

STATUS AND PROSPECTS OF FISH FARMING IN GOA

A. H. PARULEKAR AND X. N. VERLENCAR

National Institute of Oceanography, Dona Paula, Goa-403 004

ABSTRACT

In Goa, aquaculture is being practised from time immemorial. The methods of fish culture used are traditional and involve composite culture of wild stocks. Despite the ignorance of modern methods of aquaculture, the fish farmers of Goa seem to know many relevant facts empirically from their experience.

Brackish water ponds are used to serve several purposes. Some of the ponds are used for fish culture exclusively; some for salt pan-cum-fish culture, while others are used for paddy-cum-prawn culture.

Relevant information on the indigenous methods of cultivating common species, their annual yield and economics of aquaculture are discussed in the paper with reference to future prospects of fish farming in Goa.

INTRODUCTION

THE UNION TERRITORY of Goa (between Latitude 14°54' and 15°48'N and Longitude 73°41' and 74°20'E) lies along the west coast of India. It has a total area of about 3,611 sq. kms. It is bounded on the north by Maharashtra and on the east and south by the Karnataka State. The continental shelf area off Goa measuring about 9,984 sq. kms upto 200 m depth, is reportedly rich (Rao and Dorairaj, 1968) in living resources and the average annual marine fish landing is about 24,000 tonnes (1965-78). The population of Goa is about 0.9 million and fish forms an important part of food for about 90% of the population. Due to high variability of marine fish catches a good demand for any type of seafood exists in Goa. The scarcity of fish necessitates the exploration of other avenues of fish production and the foremost of this is the coastal aquaculture.

The coastal aquaculture, in a traditional way has been practised in Goa from times imme-

morial, but its present state is poorly known and, hence, it was felt necessary to summarise the relevant information for knowing the 'state-of-art' and for working out the feasibility of coastal and brackishwater fish farming in Goa. The present survey was carried out between May 1977 and June 1978.

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SCOPE AND AREA

The coastline of Goa is about 104 km long. The estuarine and freshwater wetlands are 250 sq. km. The Goa Coast (Fig. 1) is full of creeks, estuaries and backwaters formed by seven rivers, viz., Teracol, Chapora, Mandovi, Zuari, Sal, Talpona and Galgibag. A number of brackishwater fish farms, locally known as 'agar' are used in a traditional way, for fish and shrimp culture. The total area of the

brackishwater ponds is estimated to be about 200 hectares. Individual pond varies from 0.16 to 4.5 ha, in area. Such ponds are mainly confined to Bardez, Tiswadi and Salcete Taluks (Table 1). Besides, the existing ponds, there are vast areas of mangrove swamps, disused paddy fields and salt pans, which can be utilised for fish farming.

METHODS OF FISH CULTURE IN GOA

Traditional methods involving composite culture of wild stocks are in vogue. Despite the complete ignorance of scientific methods of fish farming, the fish farmers seem to know many relevant facts, especially by practical experience.

The brackishwater ponds are used to serve different purposes. Some of the ponds are exclusively used for fish culture; others for salt pan-cum-fish culture (locally known as 'mitache agar') while some others are used for paddy-cum-fish culture, known as 'khazan' land fish culture.

Permanent fish farms

These farms (Pl. I A) of varying dimensions are generally situated close to the estuary or adjoining the tributary of a river. They are characterised by dense mangrove vegetation in the surrounding area. Such ponds are bounded by mud embankments and strengthened with lateritic boulders (Pl. I B). The flow of water, in and out, of the pond is regulated by sluice gates, fitted with wooden planks (Pl. I C).

Stocking of the farm is undertaken in the months of May-June. Sluice gates are kept open, thus allowing the free exchange of water which largely depends upon the tidal conditions. Tidal inflow allows the entry of fish and prawn larvae into the pond. The larvae continue to grow and by September-October

they make attempts to move out of the pond. At this time, the water level in the pond is regulated by allowing the exchange of water only during the spring and neap tides. To prevent the escape of fish and prawn from the pond, fine mesh nets are used in the sluice gate. Small branches of trees are also planted in the

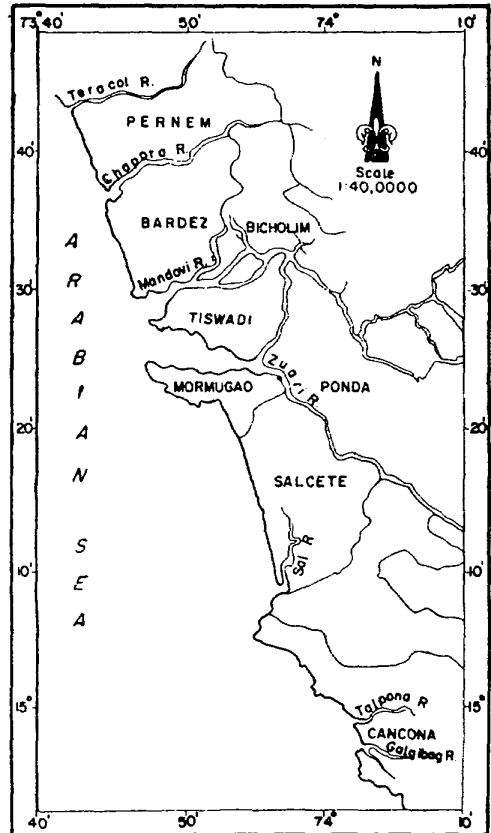


Fig. 1. Map of Goa showing Taluks and Rivers.

pond for providing shelter to fish. These twigs also help in preventing poaching. The harvesting is undertaken from February to April and is mainly done by nets fixed at the sluice gate, but at times, drag nets or cast nets are also used. Permanent fish ponds are few in number (Table 1) and are mostly located in Salcete Taluk (Fig. 1).

Salt Agar

Such ponds serve a dual purpose of both salt and fish production (Pl. I D). During the monsoon season (June-September), the salt pans are inundated with brackishwater by regulating the inflow of water through the sluice gate. By the end of August, the sluice gate is closed and the fish is allowed to grow inside the pond till December, when the pond

and hence, more attention is paid to salt production.

'Khazan' Lands

Similar to salt 'agars', 'khazan' lands also serve a dual purpose of fish and paddy cultivation. A preliminary account of khazan land fisheries of Goa, has been given by Gopinath and Dani (1973).

TABLE 1. *Some details of fish farming in different parts of Goa*

Taluk	Location of farms	Number of farms	Area (m ²)	Annual fish production (kg)	Annual Salt production (kg)	Number of persons employed	
						Part time	Full time
Canacona	Mashe, Painginim and Galgibag	5	5,000	150	..	8	..
Salcete	Betul, Assolna, Durga, Panchwadi, etc.	50	1,23,000	5,500	44,000	46	18
Tiswadi	Santan to Siridao ; Sant Inez to Merces ; Ribandar to Panaji ; Chorao Island, etc.	101	3,80,100	13,700	81,300	115	30
Bardez	Nerul, Orda, Verem, Arpora, Candolim, Siolim, etc.	56	2,19,000	4,700	1,12,500	100	20
Pernem	Kerim, Mandrem, Morjim, Malpem, etc.	11	800	50	..	15	2

is completely drained out in preparation for salt production. The harvesting of fish is done within 3-4 days, by nets fixed at the sluice gate. On one of the sides of the pond, a wide but shallow (about 0.5 m depth) channel (Pl. I E) is dug for maintaining fish larvae, which serve as stock for the next season.

The ponds are completely sun-dried and small rectangular pans are prepared. The water during spring tides is then taken in for the extraction of salt from February to May. The crystallization of salt cubes largely depend upon weather conditions, dry weather being more favourable. In such farms, the fish production is considered as a secondary crop

These are low lying wet lands, along the tidal marshes and are protected from inundation by embankment (locally known as 'bandh') of mud and lateritic boulders. Inflow of water is regulated through a sluice gate, called as 'manas'.

Paddy cultivation is undertaken only during the monsoon season and after the harvesting in October, these fields are used for fish and shrimp cultivation. Thus, fish farming may be either :

(a) Secondary crop of fish after harvesting of paddy.

Or

(b) Continuous fish culture all the year round.

In such wet lands, fish and shrimp seeds are allowed to enter, by regulating the flow of brackishwater through sluice gates. The young fish and shrimp grow along with the paddy. In the region, where paddy is grown, deep dykes (Pl. I F) are dug in which fish can remain when the paddy field is to be drained during the harvesting.

Paddy-cum-fish culture in Goa, has declined to a large extent, because of the prevailing statutory regulations, which restrict the intake of saline water into the fields for fish cultivation. Also for such 'khazan' lands, a special salt-resistant variety of paddy known as 'korgut' is used. The high yielding varieties of paddy do not seem to grow well in such environment.

COMMON CULTIVATED SPECIES

Different varieties of fish and shrimp larvae enter the pond in the monsoon season along with the tidal inflow. The prawns are mostly *Metapenaeus monoceros*, *Pendaeus monodon* (locally known as 'Waghi') and *P. indicus*. Important species of fish are mullets (*Mugil cephalus* and *M. parsia*—locally known as 'Sevtali'), milkfish (*Chanos chanos*—locally known as 'Gholshi'), pearlspot (*Etioplos suratensis*—locally known as 'Kalundra') and bhekti (*Lates calcarifer*—locally known as 'Chanyak'). Species of lesser importance are 'Tamboshi' (*Lutianus* sp.), 'Kharchani' (*Gerres* sp.) and 'Banoshi' (*Thenus* sp.). Large numbers of predatory species, like *Therapon jarbua*, grow in the farm. Similarly, 'bhekti' also a highly carnivorous species is detrimental, especially to shrimps. These predators are generally removed by angling or netting.

The species composition is almost similar in all the three categories of fish farms, but in 'khazan' type of fish farming, prawns are dominant.

HARVESTING—SEASON AND METHODS

Time of harvesting varies with the type of fish farming. In permanent fish farms, harvesting is generally undertaken from February-May. Prawn fishing is generally done at night, by using a cast net and a lantern. Fishing lasts for about 4-8 days during the full moon and new moon phases. It also depends on the local demand for fish. Drag nets are also used. This type of net is pulled all along the pond by 5-6 persons. For night fishing, sometimes gillnets are used in addition to cast nets.

A conical shaped net is fixed at the main sluice gate for the capture of fish and prawn, when the water gets drained with the ebb flow.

The harvesting of fish from salt 'agars' is generally done in December. The water is either drained or pumped out and the fish is trapped either by cast nets or drag nets.

Though the paddy-cum-fish culture has been less popular these days, the fish growing in the network of channels traversing the 'khazan' lands, are caught by fixing the conical nets at the sluice gate. The nets are fixed mainly during the night and during the receding tide. Total quantity of fish caught at one time varies from 1-25 kg.

TOTAL YIELD

The estimates of fish and salt production are based on the information collected from the local operators engaged in fish farming and extraction of salt. It seems that about 50 tonnes of fish is harvested from different fish farms and sluice gate systems in Goa. Incidentally, this is only about 0.1% of the total marine fish landing in Goa. However, it should be noted that most of the production figures given by individual fish farmers are underestimates, as most of them are rather reluctant to disclose the actual figures.

TABLE 2. *Cost benefit analysis of fish farming alone in Goa (Case Study)*

Area of farm	: 3 hectares	
Number of fishing days	: 80	
Quantity of fish caught/day	: 40 kg	
Total catch (40 × 80)	: 3,200 kg	
Cost of catch (at Rs. 7 per kg.)	: Rs. 22,400	
Expenditure		Rs.
(a) Labour		
(i) Part-time (6/day at Rs. 10 for 80 days)	..	4,800.00
(ii) Full-time (1 at Rs. 250 per month for 12 months)	..	3,000.00
(b) Other expenses—including maintenance, unforeseen, nets, etc.	..	1,000.00
(c) Annual lease charges	..	2,100.00
		Total
	..	10,900.00
Returns		
(i) Gross Profit (Cost of catch—Expenditure)	..	11,500.00
(ii) Profit per hectare	..	3,833.00
Rate of returns		
(i) Cost of production	..	10,900.00
(ii) Value of produce	..	22,400.00
(iii) Gross profit	..	11,500.00
(iv) Profit margin	..	100%

TABLE 3. *Cost benefit analysis of salt-cum-fish farming in Goa*

Area of farm	: 10.5 hectares	
Number of fishing days	: 4-6	
Quantity of fish caught/day	: 700 kg	
Total catch	: 3,500 kg	
Cost of catch (at Rs. 5 per kg)	: Rs. 17,500	
Income from salt (12,000 bags at Rs. 4 per bag)	: Rs. 48,000	
Total income Rs. 17,500 + Rs. 48,000)	: Rs. 65,500	
Expenditure		Rs.
(a) Labour charges		
(i) Part-time (50% of total income from salt)	..	24,000.00
(ii) Full-time (2 at Rs. 250 per month for 12 months)	..	6,000.00
(b) Other expenses—including maintenance, pump, charges, unforeseen, nets, etc.	..	2,000.00
(c) Annual lease charges (25% of total salt income)	..	12,000.00
		Total
	..	44,000.00
Returns		
(i) Gross Profit (Total income—Total expenditure)	..	21,500.00
(ii) Profit per hectare	..	2,150.00
Rate of returns		
(i) Cost of production	..	44,000.00
(ii) Value of Produce	..	65,500.00
(iii) Gross Profit	..	21,500.00
(iv) Profit margin	..	47.7%

The total salt production is estimated to be about 2,13,000 bags (1 bag=50 kg). The brackishwater ponds are owned by landlords and are given on short lease to an interested party. In the case of salt agar, $\frac{1}{4}$ of the total salt produced is given to the land owner, in lieu of fees for the lease. In the case of fish ponds, the terms of lease generally depend on the size and production of the pond. A fish pond of 1 ha fetches about Rs. 200-300 per annum from the lease.

ECONOMICS OF FISH FARMING

The cost-benefit analysis for a productive fish farm and salt agar, has been attempted and shown in Table 2 and 3 respectively.

It can be seen (Table 2) that both direct and indirect cost of a fish farm of 3 ha are relatively high (Rs. 3633/ha), but in spite of traditional methods of fish farming, the rate of returns is also fairly high (100%). Therefore, by adopting proper management techniques (hatcheries, nurseries, fattening ponds, compounded diet, etc.), there is a good scope for improving the yield and thus increasing the profitability.

As seen from Table 3, the cost of production in a salt pan-cum-fish farming, is high and consequently the profit margin is rather low (47.7%). Thus, though undertaken by traditional methods, the fish pond farming is more profitable than the 'agar' farming. At present, more than 400 persons are engaged in fish

farming in Goa, and since it is done as a family business, it becomes quite economical.

PROBLEMS AND PROSPECTS

Fish farming in Goa is being practised on non-scientific lines at present. No special attention is being paid for improving the stock of the cultivable species and hence the success or failure entirely depends on the availability of larvae from the natural sources. No proper measures are being undertaken for controlling predation by carnivores and infection by different vectors is quite common. Poaching is another serious problem and for small fish farmers, it is not possible to make a full-time watch and ward arrangement. Such problems are forcing many of the traditional fish farmers of Goa to shift to salt production, where the problems are not so acute and the profit is steady.

In a recent case study of fish farming in Goa (Matondkar, 1978), the high productivity potential of fish farming has been demonstrated. The scope for the expansion of coastal aquaculture in Goa appears to be quite good, as there are vast stretches of low lying wet lands adjoining the estuaries and mangroves. There are also a number of sheltered bays and coves, which can be put to proper use. These areas when brought under scientific management can produce substantial quantities of animal proteins besides providing the much needed vocational opportunities to a large number of coastal population.

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