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Marine resources of islands: status and approaches for sustainable exploitation/ conservation with special emphasis to Andaman and Nicobar

S. DAM ROY and GRINSON GEORGE

Fisheries Science Division, CARI, Port Blair

ABSTRACT

Island ecosystem is unique but with a great diversity. Marine resource potential of Andaman and Nicobar Islands (ANI) is underutilized. The sensitive ecosystems of corals and Mangroves are facing threats as a result of changing climate. Potential fishery resources need to be exploited in sustainable manner for income and employment generation of islanders. Primary data on resources of Bay Islands are collected resorting to standard survey methods and secondary data are used as supporting data for analyzing the trend and potential of fisheries in ANI. The paper is depicting in details the major marine resources and their status in Bay Islands and approaches for their sustainable exploitation and conservation.

Key words: Andaman and Nicobar islands, Conservation, Marine resourses

The Andaman and Nicobar Islands fall under the Agro-ecological region 21 (Hot humid to per humid Island eco-region). The Islands have a true maritime climate with least variation in maximum and minimum temperatures throughout the year. A plenty of (about 1530 mm) rainwater from middle of May to middle of December and a deficit of about 610 mm is experienced during remaining part of the year. On an average the Islands received around 3100 mm rainfall with considerable fluctuations in annual rainfall with highest being experienced in 1961 (4300 mm) and the lowest in 1979 (1550 mm). The Administration of Andaman and Nicobar Islands have demarcated nine fishing zones for organized fishing in these Islands. Some of the important species as per their landings are of sardines, perches, silver bellies, carangids, mackerel, seer fish, mullets, prawns and other crustaceans. About 19 species of penaeid prawns belonging to six genera and 6 species of lobsters also occur here. Among the molluscs, the most important are Trochus, Turbo shells, Pearl oysters, Giant clams, mussels and oysters. Freshwater fishes like Catla, Rohu and Mrigal are also being cultivated in ponds. In general, the annual landings through capture fisheries in these Islands have increased gradually. as it is evident in Table 1, gear wise landing from 1993 to 2002 is given in Table 2.

Island Fisheries are important in the National perspective. The projected potential of Andaman and Nicobar Islands is 1.48 lakh tones. Out of this, the oceanic fisheries constitutes about 60,000 tonnes of which tuna constitutes 46,700 tonnes, i.e. 77.83% of the oceanic fisheries. Out of the projected, potential hardly 19% are presently utilized. The economic development of the Island, therefore, hinges on the development of tuna fisheries of the island and by optimally utilizing available water for coastal aquaculture and open sea mariculture. Infrastructure such as harbour, cold storage and processing facilities as well as vessels/fleet composing of long liners are required. Since, the islands are lagging behind in comparison to other similar development areas, there is need for putting these islands in a speedy development track in the initial planning period and keep up the tempo in the subsequent plan periods with self generated support and sustainability. The farming and fisher families in Andaman and Nicobar Islands need special attention, including technology training, techno infrastructure and trade. Island fisheries have the problem of transport costs, particularly in the case of perishable commodities which may be sold in the mainland or neighbouring countries. Value addition Chain is therefore very important in context of Development of the Islands. The Andaman and Nicobar Islands and Lakshadweep group of Islands offer a great potential for improving the income of the fisher folk as well as the entrepreneurs related to Fisheries Industries. There is considerable scope for improving the income of fisher families on environmentally sustainable basis by introducing Integrated Coastal Zone Management and Scientific fish rearing, harvesting and fish processing.

ANDFISH – a road map for the development of fisheries in A & N Islands' was prepared for these Islands to expound a document for fisheries development keeping in view the potential of the resources, the livelihood and employment opportunities of the stakeholders, post-tsunami and the

Email: sibnarayan@gmail.com

Table 1. Species-wise fish landings (in tonnes) of Andaman and Nicobar Islands.

Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg.
Anchovies	1260	1501	1382	1408	1395	1073	1361	1216	1105	1103	1280
Barracuda	817	983	914	942	842	1022	1021	617	1489	946	959
Belonidae	315	379	353	358	390	113	133	364	242	43	269
Carangids	1299	1537	1455	1456	1350	1139	2249	1007	2144	3750	1739
Catfish	528	665	590	560	540	431	388	510	321	170	470
Chirocentridae	320	385	358	359	340	331	83	237	129	15	256
Crabs	125	147	141	140	145	578	556	738	542	352	346
Elasmobranchs	791	969	885	985	886	1157	941	1523	467	217	882
Hilsa	1457	964	1630	1680	1580	729	478	416	159	228	932
Mackeral	1393	1664	1559	1589	1430	1087	1213	1939	1512	2843	1623
Miscellaneous	4154	3931	4655	4661	3998	3788	1996	2838	2838	2810	3567
Mullets	804	1606	896	904	805	1262	1153	1417	1682	1043	1157
Porches	1738	2155	1946	1951	1926	1482	3356	5636	7029	5330	3255
Polynemids	226	274	209	218	209	201	430	62	17	20	187
Pomfrets	306	393	342	393	345	472	499	1856	192	107	491
Prawns	240	282	269	250	405	601	785	351	534	489	421
Ribbon fish	422	496	473	481	395	597	527	424	253	97	417
Sail & Sward fish	308	360	345	348	328	342	241	1307	316	82	398
Sardines	2852	3296	3192	3214	3194	3926	5237	3823	2389	3048	3417
Squids	186	235	253	253	249	276	82	86	41	64	173
Seer fish	626	748	700	799	729	882	1172	1210	1019	1007	889
Silver Bellies	1234	1446	1410	1420	1405	1090	1098	1557	1467	965	1309
Thissocles	1064	1268	1191	1201	1118	2581	312	728	485	615	1056
Tuna	869	1011	972	981	970	3823	1362	467	801	217	1147
Total	23334	26695	26120	26551	24974	28983	26673	30339	27173	25561	26640

Table 2. Annual Gear-wise fish landings (in tonnes) of Andaman and Nicobar Islands

Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg.
Gill Net	9800	11212	10970	11045	10296	12557	7986	10391	9928	9875	10406
Hook & Line	3267	3737	3657	3745	3641	7435	9464	8716	7215	6040	5692
Cast Net	2567	3203	3134	3215	3125	3953	3678	5537	4026	2995	3543
Shore Seine	4312	4805	4702	4795	4339	1935	1319	1629	2462	1611	3191
Anchor or Stick Net	2100	2403	2351	2451	2325	2508	4162	2902	1925	2453	2558
Traditional Methods	1260	1303	1254	1250	1200	451	8	5	54	805	759
Trolling	28	32	52	50	48	38		1062	735	744	279
Disco Net	-	-	-	-	-	96	48	58	733	1026	196
Long line	-	-	-	-	-	-	-	20	81	1	10
Bow & Arrow	-	-	-	-	-	10	8	19	14	11	6
Total	23334	26695	26120	26551	24974	28983	26673	30339	27173	25561	26640

current trends in global fisheries development. There are still more concepts and ideas in black and white to be implemented in Island Fisheries development. Potential Fishing Zone (PFZ), a concept developed by Space Application Centre, Ahmedabad and operationalised by Indian National Centre for Ocean Information Services (INCOIS) made inroads in all maritime states, but it has yet to make a break through in Bay Islands. This paper attempts to address state of the fishery resources of the island archipelagos with special emphasis on Bay Islands.

MATERIALS AND METHODS

Survey for monitoring the health status of coral reefs was made at sites –Mahatma Gandhi Marine National Park: Jolly Buoy, Boat island and Tarmugli; Rani Jhansi Marine National park: people Deara, light house and jetty of Havelock island; North Bay, Phongi Balu and so on. Line Intercept transect (LIT) method was resorted. Observations with respect to hydrographical parameters, percentage cover of different substrates including live corals, coral species composition

and abundance of fish species and other associated fauna were recorded. Salient observations made in different zones of selected coral reefs helped to identify the indicators that give information on health of reefs and to identify the reefs at risk. Secondary data were complied from the basic statistics published by Andaman and Nicobar Administration and bulletins of Fisheries Survey of India (basic statistics and FSI bulletins). Statistical analysis was done using Microsoft Excel package. Several sittings of experts were held at different occasions for discussing the policy level issues on Andaman Fisheries, which resulted in ANDFISH- a road map on fisheries of Andaman and Nicobar Islands. Regular field sampling was done in cataloguing the checklist and data on major food fish groups available. A checklist on fishes of Andamans published by CARI, Port Blair was referred for the purpose. Strategic plans and infrastructure details are enumerated based on the technical expertise of the authors in collaboration with the suggestions of various committees who implemented the fisheries policies of the islands.

RESULTS AND DISCUSSION

Mangrove ecosystem: The Mangrove ecosystem of Bay Islands is blessed with 25 true mangals and 93 mangrove associates. (Dam Roy, 2003). The island topography is hilly with small tracts of coastal fallow lands. Average annual rainfall is around 3000 mm. The pH of the soil sampled varies between 3.5 and 6.5 and mostly acid sulphate soil. In surface soils, the bulk density varies from 1g/cm^3 to 1.4 g/cm^3. Organic carbon varies from 1.5% to 1.8%. The texture is clayey and rarely loamy and sandy. Though the content of organic matter is high, the unbuffered cation exchange capacity is low. There is a lot of water run off from the tropical rain forest of Andaman and Nicobar islands, rich in organic humus that gets deposited as coastal sedimentation, making coastal lands rich in acid sulphate. Association of mangrove species likes *Rhizophora* and *Nypa* found in tidal brackish water swamps is a strong indication of acid sulphate soils, while swamps with *Avecennia* are less acidic.

There is about 966 sq. km of mangrove area in Andaman & Nicobar Islands, with a variety of mangrove and associated fauna, which are subjected to regular tidal inundation. In the post tsunami scenario, in south Andaman alone, due to the subduction of the land by about 1.25 m, the level of submergence due to tidal influence has also increased. A survey conducted reveals that approximately 4000 ha areas of agricultural farmlands have been submerged, out of which 630.12 ha of area are found suitable for coastal aquaculture. However, as coastal marshy wetlands are of acid sulphate nature, there have been a lot of apprehensions among the entrepreneurs, scientists, planners and administrators regarding technical viability and success of these ventures. As per the available technology at present, these acidic soils can be rapidly reclaimed with low cost technique. A feasibility study conducted along the coastal marshy wetlands of South Andaman explored this possibility. The ecology and scope for fisheries in mangrove areas of ANI was explored in detail. The reduction in fish catch during 2004-2005 as revealed in the basic statistics of Andaman & Nicobar Administration makes this study imperative as an alternate source of fish/ shrimp production through coastal aquaculture.

Coral reef ecosystem: Coral Reefs of Andaman – a general status assessment: Most of the coral reefs are of the fringing type, colonizing nearer to the coastline on east and west coasts of Andaman. In-between the shore and the reef, the sea is nearly 40 m deep. The windward side slopes down suddenly to a depth of 350–540 m and subjected to the monsoon winds. Channel reefs are found on the sheltered shoreline where the water of the channel is relatively calm due to less wind and wave action. They are also known as leeward reef. Such reefs are located in Ritchie's archipelago and South Andaman. Knolls occur in channels adjoining the fringing reef of the adjacent islands and may arise from about 20 m depths. They also have flat tops. *Porites* and *Favia* are the chief reef builders in these types of reefs in the Andaman. On the margins of channels of Ritchie Archipelago occur the coral knolls built mainly by the above two species. The reef edges contain mostly the stony corals of the genera *Acropora, Pocillopora, Favia* and *Porites*. At Rangat, the reef on the east coast is thickly populated by massive corals, mainly *Porites lutea* and on the sandy bottom by *Pocillopora* spp and *Acropora* spp. In long island about 72% of the bottom is covered by massive type living corals. In Hut Bay, (Little Andaman) dead coral colonies are observed. The cause of death may be silt.

In the Andamans, the reef flat extends upto about 500 m from shore. Erosion channels upto 20m wide intersect the platform. Reef edges support Acropora, Pocillopora, Porites and Favia. On the west coast of South Andaman, extensive coral reef formations were seen at Kurmadera and around the islands of the Marine National Park off Wandoor. Thickest of fragile stag–horn coral (Acropora sp.) dominate in that area, providing shelter for several coral reef fishes. Undistributed extensive coral patches were seen around Twin Island.

Management of coral reefs during stress conditions like mass bleaching is very important. One of the important outputs of studies of these islands is the observation made on mass bleaching of corals and some associated fauna like sea anemone, giant clam**;** which harbour symbiotic algae which import colour to the host animals. In 1998 and 2005, NOAA as early as in February predicted that the surface seawater temperature would be increasing than normal during the year. Since, the seawater temperature is a critical factor for the well-being of symbiotic association of host animals like corals, giant clam**;** with micro algae they are harbouring, the impact of changes in temperature on coral reefs was monitored during the year. Out of several sites of coral reefs surveyed in South Andaman Islands, it was found mass

bleaching of coral reefs started occurring from May 1998 to 2005. The bleaching in corals was observed to range between 2 and 39% and death in coral of especially branching types to vary between 3 and 55.4% in various sites. The bleaching effect continued up to July and later on the surviving corals regained the health. The impact of elevation in surface seawater temperature affected reef flat zone. The mass bleaching occurred due to the triggering mechanism of elevation of temperature caused to extrude the symbiotic algae from host animal, which play key role in supplying synthesized food to the host corals to more than 90%. Mass bleaching had changed coral reef community in a way, largely eliminating branching corals and massive corals surviving and dominating.

Previous studies on Andaman corals reveals disease and stress induced mortality. The reasons of these incidents were not catastrophic and the coral reefs recovered in time. Serious concerns were there about the health status of reefs as Andaman recorded an under sea earthquake of magnitude 9.3 m in the Richer scale, that occurred on 26 December, 2004 devastating many coastal habitats. The giant waves lashed along the coast refashioned the coastline devastating tens of hundreds of hectares of mangrove forests. In protected bays damages were less. Corals are very sensitive to their ambient water properties. Pristine transparent water in shallow protected bays ensures coral growth. So, a sudden massive rushing in of water, its inundation, salinity changes, muddy and silt deposition made by retrieving water, jolts created by the earthquake and the like were a major concern for reef lovers. Corals were exposed after the earthquake during December, 2004 in Diglipur area. The continuous exposure led to the death of the corals, but those remained in the submerged areas recovered.

Ornamental reef fishes: The marine ecosystem of A & N Islands offers a varied and complex flora and fauna of which the colorful coral reef fishes constitute the most fragile and interesting faunal element. The fish fauna of ANI contributes more than 1200 species of which over 250 species are of ornamental in nature. Inspite of huge potential of ornamental fishes as a lucrative business opportunity in these islands, the culture and rearing of the same is yet to begin. Successful breeding and further standardization of breeding technology of *Amphiprion percula* commonly known as clown fishes **s**how that sustainable and profitable production of marine ornamental fishes can be taken up as an entrepreneurial venture in ANI with limited infrastructure facilities. Some of the most popular ornamental reef fishes are; Butterfly fishes, Angelfishes, Surgeonfishes, Wrasses, Squirrelfishes, Damsel fishes, Triggerfishes, Boxfishes and clownfishes.

Marine Food fishery: The fishery potential of ANI has been estimated by various researchers (Jones and Banerjee, 1972; Kumaran, 1973; Cushing, 1971; Antony Raja, 1980). The working group of revalidation of fishery potential has accepted the estimate made by Fishery Survey of India in 1990; according to which the pelagic resources potential (0-200 m) is 130,000 tonnes and demersal resource potential (0-50 m) is 22,500 tonnes. Harvestable oceanic tuna is estimated to be around 82000 tonnes. Therefore, a total fishery potential of 2.345 lakhs tonnes exists in A & N EEZ. (Sudarsan *et.al* 1990). An analysis of the data on monthly fish catch in ANI for 5 years during 1998 – 2002 reveals that there is no significant variation (P> 0.05) in the month-wise fish landings. However, in corporation of the average fish landings in each month over 5 years, it has been observed that Jan-Apr. is the peak fishing season with an average fish landing of 2,659 tonnes while May- Aug. is the lean season with an average fish landing of 1,925 tonnes.

There has been significant variation (P<0.01) in the annual fish catch and it rose to 33,339 tonnes (2000) from 23,334 tonnes (1993). However, after 2000, the catch has declined to a level of 25,561 tonnes during 2002. ANI account for < 1% of the total marine fish landings of the country, though the EEZ of the Islands is nearly 30% of Indian EEZ. Significant variation (P.0.05) has been observed in the landings of different species of fishes. The landings of Sardines have been quite consistent and they account for about 13% of the total fish landings has doubled (from8% to 16%), when the fish landings during 1993–1997 and 1998–2002 are compared. Carangids, mackerel, silver bellies and anchovies altogether account for 22% of the total fish landings.

The Sardines, Anchovies and Hilsa are caught by gillnets, boat seines and shore seines. The important genera are *Sardinella, Dussumieria, Pellona, Herkilotisicthys* and *Anadantostoma. Herkilotisicthys punctatus* contributed nearly 70% of the total sardine catch. The main season of fishing is from July to December, Dorairaj and Soundararajan (1985). Among the anchovies *Thryssa* and *Stolephorous* contributed to the major catch. The main season of fishing is from July to December. Two species of mackerels namely *Rastrelliger kanagurta* and *brachysoma* contributed to the fishery. The gears used are gillnets and boat seines and good fishing seasons are March-June and September-December.

Hook and lines and gill nets mostly catch the perches. The important species belong to genera *Lethrinus, Lates, Lutjanus, Pomadasys Epinephelus* etc. The main fishing season is from August to November. The carangids are landed by gillnets and boat seines and the major genera are *Caranx*, *Selar, Chorinemus, Elegatus* and *Decapterus.* The favourable fishing season is from July to November. Silver bellies are mostly caught in boat seines and shore seines and are represented by two genera, namely, *Leiognathus* and *Gazza*. The former accounting for more than 90%. The main season is from June to December. The mullets and barracudas are caught by gillnets and boat seines and the peak season is from July to December. The main species of mullet are *Mugil cephalus* and *Liza tade*. The latter migrates along the tides into the creeks for foraging. Among the seerfish,

Scomberomorus guttatus and *S. commerssoni* land in good quantities. Sciaenids and catfish occur in trawl catches.

Tuna: The tuna and seer fish mainly caught in gillnets and hook and lines during March–August. The peak season of fishing coincides with the pre-monsoon period. During southwest monsoon the fishery is at its lower ebbs. The important tunas contributing to the fishery are little tuna (*Euthynmus affinis*) and skipjack, big eye, northern blue fin, little tuna, marlins, sailfish, sword fish etc. are reported to occur in abundance especially around great Nicobar, south of Car Nicobar and southern regions. The potential stock of tunas in the EEZ of ANI is estimated to be around 100000 tonnes (Sivaprakasam, 1979; John and Reddy (1989). According to fishery experts, stocks of 25000 tonnes of yellowfin and big eye tunas and 50000 tonnes of skipjack tuna could be exploited (Abidi, 1979); Dorairaj and Soundararajan, 1985). However, the present exploitation of tuna is very meagre being around 600 tonnes constituting about 2.7% of the total fish landings. The Islands are, at present, thriving on a heavily subsidized economy. The per capita expenditure is the highest for the Islands when compared at national level. However, the revenue generated through tuna fishery development should provide enough guarantees to offset the inflatory economy of the islands. The remoteness of the islands, lack of adequate infrastructure facilities and poor knowledge of the spatial and seasonal abundance of tuna in the EEZ of A & N islands are the major constraints in developing a capital-intensive tuna fishing industry (Soundararajan, 1996).

Elasmobranchs: The elasmobranches are generally caught by gillnets and longlines, the sharks are mainly caught for their fins as exportable items. The species mainly belong to *Carcharhinus*, *Scoliodon* and *Sphyrna.* There has been sporadic fishery by one or two fishermen for deep-sea sharks. *Centrophorus acus* and *Squatus megalops*. They are caught for silver extraction (Soundararajan and Dam Roy, 2004).

Crustaceans: Among crustaceans, shrimps are mainly caught using bagnets, boatseine, dragnets and castnets mostly relying on tidal cycles and lunar periods. Amongst prawns, *Penaeus meguiensis* (49%) and *Metapenaeus dobsoni* (42%) are dominant. *Penaeus monodon*, *P.semisulcatus* and *M. ensis* are caught in stray numbers in bottom set gillnets, which are operated mainly for fishes. Six species of spiny lobster occur namely *Panulirus versicolor*, *P. ornatus, P. pencillatus*, *P. longiceps*, *P. homarus* and *P. polyphagus*. Four species of Portunid crabs namely *Scylla serrata, Scylla tranqucharica, Portunus pelagicus* and *Portunus sanguinolentus* are caught by bottom set gillnets. *Scylla serrata* is also being caught in marshy areas by putting hooks on crab holes.

Reef fishes: There is no real time assessment. However, based on a conservative estimate of average potential of about 3 tonnes per km^2 , it can be expected that about 3000 to 6000 tonnes of reef fishes can be harvested from existing coral reef areas (Dam Roy *et.al,* 2001). Among the reef fishes, perches and perch like fishes are represented by 7 major groups, like *Lates sp. Serranus spp. Epinephelus spp. Polydaclyhus sp. Lettarimus spp., Pristipomoides sp*. and *Pomadasys sp*. The peak fishing season for these fishes is August to November.

Groupers: These form specially targeted group for export as live fish. The annual potential of groupers, which form about 10% of the reef fishes may be more than 300-600 tonnes. It must be considered that the actual fishing area is very much smaller at present in comparism to total exploitable area and hence, the potential is far less leading to over exploitation in limited areas.

Snappers and rabbit fish: These also have high export value. Actual potential is not known but may be considered at the same level of groupers. However, unlike groupers, they move mostly in schools and hence, the exploitable biomass may be higher (Dam Roy *et al.* 2001).Temporal Variation in Catches: An analysis of the data on monthly fish catch (Fig.1) in ANI for 5 years during 1998 – 2002 reveals that there is no significant variation (P> 0.05) in the month-wise fish landings. However, in corporation of the average fish landings in each month over 5 years, it has been observed that Jan-Apr. is the peak fishing season with an average fish landing of 2 659 tonnes while May- Aug. is the lean season with an average fish landing of 1 925 tonnes.

Offshore Fisheries: There is no organized offshore fishing from Andaman base. However, the Fishery Survey of India is conducting systematic exploratory fishing, since October, 1971. Bottom trawling, long lining, trolling, Kalava lining and purse seining has been conducted. Catch rates of as much as 100 kg per hour obtained in Andaman waters are comparable to those obtained in the east coast of India. The demersal fishes obtained by trawling are leiognathids (33%), upenids (19%), sciaenids (12%), skates (5%), rays (3.5%), shark (3%), nemipterides (3.5%), carangids (2.5%), catfish (2%), perches (1%), lizard fishes (0.8%) and other miscellaneous fishes (Sivaprakasam 1979). Sudarsan (1978) stated that good catches of sharks and marlins were obtained from long lining in areas south of North Andaman and cast of Little Andaman including the Invisible banks. During surveys, schools of sardine, mackerel, skip jack and other varieties of tuna were also encountered in the Invisible banks which are located about 60 miles South of Port Blair and North East of Little Andaman. The period between October and March is more productive than other period. Trolling lines, which were tried while proceeding to the fishing, ground and returning to the port during 1973–76 yielded catches upto 56 kg/hr. Carangids (28%), Tuna (17%) and Perches (4%) were the important fish groups caught by trolling (Sundersan, 1978). Kalava lining operated during 1974-75 could obtain highest catch of 18 kg/hr. perches (23%), sharks (15%), carangids (6%) and tunas (3%) were the important fish groups caught. Purse seining was not highly successful. Even though fish schools could be sighted they

were not large enough. Further, the sizes of the vessel and the net were not adequate for operating in deep waters (Sudersan 1978). Fishery Survey of India has been conducting trials of tuna long-lining for sometime past and the chartered vessels have also operated tuna long lines in the past few years. Some useful information of the tuna species composition and the area of abundance have been collected.

The oceanic location of A & N islands makes them ideal for the development of oceanic fisheries. The oceanic tuna resources, especially around the Bay islands are least exploited since, India does not posses the required expertise in oceanic tuna fishery. The exploratory surveys conducted by the Government of India vessels have provided ample evidence regarding the richness of tuna resources in the area. According to a working group (Anon, 1990), the estimated potential of tunas in the seas around the A & N islands is 32000 in the coastal region and 94000 tonnes in the oceanic region. The possible catch in the oceanic region by along lining in 5000 tonnes and by surface netting is 121 000 tonnes. The introduction of pole and line fishery has limitation as knowledge of the availability of suitable baitfishes is limited. The strategy should be to develop deep water pole and lining in which fishing will be made for 4-5 days using large mechanized boats with facilities for holding baitfishes alive for such duration. For assessing the actual potential for pole and line fishing, external expertise will be necessary from regions like the Lakhsadweep or Maldives, where pole and line fishing has been specialized over the years.

Finally, the fishery development action plan should reckon with the preservation of the pristine condition of the islands to ensure the promotion of high-class tourism which is the other sector holding the key to the economic development of the islands.

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