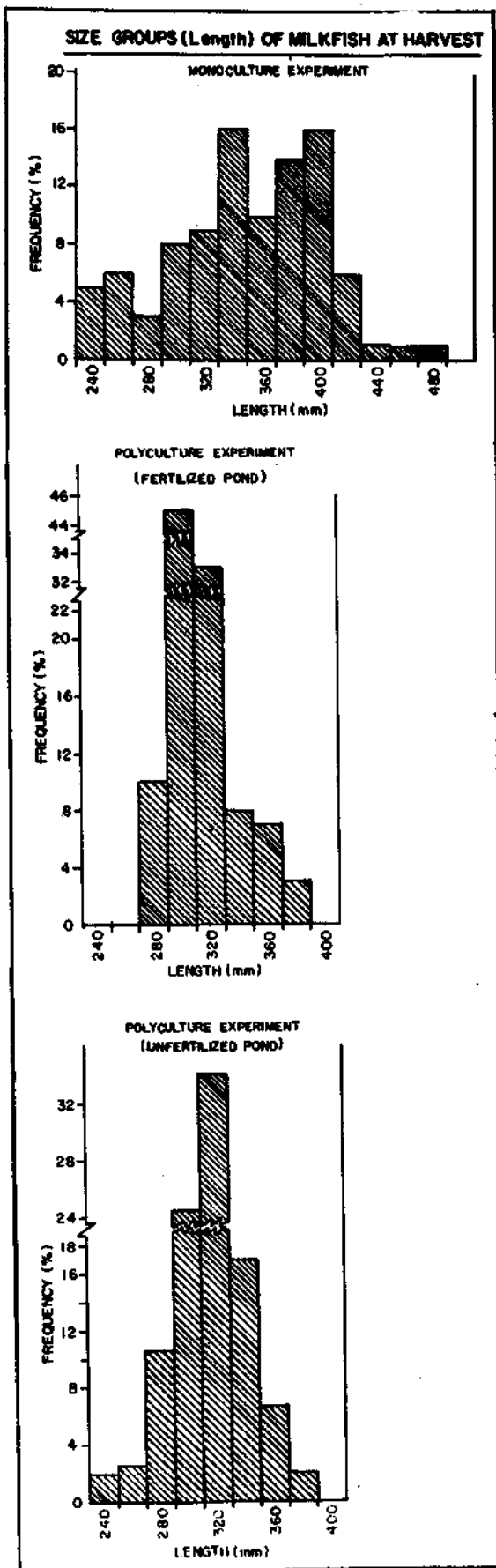


Fig. 4. The length groups of milkfish in the monoculture and polyculture at harvest.

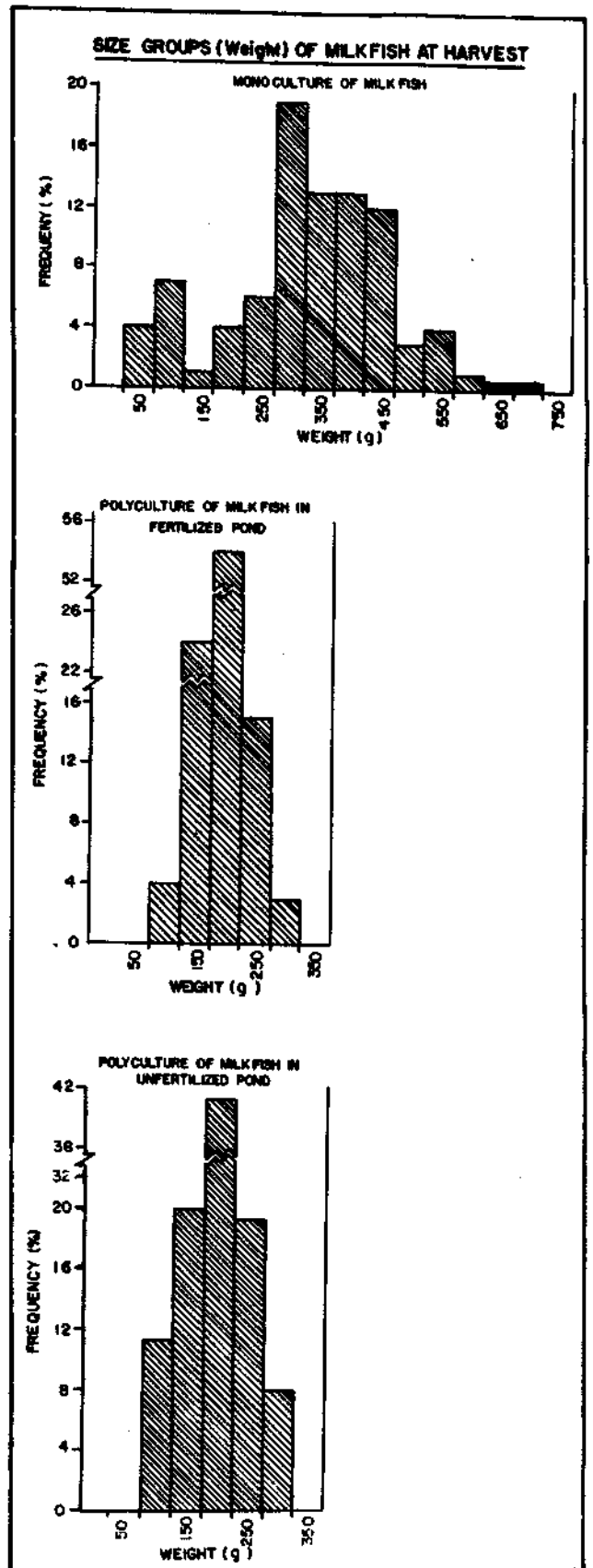


Fig. 5. The size groups (weight) of milkfish in the monoculture and polyculture at harvest

SIZE GROUPS OF GRAY MULLET AT HARVEST

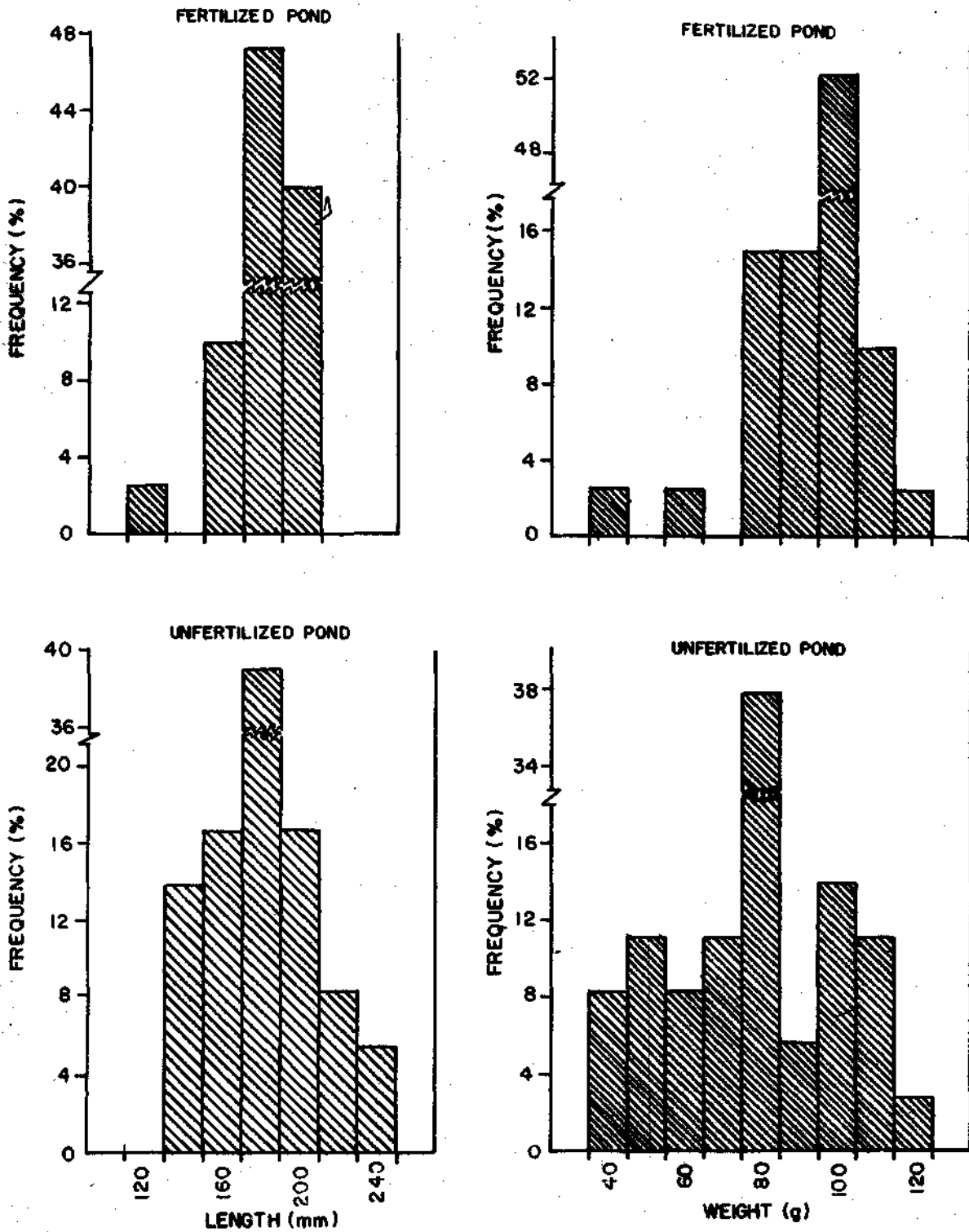


Fig. 6. The size groups (length and weight) of grey mullet in the polyculture at harvest.

let was 81.2 and 11.4% respectively. The size of milkfish at harvest ranged from 283 mm (120 g) to 397 mm (300 g). About 39% of the harvested milkfish had grown above the average size. The size groups of milkfish at harvest both lengthwise (Fig.4) and weightwise (Fig.5) are indicated. The size range of mullet at harvest was from 120 mm to 218 mm in length and 40 g to 120 g in body weight with about 57% of fish grown above the average size (Fig.6).

Remarks on the results of 1980-81 experiment

Similar experiment in the same pond with identical stocking density was conducted during September-June of the preceding year (1980-81) also. The average size of milkfish and mullet fingerlings at the time of stocking was 91.6 mm (10.6 g) and 50.6 mm (2.0 g) respectively. At harvest, the milkfish had grown to an average size of 360.0 mm (270.0 g) and the mullet to 190.1 mm (75.0 g). The monthly growth rate ranged between 3.4 mm (1.3 g) and 48.8 mm (60.7 g) with an overall monthly average of 26.5 mm (25.9 g) for milkfish and for the mullet between 7.8 mm (1.0 g) and 21.0 mm (15.8 g) with an overall monthly average of 15.5 mm (8.1 g). The actual yield at harvest was 57 kg (calculated yield 1267 kg/ha) of milkfish and 15 kg (calculated yield 333 kg/ha) of mullet with a survival rate of 60.8% and 57% respectively. The percentage of milkfish and mullet which had grown above the average sizes was 49% and 62% respectively.

Unfertilized pond

i) Growth

Milkfish fingerlings increased from the average stocking size of 121.9 mm (21.2 g) to 206.5 mm (68.3 g) in the first three months, 267.2 mm (143.2 g) at the end of six months and 329.1 mm (227.2 g) at the end of ten months, at harvest (Fig.3). The range in monthly increase was from 4.9 mm to 54.9 mm in length and 6.2 g to 44.9 g in weight with an overall monthly average of 20.7 mm and 20.6 g respectively. The growth of milkfish was better in 1st, 5th and 7th month of the rearing period.

ii) Yield

As in the case of the fertilized pond, harvest was done in July, '82. 63.25 kg of milkfish and 2.9 kg of mullets were harvested which worked out to a calculated production rate of 1405 kg/ha for milkfish and 64 kg/ha for mullet with a respective survival rate of 86.7% and 10.3%. The harvested milkfish ranged in size from 245 mm (100 g) to 398 mm (340 g) with about 44.7% of total fish grown above the average size. The size groups in length (Fig.4) and in weight (Fig.5) at harvest are indicated. The mullet which ranged from

150 mm (40 g) to 250 mm (120 g) at harvest showed a percentage of 53% above the average size (Fig.6).

Remarks on the results of 1980-81 experiment

During the preceding year (1980-81) identical experiment was conducted in the same pond. The average size of milkfish and mullet fingerlings at stocking were 65.9 mm (2.5 g) and 57.0 mm (3.0 g) respectively. The milkfish grew to an average size of 343.3 mm (249.0 g) at harvest at the end of 10 months and the mullet to 190.9 mm (65.0 g) at harvest at the end of 9 months. The monthly growth rate ranged from 7.6 mm (0.8 g) to 69.6 mm (80.0 g) for the milkfish and 7.3 mm (1.0 g) to 33.6 mm (23.3 g) for the mullet, with an average growth increase of 27.7 mm (24.6 g) and 14.9 mm (6.9 g) respectively. The total quantity of fish harvested was 54.25 kg of milkfish (1205 kg/ha) and 9.75 kg of mullet (217 kg/ha) with a recovery rate of 65% for the former and 42.9% for the latter, 49% and 57% in respect of total harvested milkfish and mullet recorded above the average size.

General Remarks

From the foregoing results it is apparent that in the monoculture of milkfish the average size of the fish as well as the production rate could be substantially stepped up by resorting to supplementary feeding. It is interesting to note that the average growth rate of 24 mm and 31 g per month obtained in 1981-82 experiments is higher when compared with the results obtained by Thampi (1960) in the same area. With regard to polyculture of milkfish, the average growth rate was found to be more or less similar in both the fertilized and unfertilized ponds. However, the survival and production rates were higher in unfertilized pond when compared with those of the fertilized pond. The salient features of the culture operations are presented in Table 1.

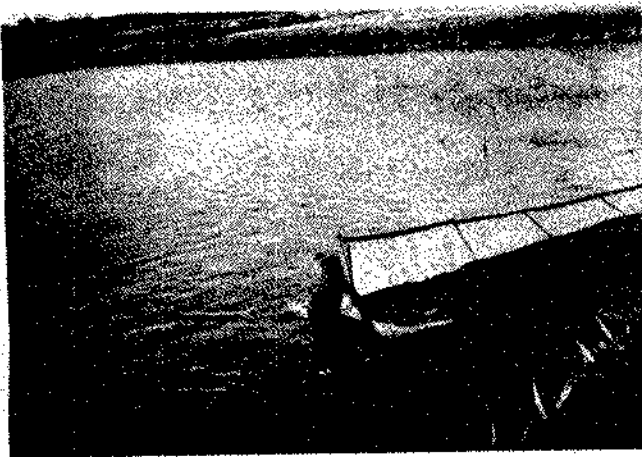
The milkfish production in the present experiment is found to be much better than in Thailand, where on an average 560 kg/ha/yr was produced (Arporna-Sribhaibhadh, Fishing News (Books) Ltd: 74-83, 1970). The yield of milkfish under monoculture in the present study is comparable to that of Ceylon, where selective harvesting followed by replenishment gave a production of 799 to 1159 kg/ha/annum. A production rate of 1405 kg/ha/10 months obtained in the present experimental polyculture of milkfish is similar to the yield of 1338 kg/ha realised at the reclaimed tidal land of Taiwan (Jium-Kuo Liang and Chin-Yun Huang, Fishing News (Books) Ltd: 417-28, 1970). Although more confirmatory data are needed to find out the actuals, the experiments conducted by CMFRI at Mandapam have helped to demonstrate the feasibility of culturing milk-



a



b



c



d

e



f



Plate. 1. (a-f) showing the sequence of operation of the net and the catch of milkfish at harvest.

Table 1. Culture of milkfish and mullet during the period 1981-'82 at Mandapam

Sl. No.	Particulars	Monoculture (Un-Fertilized) Pond	Polyculture (Fertilized) Pond		Polyculture (Un-Fertilized) Pond	
1.	Size of the pond	0.25 ha	0.045 ha		0.045 ha	
2.	Name of the Species	Milkfish	Milkfish	Mullet	Milkfish	Mullet
3.	No of seed stocked	1000	375	350	375	350
4.	Stocking rate per hectare	4000	8333	7777	8333	7777
5.	Date of stocking	20.9.81	14.9.81	14.10.81	14.9.81	14.10.81
6.	Size at stocking					
	a) Average length (mm)	129.0	109.9	42.5	121.9	42.5
	b) Average weight (g)	13.0	12.8	2.5	21.2	2.5
7.	Date of harvest	21.7.82	19.7.82	19.7.82	18.7.82	18.7.82
8.	Culture period (Days)	303	303	274	303	274
9.	Size at harvest					
	a) Average length (mm)	368.7	322.7	195.0	329.1	190.0
	b) Average weight (g)	325.9	213.0	97.6	227.2	80.0
10.	Growth rate (Monthly average)					
	a) length (mm)	24.0	21.3	16.9	20.7	16.4
	b) Weight (g)	31.2	20.0	10.6	20.6	8.6
11.	Total quantity harvested (Kg)	213.0	58.0	4.0	63.250	2.9
12.	Production rate (Kg/ha)	852.0	1289.0	89.0	1405.0	64.0
13.	Survival rate (%)	63.0	81.2	11.4	86.7	10.3

fish in coastal seawater ponds, which are considered biologically less productive.

Seasonal abundance of the milkfish seed in the nearby areas of Mandapam confers specific advantage in undertaking milkfish culture here. In addition to Chinnapalam creek and Pillaimadam lagoon which are well known potential grounds for milkfish seed, recent attempts made by this team brought to light the existence of more extensive areas near Mandapam for attempting large-scale collection of fry and fingerlings of milkfish and mullet.

The authors wish to express their very sincere gratitude to Dr.E.G.Silas, Director, Central Marine Fisheries Research Institute, Cochin for his constant encouragement throughout the period of this study. They are thankful to Dr. P.S.B.R.James, then Joint Director and Project leader for the guidance. They are also thankful to Shri S.Mahadevan, Officer-in-Charge for critically going through the manuscript and for the suggestions for improvement and Shri K. Dorairaj for the help in the preparation of this account.

