MARINE FISHERIES INFORMATION SERVICE

No. 76
OCTOBER 1987

Technical and Extension Series

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

CULTURE OF MILKFISH IN POLYETHYLENE FILM-LINED PONDS*

Introduction

The milkfish *Chanos chanos* is widely distributed in the subtropical and tropical regions of the world. It is euryhaline, hardy and fast-growing. Large scale culture of milkfish is undertaken both in brackish and seawater farms of Philippines, Indonesia and Taiwan.

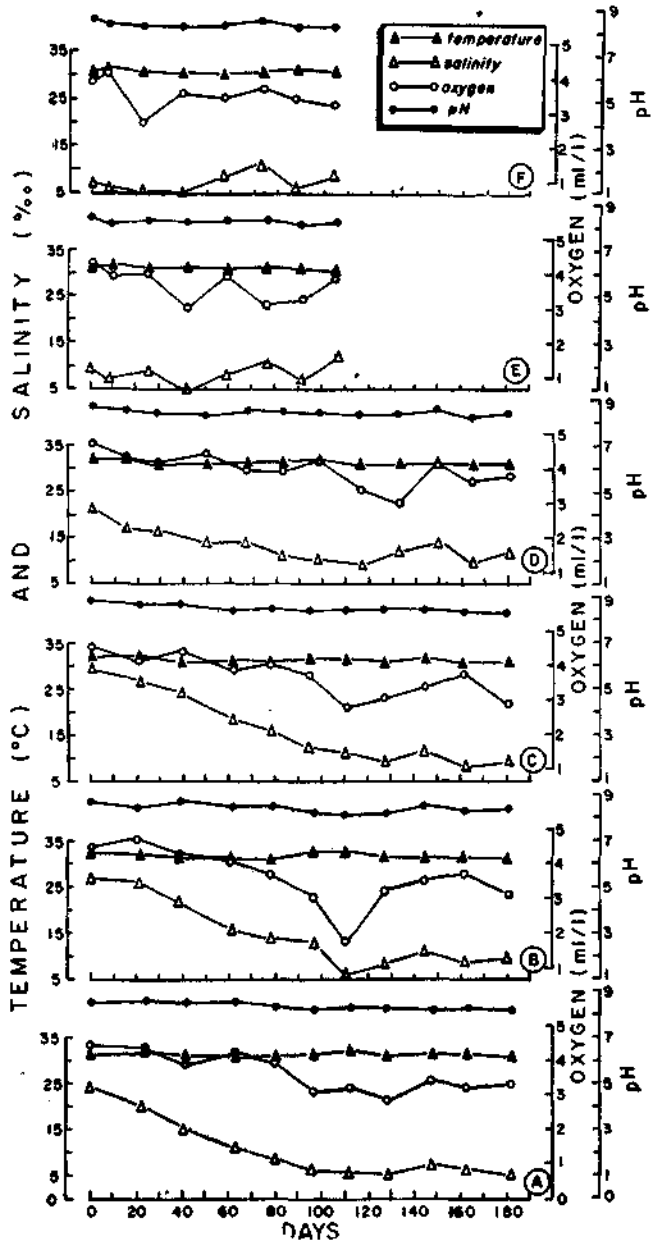

Fig. 1. Fluctuations in the values of environmental parameters recorded in the ponds.

*Prepared by S. Lazarus and K. Nandakumaran, Calicut Research Centre of CMFRI, Calicut.

In India interest in the commercial farming of milkfish has grown apace in recent years following many successful experiments conducted in earthern ponds and coastal pens. Considering the importance of converting the barren sandy beaches for aquaculture purposes an attempt was made at Calicut to culture the milkfish in ponds dug out in the sandy beach and lined with polyethylene film. Two sets of experiments were conducted in those ponds during the period June, 1983 to January, 1984. The culture experiments became highly successful and the harvest was shown to the fish farmers and general public by way of a harvest mela (Figs. 1–6).

Preparation of ponds

The ponds were prepared as described by Lal Mohan and Nandakumaran *(Mar. Fish. Infor. Serv., T & E Ser.,* 26: 6-8, 1980), during April-May before the onset of south-west monsoon. This period, because of its dry nature, facilitates quick drying of the ponds after dewatering and this in turn makes it easier for cleaning and repairing or changing the lining. Sea water was pumped into the ponds with a 5 H. P. diesel pump by tying the foot valve to a float anchored in the sea at a distance of about 90 m from the shore. Fresh water, when needed was pumped from a well by a 5 H. P. electrical pump. About 1.5 m water depth was maintained in the ponds throughout the period of experiment.

Seed

Seed were collected from the tidal pools between Korapuzha and Kadalundi in the Malabar area, using an ordinary mosquito net. A total of 4,127 seed, ranging in size from 15 to 62 mm total length, were collected during July, '83 alone. Soon after the collection the seed were brought to the fish farm in plastic bins and acclimatised by keeping them in fibre glass tanks. After acclimatisation the healthy ones were counted and stocked in the ponds (A–D) as per the details given in Table 1. As the number of ponds was not sufficient to stock all the seed collected, some quantity was stored in a nursery pond for about three months during which two additional ponds were made ready. The stored seed, with stunted growth, were then released into these ponds (E and F).

Feed

The stocked fish were fed with compounded feed made out of groundnut oil cake (30%), powdered tapioca

waste (30%), powdered prawn head (25%) and rice bran (15%). The feed ingredients were mixed up thoroughly, cooked well and allowed to cool before being served in a dough form in trays kept at the corners of the pond. Depending upon the size of the fish and feed requirement the quantity of feed to be supplied to the ponds was regulated. It varied from five times the body weight in the beginning of the experiment to 1/50 the body weight towards the end of the experiment in some of the ponds.

Environmental conditions of the culture ponds

Organic waste and other detritus found on the bottom of the ponds were removed periodically by siphoning out the bottom water with the help of 80mm flexible hose. The water loss by this and also due to evaporation was compensated by pumping water into the ponds. Estimation of dissolved oxygen, salinity and pH was made twice in a week and temperature noted twice daily at 1000 and 1400 hrs. Temperature fluctuated within a narrow range of 31.0 - 32.5°C in the ponds throughout the experiment. Maximum salinity values of 24.2, 27.3 and 29.2‰ were obtained in ponds A, B and C respectively at the beginning of the experiment and a minimum of 5.0, 9.1 and 6.1‰ respectively towards the end of the experiment. In the other three ponds, however, this difference was not significant. Dissolved oxygen values ranged between 2.6 and 4.7 ml/l in all except pond B in which it touched a lower value of 1.8 ml/l around 110th day of stocking. The pH values ranged between 8.1 and 8.9. The fluctuations in these values in the ponds are shown in Fig. 1.

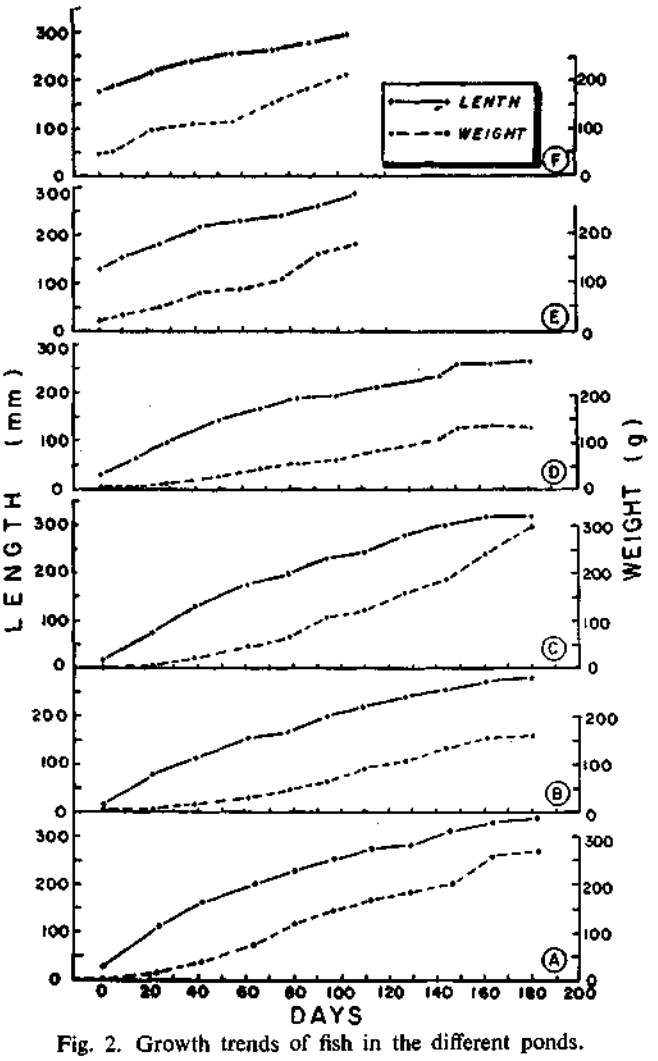

Fig. 2. Growth trends of fish in the different ponds.

Table 1. *Ponds with stocking and harvest details of* Chanos chanos *stocked in* 1983-'84

Ponds	A	B	C	D	E	F
Area (m^2)	200	555	1000	220	300	135
Depth of water (m)	1.5	1.5	1.5	1.5	1.5	1.5
Number stocked	200	555	1000	440	300	34
Stocking density (No/m^2)	1.0	1.0	1.0	2.0	1.0	0.25
Mean length at stocking (mm)	53.6	16.3	16.3	27.8	130.5	175.3
Mean weight at stocking (g)	1.30	0.045	0.045	0.20	22.5	43.0
Duration of the experiment (days)	182	180	180	181	107	104
Date of stocking	2-7-'83	4-7-'83	4-7-'83	15-7-'83	27-9-'83	30-9-'83
Date of harvest	31-12-'83	31-12-'83	31-12-'83	12-1-'84	12-1-'84	12-1-'84
Mean length at harvest (mm)	332.7	280.3	321.6	259.6	289.4	297.4
Mean weight at harvest (g)	271.4	156.7	256.7	130.4	182.2	209.8
No. of fish harvested	93	493	682	371	297	32
Survival (%)	46.5	88.8	68.2	84.3	99.0	94.1
Quantity harvested (kg)	25.2	77.3	175.1	48.4	54.11	6.8
Production rate (kg/ha)	1,260	1,392	1,751	1,882	1,367	503
Extrapolated level of production (kg/ha/year)	2,527	2.823	3,550	3,795	4,663	1,765

Growth of fish in the ponds

Growth measurements were recorded once in a fortnight by taking a random sample with a cast net. Usually 20 to 30 fish were measured in live condition and were released back into the pond after measurement. Growth trends of fish in different ponds are indicated in Fig. 2. The growth of fish was very good in pond C, followed by ponds B and D. In ponds E and F the growth was poor when compared to the above three ponds. In pond A the growth rate was moderate. In ponds C and B the fishes with a mean size of 16.3 mm were stocked; in pond D it was 27.8 mm. Pond A had a slightly higher stocking size of 53.6 mm and pond E and F got respectively 130.5 and 175.3 mm. The instantaneous growth rate observed for the different ponds are: 1.8219 for pond C, 1.6438 for B, 1.4116 for D, 1.2155 for A, 0.5433 for E and 0.3727 for F. Thus, a decrease in the instantaneous growth of fish was noticed as stocking size increased.

Survival of fish in the ponds

A maximum survival of 99.0% was observed after 107 days in pond E, which had 1.0/m² stocking density and 130.5 mm stocking size. This was followed by pond F having 94.1% survival after 104 days of stocking at 0.25/m² stocking density and 175.3 mm stocking size. Pond D with a higher stocking density of 2.0/m² and stocking size of 27.8 mm gave 84.3% survival rate after 181 days of stocking. In pond B and C, the survival rates were found at 88.8 and 68.2% respectively. These two ponds had same stocking density (1.0/m²), stocking size (16.3 mm) and culture period (180 days). Pond A gave a survival of only 46.5% even though the stocking density was 1/m² and stocking size 53.6 mm (Table 1).

Production rate of fish from the different ponds

The production was good in all the ponds except pond F in which it was 503 kg/ha/104 days. Pond D with 2/m² stocking density gave the highest production of 1,882 kg/ha/181 days, which is followed by pond C with 1/m² stocking density (1,751 kg/ha/180 days). In ponds B, E and A the production rates were estimated as 1,392/kg/ha/180 days, 1,367 kg/ha/107 days and 1.260/kg/ha/182 days respectively. These ponds had the same stocking density of 1/m² eventhough they differed in the stocking size and period of experiment. The mean size at harvest was also remarkable in ponds A (271.4 g), C (256.7 g) and F (209.8 g). In the other three ponds the mean weight at harvest ranged between 130.4 and 182.2 g (Table 1).

Economics of the culture operation

An attempt was made to study the economics of aquaculture operations in polyethylene film-lined ponds in order to estimate the input-output relationships of production (Table 2). It is seen that the greater part (about 80%) has been spent on feed and labour under operational cost. Even with the operational cost of Rs. 6,000/- a net return of Rs. 975/- has been obtained from 0.24 ha area within a period of 6 months. From this it appears that the need is to reduce the operational costs for the venture to be economically viable.

The present results appear to be better than those obtained elsewhere. With all its merits, however, milkfish culture in polyethylene film-lined ponds seems

Table 2. *Economics of* Chanos *culture experiments conducted at Calicut during the year* 1983-'84

(For six ponds (0.24 ha) for six months)

1.	Initial investment:	Rs.
	Pond construction	1,446
	Pump sets	10,000
	Hose	2,955
	Sheet and lining	8,746
	Total	23,147
2.	Operational cost:	
	Feed	3,379
	Seed	253
	Diesel and oil	786
	Kerosine	190
	Labour	1,383
	Total	5,991
3.	Depreciation:	
	Pump sets	603
	Hose	369
	Sheet and lining	1,093
	Total	2,065
4.	Total cost:	
	Operational cost	5,991
	Depreciation cost	2,065
	Interest for initial investment (@ 10%)	1,158
	Total	9,214
5.	Returns: 387 kg	
6.	Value: Rs. 6,966 (@ Rs. 18.00 per kg)	

Net returns without considering depreciation and interest for the initial investment for an area of 0.24 ha for 6 months: Rs. 975.00.

to be a labour-intensive and expensive operation. Although high production and survival rates have been obtained, the high operational cost has made the returns inadequate. Cost of labour accounts for about 23% of total operational expenses and cost of artificial feed accounts for about 56% of total expenditure. In order to achieve some reduction in these areas, a few suggestions are made here.

A major part of the labour was spent on pumping sea water and this operation was disrupted often due to the roughness of the sea. This can be avoided by selecting the farm site in places where the sea is always calm. Expenditure towards artificial feeding can be avoided by promoting the growth of natural feed in the ponds by way of fertilisation. There are reports which clearly indicate that the milkfish can grow better in ponds with natural feed than with artificial feed.

Remarks

While planning milkfish culture in polyethylene film-lined ponds the following aspects have to be borne in mind. (1) Seed collected from the wild should be well acclimatised to the pond condition before stocking in culture ponds so as to get maximum survival rate. (2) As the stocking size increases, the growth rate of fish decreases. So in order to get maximum growth and production it becomes necessary to stock the *chanos* at a smaller size, preferably when it is 15 to 25 mm size. (3) In the experiments a stocking density of 1/m^2 has given best result of growth, survival rate and production. (4) A harvesting period between 150 and 180 days after stocking seems to give the best returns.

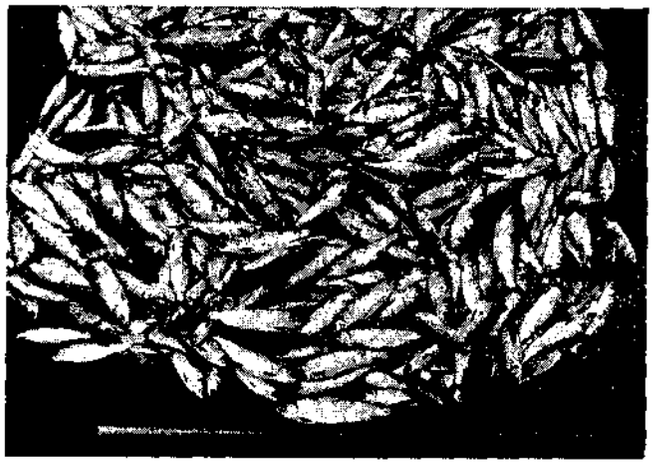

Fig. 3. A portion of the harvested milkfish.