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AQUACULTURE PROSPECTS IN ANDAMAN AND NICOBAR ISLANDS, INDIA

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ABSTRACT – Andaman and Nicobar group of Islands has a coastline of 1,962 km, about one fourth of the total coastline of India with the exclusive economic zone (EEZ) of 0.6 million km^2, about 30% of the Indian subcontinent. It has an estimated annual fishery potential of 1.48 lakh tones which is about 3.8% of the national fishery potential (39 lakh tones). After post-tsunami earthquake, an area of about 1,300 ha got permanently inundated of which 830 ha suitable for brackishwater aquaculture wherein primarily shrimp culture is being advocated. In inland waters, freshwater fishes like the Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) are cultivated in ponds. *Pangasius sutichi* has been introduced in the Bay Inlands in 2010 and the scope, demand and potential of this species are very high. Breeding techniques of the catfishes are being standardized for diversification of freshwater aquaculture. The details of water bodies for aquaculture development, expansion and diversification have been enumerated for socio-economic development of the people of the Bay Islands.

Key words : Fishery resources, aquaculture prospects, Andaman & Nicobar Islands.

INTRODUCTION

Andaman and Nicobar group of Islands is situated between 60^0, 14$^{'}$ N and 92^0 94' E in the south-east of Bay of Bengal. Though the total coastline of the Islands is 1,962 km which is about one fourth of the total coastline of India, the continental shelf area is only 16,000 km^2 because the seas around the islands are deep within a short distance from the shore. The exclusive economic zone (EEZ) of the Bay Islands is 0.6 million km^2 accounting to about 30% of the Indian EEZ (2.02 million km^2) (Arif, 1983; Alagaraja, 1987). Andaman and Nicobar group of Islands fall under the Agro-ecological Region 21 (hot humid to par humid island eco-region) has an estimated annual fishery potential of 1.48 lakh tones which is about 3.8% of the national fishery potential (39 lakh tones). The important oceanic fisheries constitute about 60,00 tones consisting 46,700 tones of tuna (77.83%) of the marine species. Out of projected potential of oceanic fisheries, only 19% are presently being utilized giving much scope for future exploitation of the oceanic species. Some of the important species *as per* their landings are sardines (*Sardinella*, *Dussumieri*a, *Pellona*, *Herkilotisichthys* and *Anadontostma* species), anchovies (*Thryssa* and *Stolephorous* species), perches (*Lethrinus*, *Lutjanus*, *Lates*, *Pomadasys*, *Epinehhelus* species), silver bellies (*Leognathus* and *Gazza* species), carangids (*Carax*, *Salar*, *Chorinemus*, *Elegatus* and *Decapterus* species), mackerels (*Rastrelliger kanagurta* and *R. brachysoma*), seerfish (*Scomberomorus guttatus* and *S. commersoni*), mullets (*Mugil cephalus* and *Liza tade*), elasmobranchs (*Carcharinus*, *Scoliodon*, *Shpyrna* species including *Centrophorus acus* and *Squatus megalops*), prawns and other crustaceans (Paulinose and George, 1976; Thomas, 1977; Silas *et al*, 1983; Rajaram and Neduraman, 2009; Rajan *et al*, 2012). About 19 species of penaeid prawns and 6 species of lobster are part of the landings (Dorairaj and Soundararajan, 1985; Soundararajan, 1985; Dam Roy and George, 2010; Venkataraman *et al*, 2012). Among mollusks, the most important are *Trochus*, *Turbo* shells, pearl oysters, giant clams, mussels and oysters (Dorairaj and Soundararajan, 1985; Rajaram and Murugan, 2012; Venkataraman *et al*, 2012). The marine fishing in the islands is mainly traditional in nature. The Andaman and Nicobar Administration has demarcated nine fishing zones for organized fishing in these islands. About 6,340 marine fishers are active and use about 1,451 country crafts, 1,257 motorized boat, and 12 mechanized vessels for fishing. There are 72 fish landing centres at the beach site and one organized fish landing centre. The fishing gears used are gill nets, hook and lines, long lines, cast nets and shore seines/anchor nets. The traditional fishing crafts and gears used by the tribes of Car Nicobar have been highlighted by Zamir Ahmed *et al* (2013). Details regarding aqua-resources as well as fish and fisheries of Andaman and Nicobar Islands are being summarized in Table 1.

In inland waters, freshwater fishes like the Indian

major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala,* are cultivated in ponds. The number and area of minor irrigation ponds in major places of Andaman and Nicobar Islands where freshwater fishing is being practiced are given in Table 2.

In general, the annual marine fish landings in these islands have increased gradually from a meager 44 tonnes in 1950 to 28,800 tonnes in 2008. However, in the last 8 years, the fish landing from about 27,600 tonnes in 2000-01 to 28,800 tonnes in 2007-08 (except a drop to 12,000 tonnes in 2005-06 after tsunami) remained nearly static (Table 2). In fact, the fish potential of the islands is hardly being exploited with the present level of catch of only 28,800 tonnes (18.29%). It has been estimated that tuna fish alone account for 44% (64,500 tonnes) of the total fish resource of the Andaman and Nicobar Islands (1.48 lakh tones).

The seed of the Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) are being produced through induced breeding, reared for 30-45 days and supplied to the farmers for stocking in the ponds for further rearing. The seed production and supply of freshwater fish and its production are given in Table 3.

Most of the fish landed in these islands is consumed locally in fresh form. The current trend is for fishing high value finfish such as groupers, snappers, emperors and shell fishes such as crabs, lobsters and shrimps. These fishes are also exported in live, chilled/frozen/salted/dried form either to mainland or to foreign countries by fish traders. Transportation of fish outside the jurisdiction of the islands attracts payment of royality to the government at the prescribed rate. The details of fish and fishery products exported and revenue collected by Andaman and Nicobar Administration, Port Blair are given in Table 4.

Andaman and Nicobar islands are bestowed with rich marine biodiversity. Proper harnessing of these resources is only possible when various mariculture practices such as culture of mussels, edible oyster, pear oyster for pearl production etc are being taken up in the earnest (Thomas, 1977; Silas *et al*., 1983). Even land-based oyster culture and lobster culture in FRP tanks/cement tank can also be undertaken which will cater to the demand of tourists who are arriving here in large number. Since there is a wide gap between the level of exploitation and the estimated fishery potential, fishery has been identified as a priority sector for socio-economic development of the people of the islands.

Cage culture

There is vast scope of cage culture of commercially important fishes like groupers, snappers, seabass, milkfish, mullet etc. These fishes can be cultured in cages in the innumerable bays and creeks of Andaman and Nicobar Islands. Eco-friendly brackishwater aquaculture has been standardized during past two decades by Central Agricultural Research Institute (ICAR), Port Blair. Experiments were conducted on various candidate species in the brackishwater fish farm at Sippighat, South Andaman and the production achieved for mullet (*Liza tade*), milkfish (*Chanos chanos*), seabass (*Lates calcarifer*), tilapia (*Oreochromis urolepis*), prawn (*Penaeus monodon*, *Penaeus merguensis*) and mudcrab (*Scylla serrata*) were 342 kg/ha/yr, 600 kg/ha/yr, 119 kg/ha/yr, 1,036 kg/ha/yr, 1,200 kg/ha/4 months and 878 kg/ha/yr, respectively.

Tsunami

As it is well known that on 26th December 2004, an earthquake measuring 8.9 an Richter scale struck Andaman and Nicobar group of Islands at early hours. This was followed by Tsunami, causing destruction of very high magnitude both in terms of loss of property as well as life. Consequent to the earthquake, there was subduction of land of more then a meter and half with the result sea water intruded inland area to a large extent, thereby inundating the lands which were previously used for agriculture. About 1,300 ha area got permanently inundated, particularly in South Andaman. The areas where the effect was maximum are Sippighat, Chouldari, Teylarabad, Badmaspahar, Port Mount, Methakhari, Dundas Point, Namunaghar etc. The lands which were used hitherto for paddy cultivation have become useless due to increase in salinity. As a result, the farmers who were practicing agriculture are now forced to search for a viable alternative livelihood. The Andaman and Nicobar Administration being aware of the emerging situation, has take up proactive action by constituting a Project Implementation Committee for Aquaculture in the inundated lands. The objective of the Committee is to implement the Aquaculture Projects in the submerged areas of South Andaman. The survey showed an area of 830 ha suitable for brackishwater aquaculture wherein primarily shrimp culture is being advocated. Post-larvae produced from mother prawn of Andaman waters are being used for culture purpose thereby giving an alternative livelihood to the farmers of the area. Reservoir resources in Andaman and Nicobar Islands have been given in Table 5. Scientific exploitation of fisheries will certainly enhance fish production from such water bodies (Sugunan and Sinha, 2001).

There are about of 1,678 minor irrigation ponds existing in farmers field in Andaman and Nicobar Islands,

Table 1 : Some facts about fish and fisheries of Andaman and Nicobar Islands.

Fishery resource potential	1.48 lakh tons
Production	26,000 tons (2005)
Demersal resources	32,000 tons
Pelagic resource	56,000 tons
Oceanic resource	60,000 tons
Total catch	28,800 tons (2008)
Diversity of marine fishes	1,330 species
Family	169
Genera	300
Species	547
Number of fisherman engaged in fishing (2010)	17,498
Skilled fisherman	7,500
Unskilled fisherman	5,000
Gear used (2010)	
Gill net	1,715
Shore seine	10
Anker net	1
Cast net	517
Hooks & lines	1,850
Trawl net	6,787
Disco net	10
Fishing craft used (2010)	
Country craft	546
Mechanized boat	436
Local Boat	566

Table 5 : Reservoir resources in Andaman and Nicobar Islands.

Sl. No.	Place	Number of ponds	Water area (ha)
1	Dhanikari Reservoir	South Andaman	65
2	V. K. Puram Reservoir	Little Andaman	48
3	R.K.Puram Reservoir	Little Andaman	65
4	Dilthamam Tank	South Andaman	03
5	Chakkargaon Tank	South Andaman	03
6	Nayagaon Tank	South Andaman	03
7	Kalpong Reservoir	North Andaman	180
	Total		367

Table 2 : Minor irrigation ponds used for aquaculture in Andaman and Nicobar Islands.

Sl. No.	Place	Number of ponds	Water area (ha)
1	South Andaman	382	22.00
2	Baratang	25	1.60
3	Billiground	255	16.80
4	Diglipur	465	27.28
5	Havelock	63	3.36
6	Mayabunder	89	5.20
7	Neil Island	37	2.80
8	Hut Bay	75	3.20
9	Rangat	118	5.76
10	Kadamtala	134	7.60
11	Car Nicobar	07	0.56
12	Campell Bay	26	2.08
13	Nancowry	02	0.12
	Total	1,678	100.68
Survey in the year 2010 showed the total number of ponds 2,200.			

(Source: Directorate of Fisheries, Andaman and Nicobar Administration, 2007-08)

Table 3 : Marine and freshwater fisheries in Andaman and Nicobar Islands.

Sl. No	Item	2000-01	2005-06	2007-08
1	Marine fish production (000' tones)	27.6	12.0	28.8
2	Freshwater fish production (000' tones)	0.07	0.04	0.15
3	Freshwater fish seed production & supply (Rs. in lakh)	4.50	7.13	5.10

Table 4 : Fish export and revenue earned by Andaman and Nicobar Islands.

Sl. No	Item	2000-01	2005-06	2007-08
1	Export (000' tones)	0.17	0.32	0.32
2	Revenue (Rs. in lakh)	14.68	12.28	9.90

Table 6 : Details of major culture ponds in Andaman and Nicobar Islands.

Sl. No	Place/Tehsil	Number of ponds	Water area (ha)
1	South Andaman	382	22.92
2	Baratang	25	1.50
3	Billiground	255	15.30
4	Diglipur	465	27.990
5	Havelock	63	3.78
6	Mayabunder	89	5.34
7	Niel Island	37	2.22
8	Hut Bay	75	4.50
9	Rangat	118	7.08
10	Kadamtala	134	8.04
11	Car Nicobar	07	0.42
12	Nancowry	02	0.12
13	Campell Bay	26	1.56
	Total	1678	100.68

some new ponds are also being constructed day-by-day for fish culture. The details of major culture ponds are summarized in Table 6.

These ponds are of the average size of 30x20 m (600^2 m each) with the depth of 2-3 m. Under the Departmental Plan Programme, seed of only the freshwater Indian major carps (catla, rohu and mrigal) are being supplied presently to the pisciculturists on the nominal price @ Rs. 100/- per thousand. The Department is also maintaining a Freshwater Fish Seed Farm for production of freshwater fish seed at Nayagon in South Andaman District. In the Departmental Farm, only seeds of the Indian major carps are being produced because the brood stock of exotic carps (silver carp and grass carps) are not available in the Islands.

Carp culture

For optimum utilization of the freshwater bodies, combined culture of the Indian major carps along with exotic carps (grass carp, silver carp and common carp) are being practiced in the mainland which is popularly known as Composite Fish Culture, it is a scientific technology for maximum fish production from a pond through utilization of fish food organisms available in the water body. According to food and feeding habits, the three feeding zones of Indian major and exotic carps are given in Table 7.

Table 7 : Food, feeding habits and zones of the cultured carps.

Sl. No.	Species	Feeding habit	Feeding Zone
	India major carps		
1	*Catla catla*	Zooplankton feeder	Surface feeder
2	*Labeo rohita*	Omnivorous	Column feeder
3	*Cirrhinus mrigala*	Deterious feeder	Bottom feeder
	Exotic carps		
4	*Hypophthalmichthys molitrix*	Plankton feeder	Surface feeder
5	*Ctenopharyngodon idella*	Aquatic vegetation	Column feeder

Diversification of indigenous species

There is urgent need of diversification of fish species in Inland water. Some important species of air-breathing fishes such *as Clarias batrachus, Heteropneustes fossilis, Channa striatus, Channa punctatus, Anabas testudinus* and *Notopterus chitala* are also available in Andaman and Nicobar Islands (Chaturvedi *et al*, 2013). One catfish hatchery was developed for the seed production of singhi and magur and the induced breeding technology has been standardized (Chaturvedi and Pandey, 2012). Recently, *Pangasius sutichi* (exotic) catfish is introduced in Andaman and Nicobar in the year 2010. The scope, demand and potential of *P. sutchi* is very high in recent years. There is a vast scope of culture of *P sutchi* and seed production unit of diversified species of catfishes is the present demand. Although the demand of catfish seed is too much in Bay Island but hatchery development of such species is the the thrust area for Islands development. *Pangasius sutchi* production is (40 ton/ha) very high as it is tested in different part of the country. This species is quite good for cage culture in Inland water or low saline water or Tsunami nundated water areas.

Seed requirement

Catfishes such as *Heteropneustes fossilis* (singhi), *Clarias batrachus* (magur) and *Pangasius sutichi* have been identified as potential candidate species for diversification of aquaculture in the Bay Islands. The seed required for the culture were initially procured from Bangladesh by the traders from West Bengal and distributed to different states. Now hatcheries have been established in West Bengal, Andhra Pradesh and Chhattisgarh to meet out the demand by the farmers. Present production of *P. sutchi* seed in the country is estimated to be around 40-50 million. Among the catfish,

P. sutchi has rapid growth and attends 1-2 kg in 8 months of the cultured period, thus having tremendous culture potential in Bay Islands. This species can be cultured in ponds, seasonal tanks, abandoned shrimp ponds, cages, reservoirs and landlocked water bodies in Andaman and Nicobar Islands.

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