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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the National Marine Living Resources Data Centre (NMLRDC) and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

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Front cover photo:
Tunas being smoked over an iron grill; a step in the preparation of 'masmin'.

Back cover photo:
Live-bait fishes to be used in the pole and line fishing for tunas being fished from the coral lagoon in Bangaram, Lakshadweep. Also note the live-bait tank for keeping the fishes alive.

IMPRESSIONS OF A RECENT VISIT TO LAKSHADWEEP FROM THE FISHERIES AND MARINE BIOLOGICAL PERSPECTIVES

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In the recent times, the Lakshadweep has been in the limelight owing to the special considerations shown by the Government of India towards its alround development and the welfare of the people. The Prime Minister during his recent visit to the Lakshadweep has evaluated the overall conditions there, and while taking manifold steps for improving the socio-economic aspects of the islands and the people, has stressed the need for effective involvement of all the agencies concerned with the development of these remote islands. Occupying a pivotal position in the economy of the islands, the marine fisheries has to play a key role in maintaining and upgrading the standard of the life in the islands. In this context CMFRI had already contributed to the management of marine fisheries resources and steps are now being taken to expand its research activities in particular fields.

In order to make an on-the-spot study of the pole and line fishery for skipjack, live-bait fishes, coral reef ecosystem and the associated flora and fauna and other ancillary marine resources in the Lakshadweep, the senior author accompanied by the other two scientists made a visit to four of the islands, namely Minicoy, Kavaratti, Agatti and Bangaram from 20 to 28 February, 1987.

During the visit it was found that considerable damage had taken place to the coral reefs around Minicoy Island and this could be one of the reasons for the disappearance of the live-bait fishes in the region. To remedy the situation, one method would be to provide small artificial reefs in the Minicoy lagoon for attracting different species of live-bait fishes which are known to exist in the lagoon and outside. Similar attempts made in Hawaii have proved very successful.

For immediate relief to the fishermen, urgent research is needed to study the live-baits in confinement for understanding the behaviour of each species, their capability to survive and the densities at which they could be maintained. The results emerging out of such studies would help fishermen to adopt new methods of storing live-bait fishes for use when the same cannot be collected readily from the sea.

There appears to be great scope for exploiting the wide variety of ornamental fishes such as *Heniochus acuminatus, Dascyllus aruanus, Rhinecanthus* sp., *Holocentrus* spp., *Chaetodon auriga, Acanthurus* sp. *etc,* available in different islands of Lakshadweep. While it would be difficult to assess the stocks of these fishes, from information available so far, it appears that there was no decline in the stock of these fishes. For proper utilisation of these fishes for ornamental purposes in aquaria, it is necessary to conduct experiments on the maintenance of these fishes under artificial conditions. Some trials of transport onboard vessel and by air as well as their maintenance with and without the coral associates need to be done to develop domestic as well as export market. Trials have already been initiated at Minicoy in this direction in respect of the species like *Chromis caeruleus, Dascyllus aruanus, Archamia fucata* and *Caesio caerulaureus.*

The other fishes observed during the visit and also during the inter-island travel include flying fishes and belonids, which were found gliding on the surface. Muraenid eels were observed in coral reef areas. Large sized carangids were noticed in the deeper waters and can be caught in troll lines.

While the coral ecosystem at Minicoy has sustained some damages and seems to have considerably changed from the situation prevailed decades before, the same ecosystem around Agatti and Bangaram does not appear to have been affected to that extent by human activity. In view of this, it is advisable that at least in islands where the coral reefs are not damaged, measures have to be taken to properly preserve the environment so that

the nature's balance with reference to the flora and fauna can be maintained for deriving maximum benefits. The coral reefs around Agatti and Bangaram islands show luxuriant growth and provide good natural habitat for different live-bait fishes. Other associated fauna and flora are also abundant. Fishermen were observed to go specially in search of two species of sprats *(Spratelloides delicatulus* and *S. japonicus)* in the extensive lagoon of the Bangaram Island. This lagoon also provides a congenial habitat for a variety of molluscs, corals, ornamental fishes and edible varieties of fishes like the lutianids *(Lutianus gibbus)*, lethrinids *(Lethrinus xanthochelus)* and goatfishes *(Mulloides vanicolensis)*. These fishes could easily be caught by the hook and

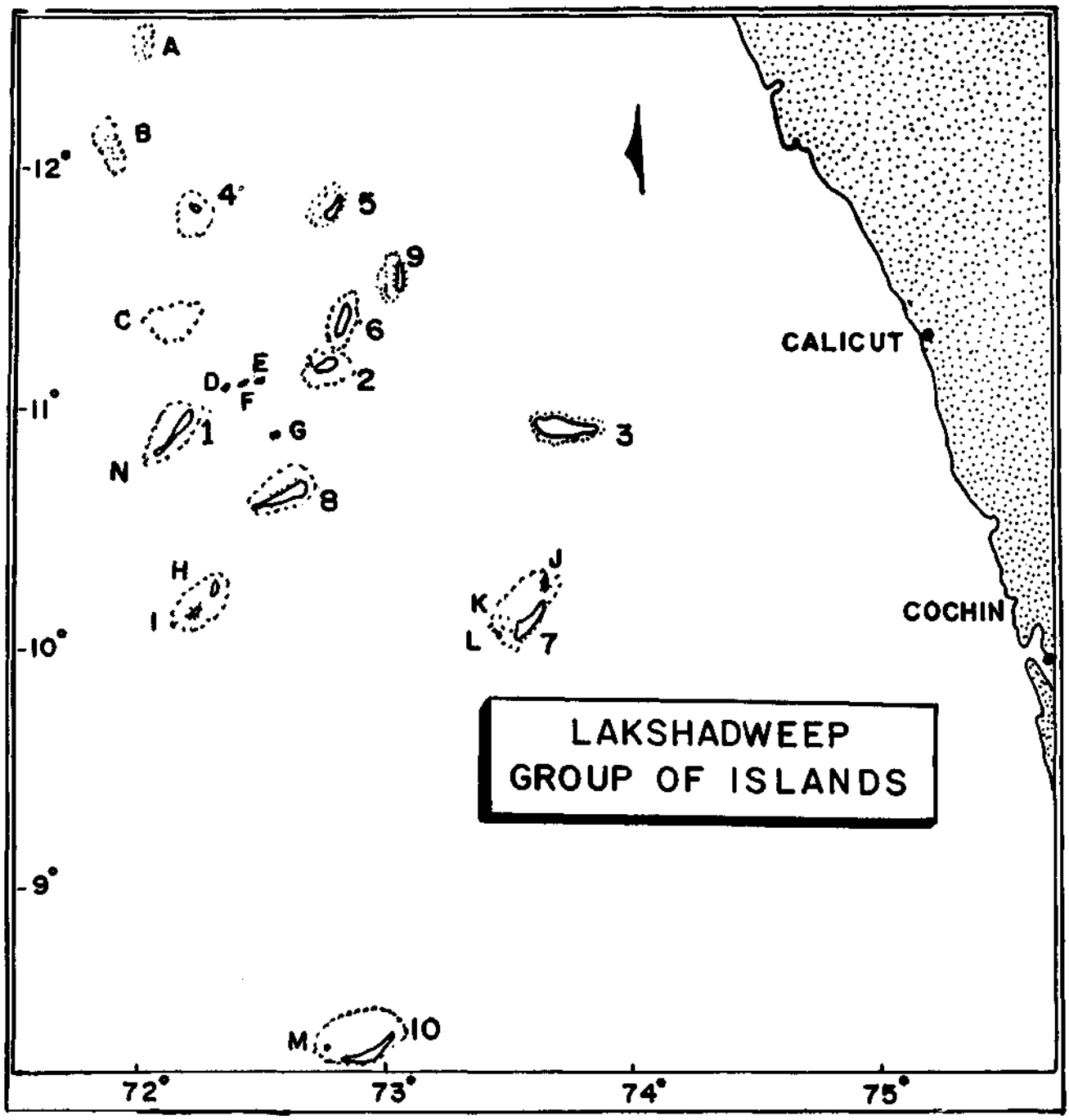

Fig. 1. Inhabited islands: 1. Agatti, 2. Amini, 3. Androth, 4. Bitra, 5. Chetlat, 6. Kadmat, 7. Kalpeni, 8. avaratti, 9. Kiltan and 10. Minicoy. Uninhabited islands: A. Cherbaniani or Baliapaniyam Reef, B. Byramgore or Chereapani Reef, (C) Peremul Par, (D) Bangaram, (E) Parali 1-3, (F) Tinnakara, (G) Pitti (Bird Island), (H) Suheli Valiyakara, (I) Suheli Cheriyakara (Seasonally inhabited), (J) Cheriyam, (K) Pitti, (L) Tilakkam 1-3, (M) Wiringli and (N) Kalpitti.

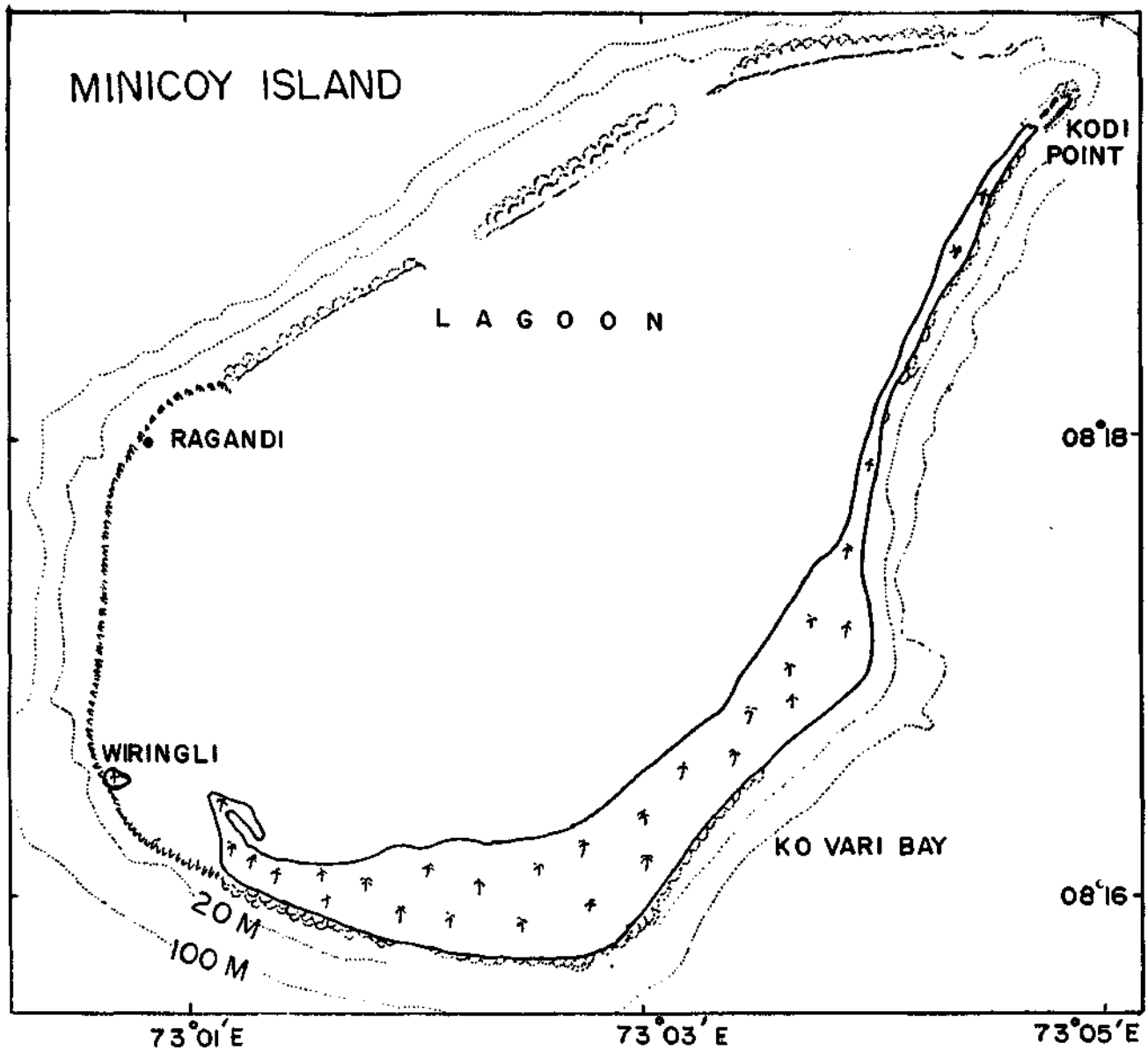

Fig. 2. Minicoy Island

line using sipunculids *(Sipunculus indicus)*, available in the sandy stretches of the lagoon, as bait. The other fishes that could be netted easily at times of high tide include *Gerres acinaces, G.filamentosus, Caranx melampygus, Trachinotus bailloni* and *Bothus pantherinus.*

Although a luxuriant growth of seaweeds is expected in association with coral reefs, high abundance of seaweeds has not been noticed in any of the islands visited. A few seaweeds which were collected include the green alga *Halimeda gracilis,* the brown alga *Turbinaria* sp., the red alga *Gracilaria crassa, Hypnea musciformis, Laurencia papillosa, Acanthophora spicifera* and the calcareous alga *Lithophyllum.* The lagoon areas of the islands indicated sea grass beds dominated by the species, *Thalassia hemprichii.*

The echinoderms collected and observed were *Holothuria (Microthele) nobilis* (very good for *Bechede-mer), Bohadeschia argus* (can be tried for *Bechede-mer), Stichopus chloronotus* (no commercial value), *Culcita novaeguineae* and *Echinometra mathaei.*

Among the molluscs, the giant clam *Tridacna* sp. (live as well as shells of dead ones) was noticed. The

mantle edges of different individuals were observed to be bright orange and brown. *Trochus radiatus, Lambis* spp., *Conus* spp., *Arabica arabica and Cassis cornula* were also available.

Among corals *Acropora* spp. dominated. *Poritus* sp., *Cavilastrea* sp., *Coeloseris* sp. and *Platygura* sp. were noted.

On the beaches of Bangaram Island young and adult ghost crabs *(Ocypoda ceratophthalmus)* were found to be active especially at night in the intertidal zone. The holes are made very characteristically by the crab by depositing the excavated sand in heaps about half a metre away from the hole.

As well known, the species of tuna which mainly supports the fishery in the Lakshadweep is the skipjack

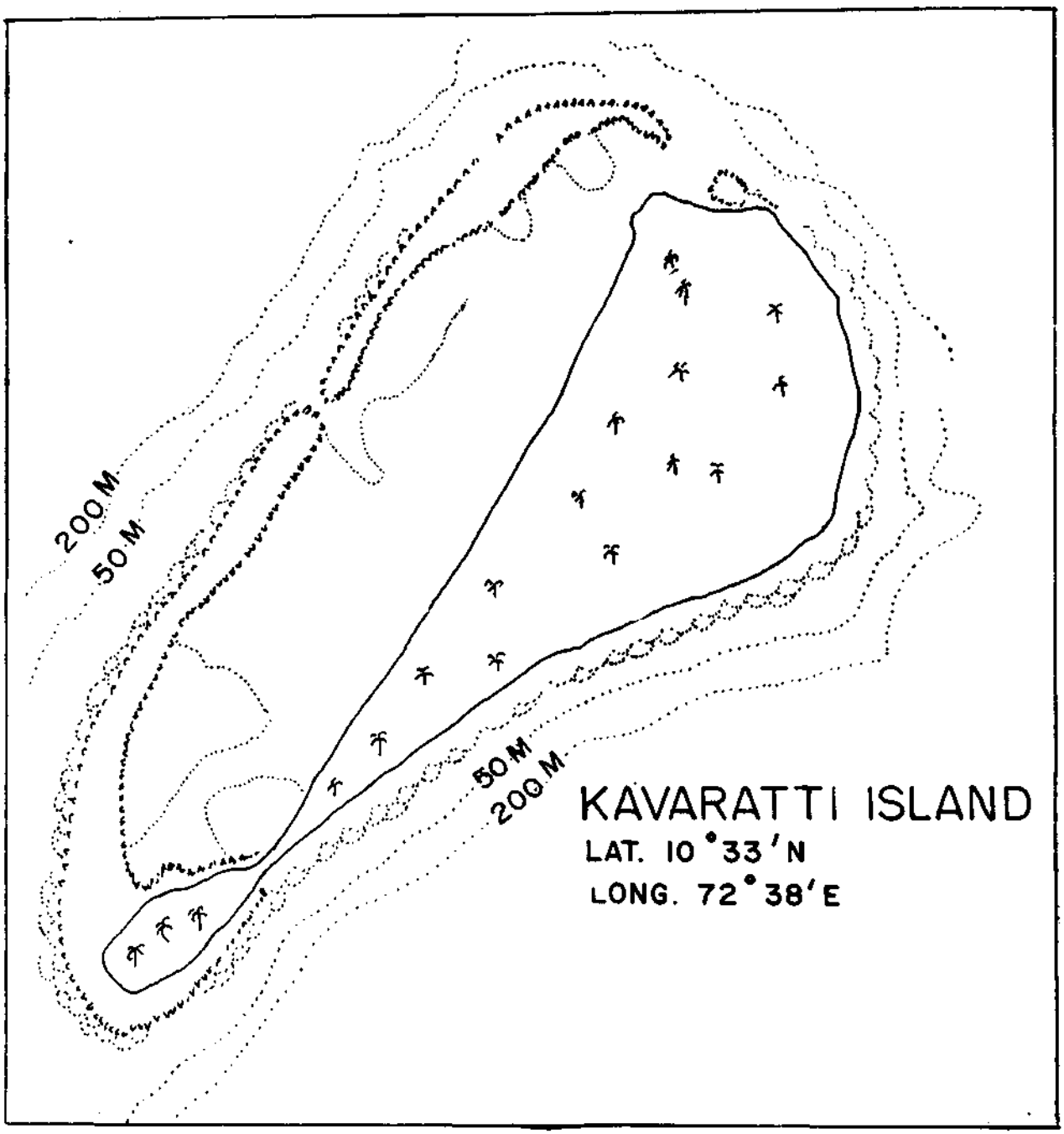

Fig. 3. Kavaratti Island

on which the entire fishing activity and 'masmin' trade depends. The average catch of tunas (1981–'85) was 3,265 tonnes and the catch during 1985 amounted to 3,775 tonnes. The whole economy of the islands revolves around this fish. Large schools of skipjack occur in the region during the season especially from September to May. One school which was specifically observed and on which pole and line fishing took place, occupied a circular area, the radius of which could easily be about 200 metres. The school was quite active, splashing the water at the surface and remained in position for about two hours when large numbers of fish were caught. However, when compared to the vastness of the school and the possible high number of fish within the school, the number of fish actually caught did not appear to be significant. It was apparent, inspite of about 20 boats fishing on the school, that the tunas were not scared by the sounds or other disturbances but continued to swim in the same area. The skipjack in the school ranged in size between 58 and 62 cm. Examination of the specimens landed at Agatti indicated dominance of males over females. No distinct flocks of birds were noticed associated with the tuna schools. A group of porpoises were also noticed at sea between Agatti and Bangaram islands.

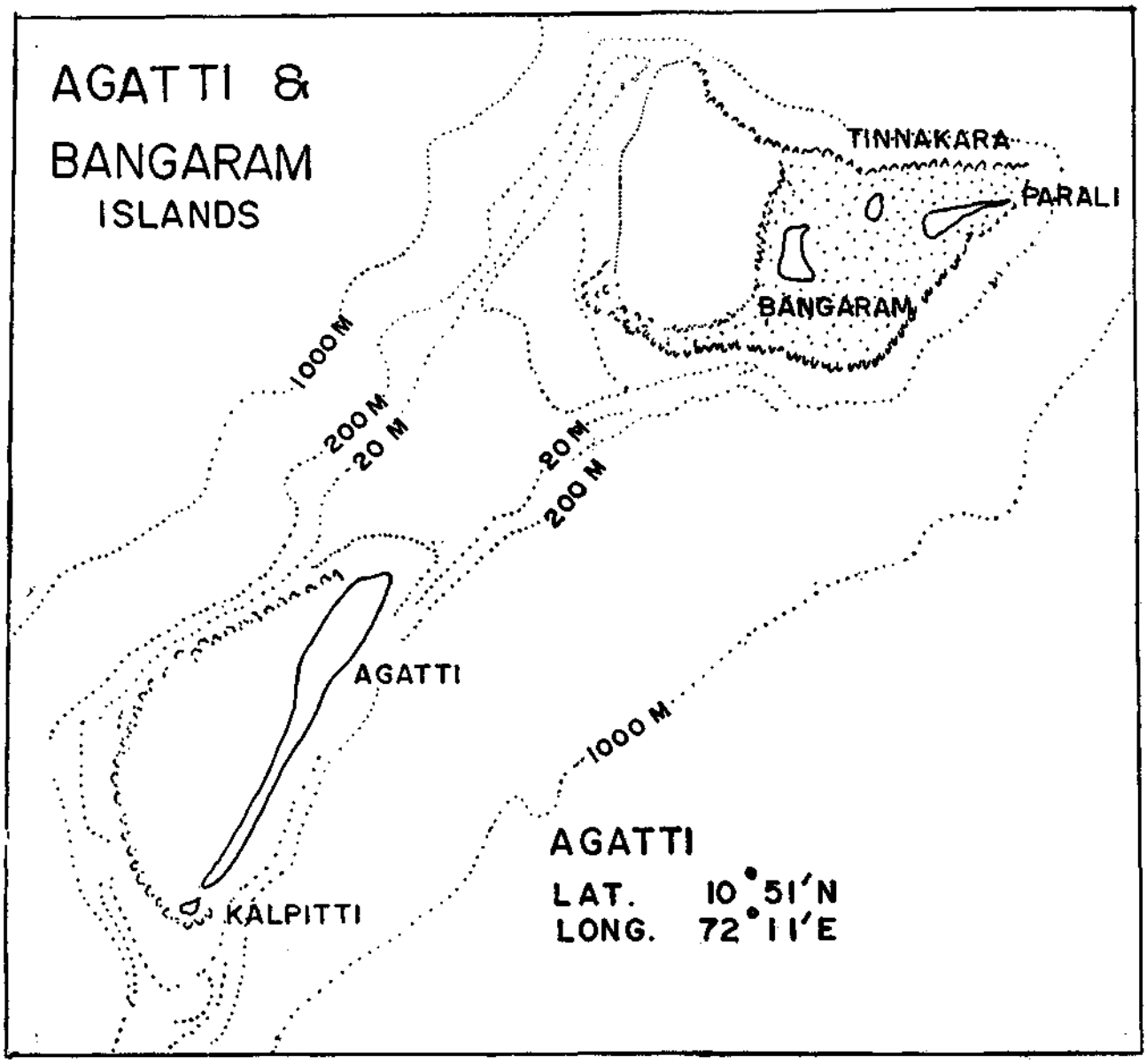

Fig. 4. Agatti and Bangaram islands

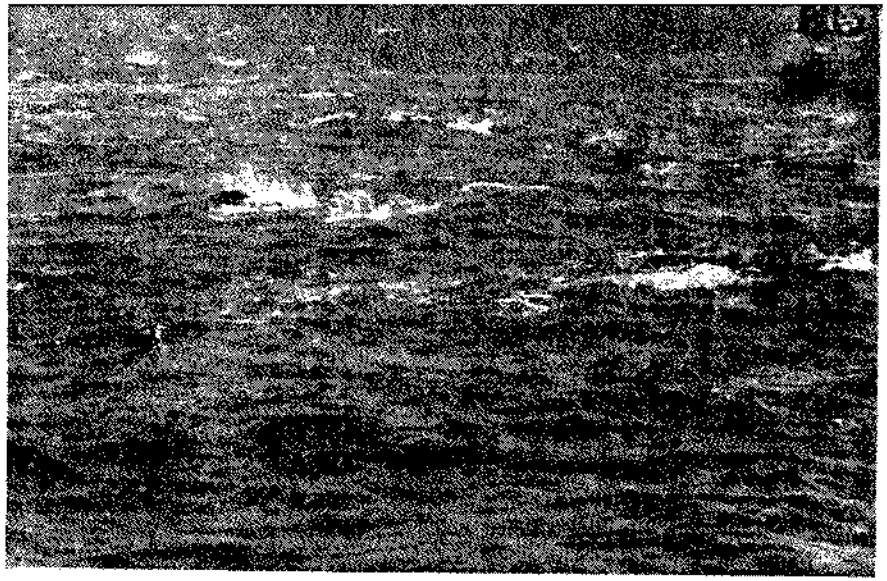

Fig. 5. Characteristic water movement caused by the 'boiling' nature of the skipjack tuna schools off Agatti Island.

Fig. 6. Pole and line fishing for skipjack tunas off Agatti Island.

Fig. 7. A good catch of skipjack tuna being landed at Agatti Island.

Fig.8. Tunas being cut in a characteristic style for the preparation of 'masmin' at Agatti Island.

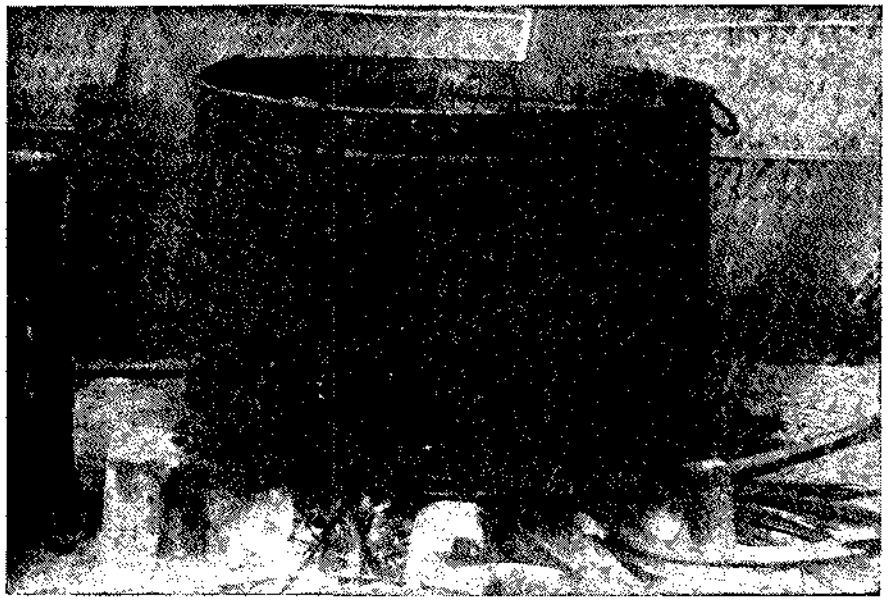

Fig. 9. Boiling of cut tunas in brine before smoking at Agatti Island.

Fig. 10. Sundrying of boiled and smoked tunas at Agatti Island.

Fig. 11. 'Masmin' ready for packing and exporting at Agatti Island.

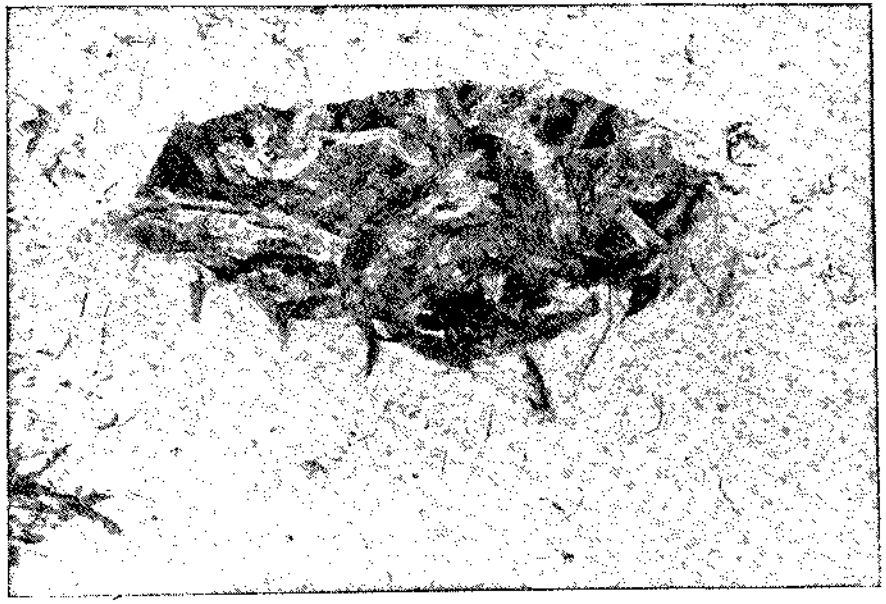

Fig. 12. A pit in which tuna wastes are buried on the beaches of Agatti Island.

Fig. 13. Sundrying of other species of fishes (Lethrinids and Lutjanids) which are exploited on a limited scale from shallow waters of the lagoon at Agatti Island.

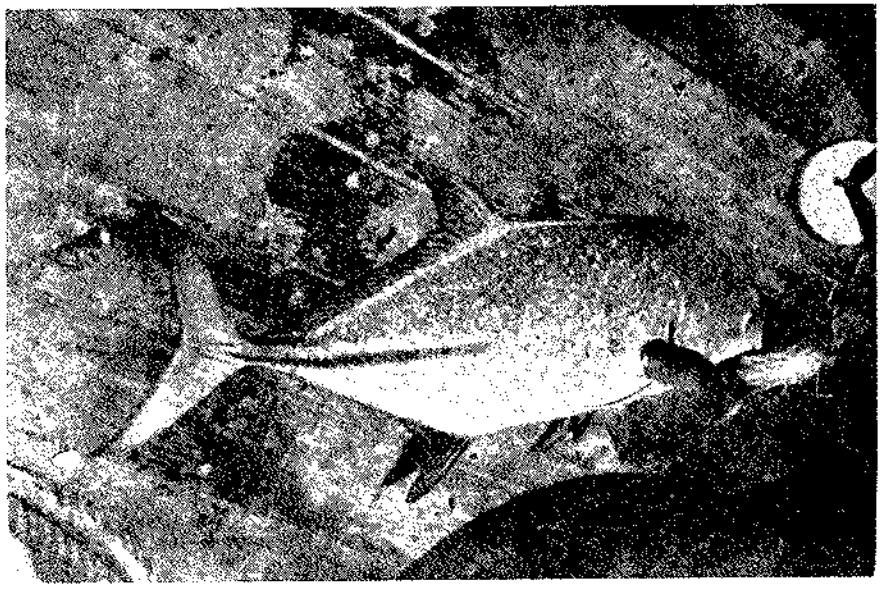

Fig. 14. *Caranx melampygus* caught on hook and line from deeper waters in Lakshadweep.

Fig. 15. A group of the marine ornamental fishes, *Dascyllus aruanus* maintained in the field laboratory of Minicoy Research Centre of CMFRI for the studies on behaviour.

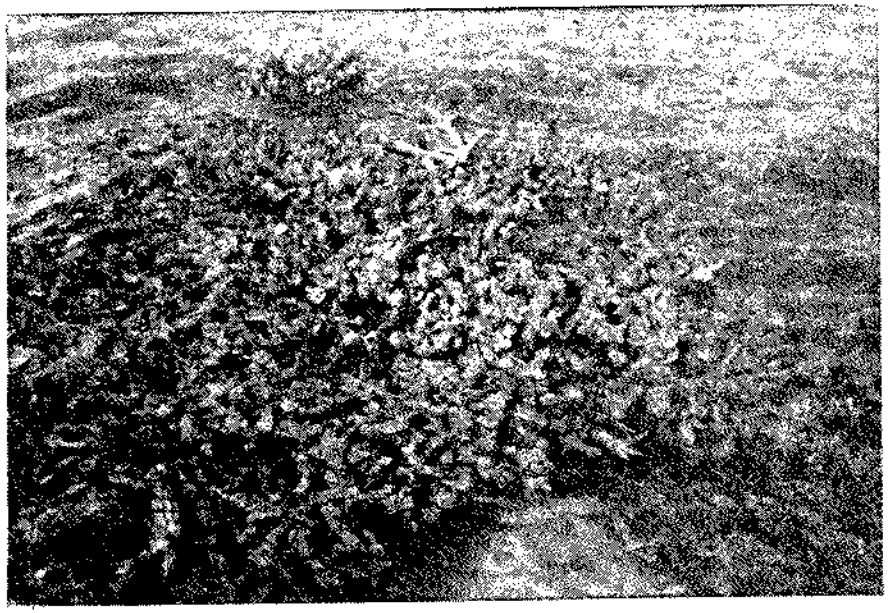

Fig. 16. An exposed reef flat in Bangaram Island during low tide.

The reason for the low rate of hooking appears to be the poor response of fish to the live-baits. Observations simultaneously made in the surrounding waters indicated abundance of small forage fish, possibly sprats and apogonids. Examination of gut content of a few fish caught at the same time indicated that the fish had already fed heavily on the carridean shrimp *Leptochela robusta* Stimpson which constituted about 90% of the volume. In view of the condition of the feed, it is presumed that although live-bait was chummed, since the fish had already fully fed, the response of the fish to the live-bait was poor. Therefore, the factors that determine the variations in the hooking rate, whether it be the presence or absence of forage fishes in the water at the time when the fishermen supply the live-bait or the condition of feed at the time of fishing or even environmental, need detailed study.

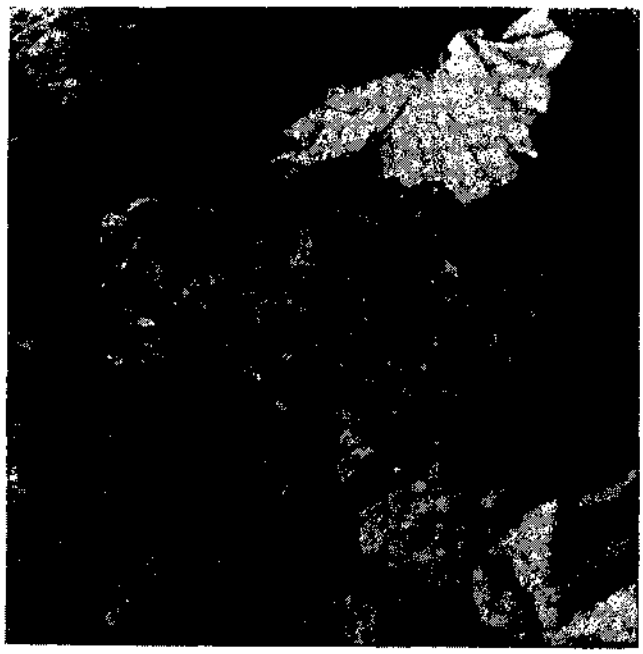

Fig. 17. The giant clam *Tridacna* sp. found in the lagoon of Bangaram Island.

Earlier studies (1958–'59) at Minicoy on the food of skipjack showed that crustaceans formed the major item and consisted of stomatopod larvae, mysids, euphausiids and *Acetes indicus*. Fishes such as balistids, monacanthids, syngnathids, young ones of *Dactyloptena* sp., tetradontids, carangids, *Triacanthus* sp., *Sphyraena* sp., *Ostracion* sp. and antennarids were encountered. Later studies during 1960–'61 revealed that the fish constituted 69.5% followed by crustaceans and stomatopods 8.9% and miscellaneous items forming 2.7%.

The processing of skipjack for preparation of the traditional product called 'masmin' was studied in detail. The fish are sliced in a particular manner as soon as they are brought ashore, and meat required for '*masmin*' is separated from the bones which is used for conversion into product called 'riha akru' used for flavouring the curries. The discarded materials from each fish including the head, gills, entrails and gonads are gathered together and buried in a very shallow pit along the beach. This waste from an individual fish of 4–5 kg amounted to about 1/2 kg. Therefore, the waste accumulated from tonnes of fish caught each day is enormous and this can provide good raw material either for conversion into fish ensilage or simply a manure to be used for plantations, especially the coconut, which is abundant in the islands.

The 'masmin' preparation is a very simple and quick process, locally managed by the boat owners/fishermen. The meat is straight away cooked in large urns in salt water for one or two hours. The cooked meat is removed and placed on metallic grills below which the smoke is produced using the waste from coconut trees. Smoking is done for a few hours and the smoked product is dried on the beach on coconut palm-leaf mats for about a week. The finished product is black in colour, very hard and without any odour. It is then put in gunny bags and transported by boat to different parts on the mainland for marketing. From a tuna of 4–5 kg in weight, about one kg of 'masmin' could be obtained and the price is Rs. 28 to 30 per kg. On the mainland, especially in Calicut, one kg of 'masmin' may cost Rs. 55 to 60. The annual production of 'masmin' amounts to 500 tonnes, worth Rs. 1.5 crores.

Different methods of disposal of the tuna waste are adopted in different islands. It is done hygienically in the Minicoy Island, where all the wastes are gathered and taken to far off places from human habitation and activity and dumped into coastal waters. In Agatti Island these wastes are buried in shallow pits all along the beach where the tunas are landed. This appears to be very unhygienic since such activities seem to generate unhealthy conditions resulting in development of maggots and flies which are commonly found even in the residential areas. It is suggested that such wastes should be profitably converted into fish ensilage (for use in mainland, if economically feasible) or atleast as manure in an organised manner.

While pole and line fishing is very successful under the present conditions existing in the islands, it cannot be concluded that the greater part of the natural resource of skipjack occurring in the area is fished. The potential for skipjack in the Lakshadweep Sea is great that it will be worthwhile to attempt an organised fishery by

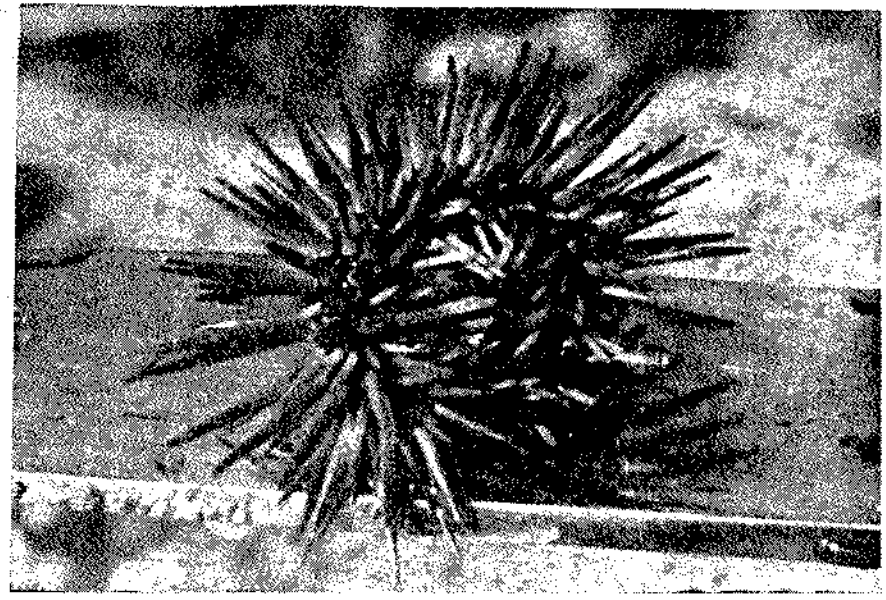

Fig. 18. *Echinometra mathaei*, a small sea urchin found associated with the corals in the lagoon of Bangaram Island.

Fig. 19. *Culcita novaeguineae* (ventral view), an asteroid collected from the lagoon of Bangaram Island.

Fig. 20. *Holothuria (Microthele) nobilis* (dorsal view) collected from the lagoon of Bangaram Island.

Fig. 21. A sea grass bed *(Thalassia hemprichii)* found exposed during low tide in the Bangaram Island.

purse seining which can harvest larger quantities of this resource. The constraints appear to be the lack of boats, expertise and labour needed for such fishing. It will be worthwhile to initiate purse seining in the area on a limited scale and monitor the effect of purse seining on the stocks, and the relationship between pole and line fishing and purse seining. Although a few specimens of yellowfin tunas, mostly young ones, are now and then caught in the pole and line fishery in the different islands, compared to skipjack, the yellowfin appears to be scarce. The possibilities of operating long line for yellowfin in the region should be examined by conducting experimental fishing since this method is more appropriate for this species.

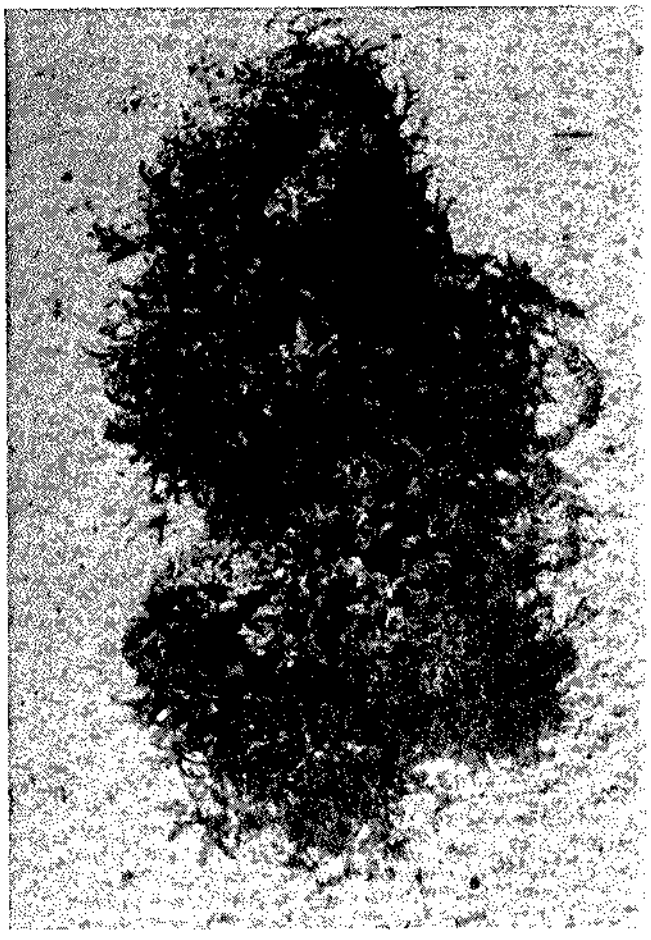

Fig. 22. The red alga *(Gracilaria crassa)* found growing on live and dead corals in the lagoon of Bangaram Island.

There is ample scope for development of tourism in the Lakshadweep islands. The aquarium and the museum maintained by the Fisheries Department of the Lakshadweep Administration have won already the appreciation of dignitories and tourists alike. Sport fishing can also attract tourists. The extensive lagoons and the surrounding waters and the stretches of inter island waters between closely placed islands abound in fishes such as carangids, lethrinids, lutjanids and even tunas and billfishes which can be taken on hooks and lines. Necessary steps to provide facilities like boats and gear for sport fishing as part of tourism development may be taken at suitable islands.

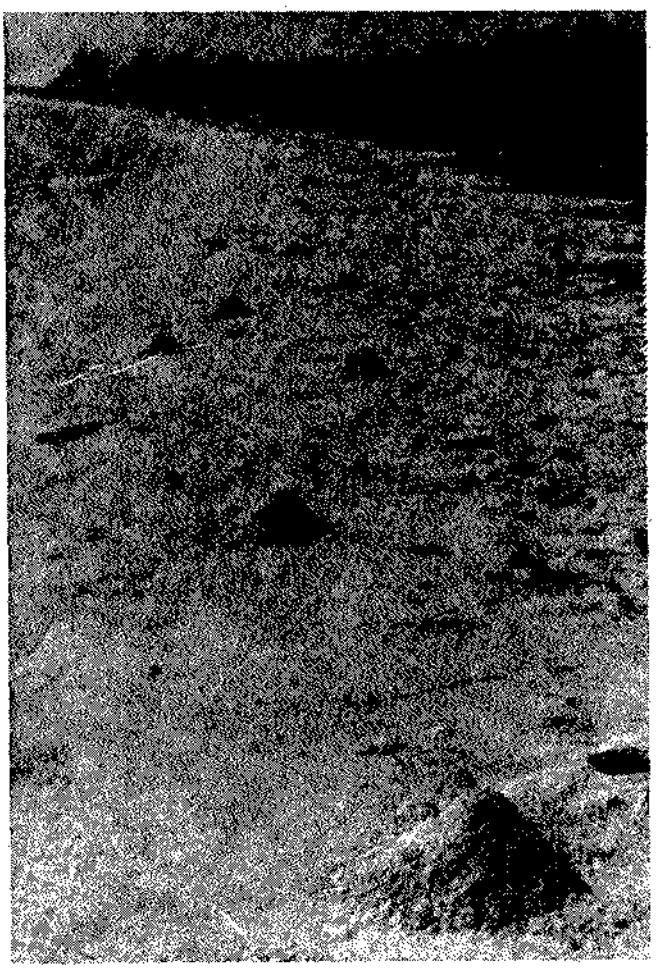

Fig. 23. The holes made by the ghost crab *(Ocypoda ceratophthalmus)* and the heaps of sand thrown out by them on the beach of Bangaram Island.

In view of the damages caused in some of the islands due to dredging and resultant effects on the coral reefs and associated fauna it is desirable that urgent steps are taken to declare some suitable areas as marine resources reserves or marine parks to preserve the coral reef ecosystem. However, location of such marine park will have to be decided upon by detailed studies including underwater surveys.

ROLE OF WOMEN IN SMALL SCALE FISHERIES — A CASE STUDY

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The studies conducted in India and a few countries abroad on the socio-economic conditions of the fishing communities have highlighted the role played by women in small-scale fisheries. The socio-economic structure of small-scale fisheries in India is very complex and there are many factors which influence the participation of women in fishery related activities. To identity these factors, a case study was carried out in Vypeenkara, one of the important fishing centres in Kerala.

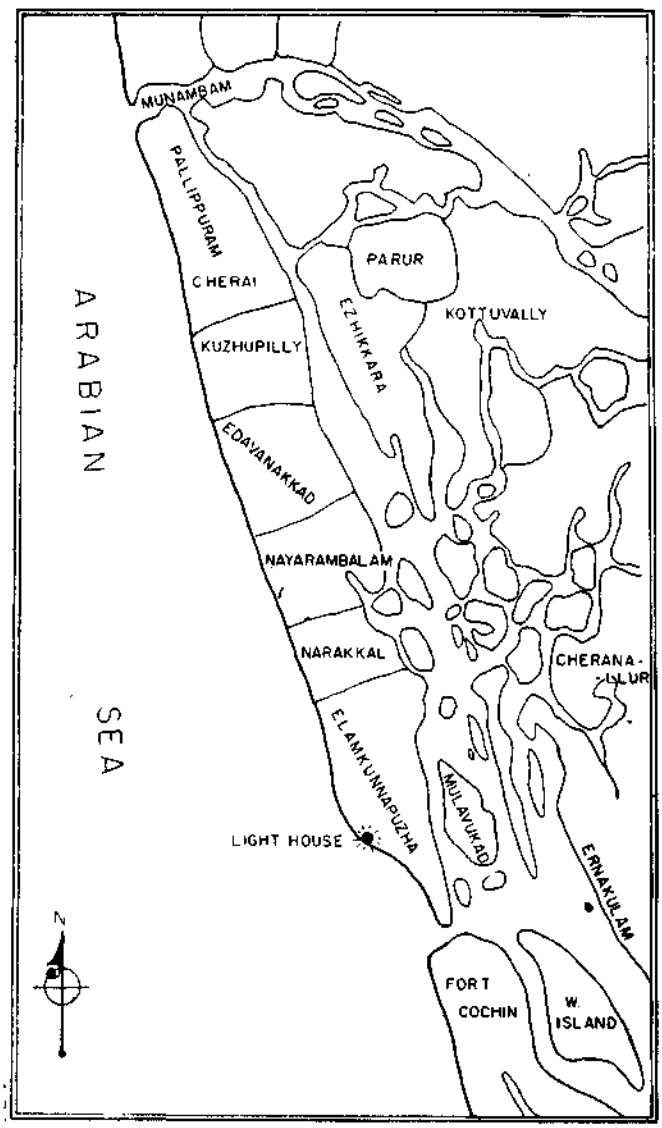

Fig. 1. Vypeenkara the area where the case study was conducted.

Data base

Data collected through a survey in Vypeenkara forms the basis for this study. A sample of 500 households covering 11 fishing villages coming under the jurisdiction of 6 panchayats were selected. An interview schedule was administered to the female head of the households which gave information on 1,148 women. Observations were also made in landing centres, curing yards and processing units.

In terms of the infrastructure facilities the Island was divided into three regions; Region - I consisting of Elamkunnapuzha Panchayat, Region - II consisting of Narakkal, Nayarambalam, Edavanakkad and Kuzhupilly panchayats and Region - III consisting of Pallipuram Panchayat for the purpose of this study. The

Table 1. *Regionwise distribution of villages and number of households*

Region	Panchayat	Fishing villages	No. of households selected	Percentage of Male	Female	Children
I	Elamkunnapuzha	Murikkumpadam, Ochanthuruthu	35	36	37	27
II	Narakkal	Narakkal	40	37	36	27
	Nayarambalam	Nayarambalam	35	34	35	31
	Edavanakkad	Edavanakkad	35	31	34	35
	Kuzhupilly	Kuzhupilly	35	34	35	31
		Ayyampilli	35	34	35	31
III	Pallipuram	Cherai	40	40	38	22
		Pallipuram	65	35	34	31
		Munambam	85	36	36	28
	Total		500	36	36	28

households falling along the western side of the Island where most of the marine fishermen lived were mainly considered for the study. (Table 1, Figure 1).

Areas of women's participation

Prawn peeling, fish curing, drying and marketing, net making, fishing in the canals and clam shell collection are the major areas of women's participation. About 20% of the women population was estimated to be engaged in the fishery related activities. This figure, however, does not indicate the employment status of the women as none of the activities assure regular employment or income nor a distinct line can be drawn among various groups engaged in different activities as these activities are quite often not mutually exclusive.

Prawn peeling

Peeled prawn is an important item of foreign exchange earner to the country. Prawn peeling is a seasonal activity coinciding with prawn fishery season, the peak being August-November. In prawn peeling two types of activities are observed. They are (i) peeling in the centralised units such as peeling sheds rented in by agents (Fig. 3) and (ii) peeling in decentralised units such as homesteads. Peeling does not require any special skill though some variation is seen in the percentage of meat recovery from person to person. In a peeling shed of 3 x 4m area, about 10–15 women are engaged at a time, and depending on the quantity of prawn available the number of women engaged also varies. Peeling is carried out under the supervision of the agents who distribute weighed quantity of prawn among the women. A woman can peel about one kg of prawn in an hour and can earn a maximum of Rs. 6 per day at the rate of 50–75 paise per kg. During the peak season peeling goes on day and night. Prawns landed by mechanised boats are generally peeled in such units. These peeling sheds are mostly located near the landing centres.

There are about 85 registered peeling sheds according to panchayat records and several others without registration in the Island. Among registered sheds 60 are located in Region - III *i.e.* Pallipuram Panchayat. There are also sheds where prawns from filtration ponds are peeled. In view of the cost incurred towards rent and difficulties in maintaining the prescribed hygienic standards, there is a tendency among the agents to get the peeling done in decentralised units by distributing the prawns among the households in the vicinity of the landing centres. In decentralised peeling, two systems are followed. In the first, the agents distribute 1 or 2 kg of prawn among the households of the locality and get it peeled at certain rate. In the other, prawn is sold to the local women and meat is bought back. In the former system the labour charge is paid whereas in the latter the payment is based on meat recovery. Peeling agents do not employ women on regular basis as they should be covered by Minimum Wages Act, if done so. Peeling is also done in households which own crafts and gears where women from neighbourhood are engaged and the meat is sold to the agents or to the processing units. In the sample selected, 25% of the women are found to participate in prawn peeling.

Curing, drying and trading of fish

In the backwater fishing using stake nets and chinese dip nets, once the catch is landed women take over the entire post-harvest operations namely sorting, (Fig. 4) on-the-spot auctioning, gutting and salting (curing), drying, carrying the dried fish to market in the mainland and trading it. These women mostly belong to 'Vaala' community. The fish is processed daily but is taken to the market only twice a week. A woman takes about 30 kg of fish at a time for trading. The processed fish is transported to the mainland (Ernakulam) in canoes and women travel by bus to the boat jetty and then to the mainland by ferry. The fish is sold at both retail and wholesale rates. A net profit of Rs. 15–20 is earned by a woman twice a week. There are also women who buy fresh fish from boat owners and traders, usually on credit, and the money is paid back after disposing the processed commodity.

In fish curing and drying also centralised type of activity is seen (Fig. 5). But out of the 45 curing yards (most of which are available at Pallipuram Panchayat) only a few are functioning regularly. These yards engage one or two women on weekly wage at the rate of Rs. 10–15 per day. Curing of fish is practiced on the sea shore by small traders with the help of a few women. Marine fisherwomen are also found to be engaged in trading of fresh and dry fish as vendors. In icing and other activities in the processing units, participation of women is found to be very rare. The participation of women in curing and drying and in trading is estimated at 19 and 20% respectively.

Net making

Net making is the traditional skill of 'Araya' community though women of other communities also have learnt the job. Women in some part of Elamkunnapuzha, Puthuvaippu and Narakkal engage themselves in hand braiding of fishing nets (Fig. 7). Net making is a leisure time activity. Net mending is done by men during their leisure. The cotton and silk threads have been replaced

by nylon yarn and braiding of nylon net for boats is the most important activity. Agents for net making distribute about 200 kg nylon yarn among 40 households at a time. Normally a period of one month is required to complete the job. A woman can braid a maximum of one kg net a week. The labour charges work out to Rs. 3 per 100 mesh and a woman can earn Rs. 20 per week through net making. Though hand braided nets are considered to last longer, net making for own use is not considered worth the effort as it is a time consuming activity. Moreover the gains do not compensate for the labour put in. The net making by women is reported to be decreasing with the establishment of nylon net factories. Eighteen per cent of women in the sample are estimated to be engaged in net making.

Fishing in the canals

Fishing in the canals and the impounded water areas for prawns and priced fish such as pearl spot during the low tide is one of the important activities of women belonging to 'Pulaya' community in areas where prawn/fish farming activities take place. Women move in water in a line with narrow-mouthed aluminium and earthern pots in their hands (Fig.2). A bunch of leaves is inserted into the mouth of the pot which prevents the fish collected in the pot from escaping. The fish and prawn are caught by searching with hands. An income of about Rs. 20 per day is earned by women, if she gets a good catch. The 'Pulaya' women also help their husbands in cast-netting and collection of prawn larvae from the surf. During the paddy season they engage themselves in agricultural operations.

Collection of clam shells

During the monsoon due to fresh-water influx marine clams are washed ashore. The women from Pallipuram Panchayat area collect these shells and sell to the clam shell society or the agents at the rate of Rs. 2.50 per basket of 20 kg and earn about Rs. 10 per day. July–September is the main season for clam shell collection, but women and children are found engaged in this activity throughout the year. During certain seasons collection is done during the night. Women stand in knee-deep water and scoop the clams with the help of an iron plate called *'Odu'* and collect them in *'vatta vala'* (Fig. 6). Clam shells thus collected are heaped

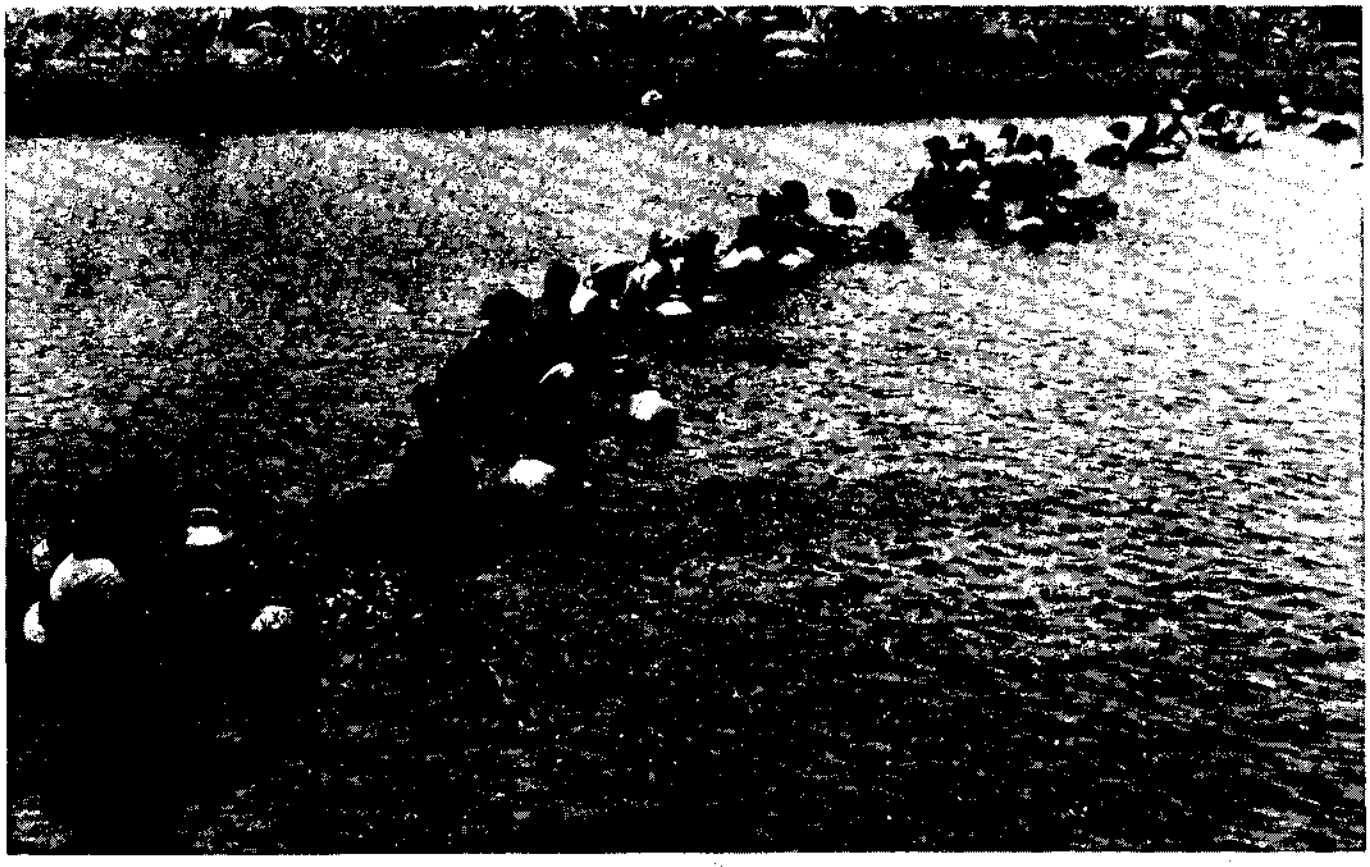

Fig. 2. Hand picking of prawns and pearl spots by women is an age old practice for harvesting prawns from culture farms.

on the beach by the agents and when good quantity is collected the same is loaded in trucks and sent to other states mainly Tamil Nadu to be used in lime industry. The loading of shells in the trucks is also done by women.

Fig. 3. Prawn peeling is an almost exclusive job of women.

A total of 20% of fisher women is estimated to be participating in the above activities together. Table 2 gives the average number of hours a woman engages in the different fishery-related activities and average income per day.

Table 2. *Average number of hour of occupation and income earned per hour*

Activity	Average hours occupied in a year (No. of days & No. of hours)	Average income per hour (Rs.)
Prawn peeling	1,080 (180 x 6)	0.50
Drying and trading of backwater fish	1,080 (180 x 6)	0.50
Net making	900 (300 x 3)	0.45
Clam shell collection	720 (120 x 6)	1.42

Women's participation in fishery-related activities

Availability of infrastructure facilities

The availability of infrastructure facilities was found to be the major factor influencing women's role in fishery related activities. A significant relation was found between different regions divided in terms of availability of infrastructure facilities and participation of women in different activities. The households in parts of Elamkunnapuzha in Region -I and Pallipuram Panchayat in Region - III have better infrastructure facilities in terms of landing centres, peeling sheds, bus stand and boat jetty, which facilitate them in processing and transporting the commodity to the market. In Region - I households have access to both backwater and sea fishing. The villages in Region - II in the middle section of the Island are far from the main road and do not have adequate infrastructure facilities for processing and marketing of fish and hence the fish catch is sold off by fishermen in the landing centre. As a result, women in this region do not get enough opportunities to gainfully engaging themselves. In certain parts of these marine fishing villages women have to spend major part of their time in fetching drinking water from road side public hydrants.

Caste

Distribution of different castes in each activity is presented in Table 3. In peeling, the major participation is found to be that of 'Kudumbis' and 'Vaalas' with substantial participation by other communities also. Drying and trading is dominated by 'Vaalas' whose main household occupation is backwater fishing. In net making 'Arayas' have the major contribution estimated at 60% as the activity is the traditional skill of the community. Fishing in canals is dominated by 'Pulayas' and major participation in clam shell collection comes from 'Kudumbis'.

Table 3. *Caste-wise distribution of women engaged in various activities (%) (participation in each activity is not mutually exclusive)*

Caste	Peeling	Curing and trading	Drying	Net making	Fishing in canals	Clam shell collection	Others
Araya	14	16	3	80	—	—	8
Vaala	20	72	77	2	—	—	18
Christian	11	5	11	10	—	—	30
Ezhava	12	—	4	6	—	—	26
Kudumbi	26	5	0	2	—	88	4
Pulaya	12	0	3	—	100	—	—
Others	5	2	2	—	—	12	14
Total	100	100	100	100	100	100	100

Fig. 4. Women engaged in sorting of fish into different groups.

Fig. 5. Fish drying in homesteads, another women oriented job.

Fig. 6. Women and children make a living out of clam shells filtered out of sand in the estuaries and backwaters.

Fig. 7. Skilled work like hand braiding of fishing nets is also handled by women of coastal areas.

Age group and education

It can be seen from Tables 4 and 5 that most of the women in the sample who participate in peeling are in the age group of 13–40 with education upto secondary (VIII to X standard) level. In net making also women of the same age group have higher participation but the educational level is found to be at primary and below. In the case of curing and trading the major participation is from the age group of 40 -49 with education below primary level.

Table 4. *Age-wise distribution of women in different activities (%)*

Age group (years)	Peeling	Net making	Curing and trading	Drying	Fishing in canals	Clam shell collection	Others
< 13	9	0	0	0	2	9	—
13–24	43	20	0	0	10	15	—
25–39	35	63	22	30	37	17	—
40–49	7	10	60	50	38	38	—
50–60	3	4	18	20	7	13	—
> 60	3	3	0	0	6	18	—
Total	100	100	100	100	100	100	—

Table 5. *Education-wise distribution of women in various activities*

Education level	Peeling	Curing and trading	Drying	Net making	Fishing in canals	Clam shell collection	Others
< Primary	20	81	81	51	89	60	58
Primary	28	18	19	37	2	33	26
Secondary	41	1	0	10	9	7	10
>secondary	11	0	0	2	0	0	6
Total	100	100	100	100	100	100	100

Among the women who participate in peeling, a good percentage can be accounted for those who go to the peeling sheds to do the job. The income thus earned is mainly used for buying personal requirements like clothes and cosmetics. In the case of other activities where women of higher age group participate the earning is added to the household income.

Remarks

Out of the sample selected for the study, a total of 20% is estimated to be participating in fishery-related activities, the major areas of participation being prawn peeling, curing, drying and trading of fish, net making, fishing in canals and clam shell collection. In prawn peeling and net making women of younger age groups have better participation. The participation is also, to certain extent governed by caste, though caste structure does not bar any section from engaging in the above activities. Availability of infrastructure is found to be the major factor influencing women's participation in fishery-related activities.

Women in general are hopeful of improving their lives through the development of fisheries activities in the Island and show readiness to acquire new skills and undergo training for the same. But poverty and to certain extent ignorance have hampered their progress. The inhabitants of the Island in general felt that the Island has been witnessing a transformation in fishery sector over the years and opportunities for women to engage in gainful activities have been declining. This is mainly due to the construction of fisheries harbour at Cochin and subsequent landing of mechanised crafts there, thereby resulting in considerable reduction in the volume of business coming to the Island. Improvement in the situation could be brought about by hastening the process of establishment of the village societies by the State Government for supply of improved fishing implements and improvement of landing facilities for mechanised crafts at Munambam. Co-operatives may be organised for women engaged in processing and trading of fish and training may be given in improved handling and processing techniques. In similar way, women can also organise themselves for net making on a co-operative basis. Aquaculture will be another useful enterprise for women as the Island has good potential for it. Development of the same may be accomplished through the concerted effort of centres like Krishi Vigyan Kendra.

A NOTE ON THE LONG LINE FISHERY AT SIKKA, GUJARAT*

Sikka is a small fish landing centre in the Gulf of Kutch, about 30 km north of Jamnagar. In the Village 135 fishermen families with a population of 995 members are actively involved in various fishing activities of which 494 are actively engaged in fishing. A total of 99 boats are in operation of which only eight are mechanised. Three types of gill nets, stake net and long line are the gears used for fishing. Of these the long line deserves special mention for they are being made out of old material and therefore economical.

The long lines locally known as 'Wagha' are made of polyethylene and nylon. The main line is about 400 to 600 m long and has a diameter of 4 to 6 mm. 200 to 300 hooks, locally known as 'Kundi' or 'Gill' are attached to the main line at an interval of 4 m by means of small branch lines of 1 m length and 2 mm diameter each having two to three hooks. Plastic cans of 20 to 35 litre capacity are used as floats and weights of 20–35 kg are used as anchors.

An interesting fact with regard to the making of long lines is that 80% of its material come from old gill nets. The main line is prepared from old head and foot ropes of gill nets while the branch lines of 2 mm diameter are prepared from twine obtained from the old webbing of gill net and old ropes, polyethylene, coir or jute. The lines for floats and anchor are also made from the webbings of the gill net. The split up cost and total cost of 400 m and 600 m long lines are given in Table 1.

Flesh of octopii is being used as bait in long line operation. The octopii locally known as 'Saravan' occur in plenty in the nearshore waters along the Sikka coast. The number of persons engaged in long line fishery varies from 4 to 7 according to the size of the boat. The fishing grounds are 10–20 km away from the coast where the depth may range between 20 and 30 m. During a trip 3–4 operations are carried out, each lasting for about 1–3 hours.

The catch usually brought by the long liners include 'Ghol', 'Koth', 'Dara', cat fishes, eels, perches and sharks. Special observations were made on the catch, composition, CPUE and price realised for nine boats and the data were used to calculate the same for the 35 long liners in operation at Sikka. The results are given in Table 2.

*Prepared by S.G. Raje, Veraval Research Centre of CMFRI, Veraval.

Table 1. *Specifications of long lines made out of old material*

Items	Size of rope/ twine & No. of hooks	Weight (kg) and number	Rates (Rs/kg/ No.)	Cost (Rs.) 400 m long line	600 m long line
Main line	4–6 mm	3–5	80.00	240	400
Branch line	2 mm	2–3	60.00	120	180
Hook	2–3	200–300	1.25	250	375
Misc. (Jerry can, anchor etc.)	—	—	—	150	300
			Total	760	1,255

Table 2. *Total catch, CPUE and income realised (estimated for a day)*

Group	Estimated catch (kg)	C.P.U.E. (kg)	Price (Rs.kg)	Income per boat (Rs.)
Cat fish	20,222	578	2.50	1,445
Ghol	1,003	29	8	232
Sharks	331	18	2	34
			Total	1,711

Due to the lack of infrastructure facilities such as ice plant, storage and transportation, fishermen are compelled to dispose off their catches to the middle men at the landing centre who in turn carry them to Jamnagar and from there the fish are being transported to Delhi, Bombay and Calcutta by train.

It has been reported by fishermen that the long line fishery is more lucrative at Sikka. The significant aspect in this regard is that, here the long lines are made exclusively of material recovered from old gill nets and hence very economical. The fishermen have further stated that they are interested to develop this gear but wish to be assured of a good price for their catches besides ice plant and cold storage facilities.

MARINE ALGAL FLORA FROM SELECTED CENTRES ALONG THE MADRAS COAST†

A survey was made on the marine algae occurring at Pulicat, Kovalam, Muthukadu and Mahabalipuram along the Madras coast. The species recorded at the respective centres are given in Table 1. A total of 22 species were collected of which six species belonged to Chlorophyta, three to Phaeophyta, 10 to Rhodophyta and three to Cyanophyta. Out of the 22 species, 16 are recorded for the first time along the Madras coast.

The agar-yielding seaweeds *Gracilaria corticata* var. *corticata* and *G. verrucosa*, carrageenan yielding seaweeds *Hypnea valentiae* and *H. spinella*, algin yielding seaweeds *Padina tetrastromatica*, *Rosenvingea intricata* and *Chnoospora implexa* and edible seaweeds *Enteromorpha compressa*, *Ulva lactuca* and *Centroceras clavulatum* were present among the species collected. Detailed investigations throughout the year on algal composition at different localities along Madras coast are necessary to know the availability and seasonal variations of the different algae.

Table 1. *List of marine algae collected from four localities near Madras*

Sl. No.	Name of the algae	Pulicat lake	Kovalam	Muttu-kadu	Mahabali-puram
	CHLOROPHYTA				
1.	*Enteromorpha compressa* (Linnaeus) Greville	+	—	+	+
2.	**E. intestinalis* (Linnaeus) Link	+	—	+	—
3.	**Ulva lactuca* Linnaeus	—	—	+	—
4.	**Chaetomorpha antennina* (Bory) Kuetzing	—	+	—	+
5.	*Chaetomorpha* sp.	+	—	+	+
6.	*Cladophora* sp.	—	—	+	+
	PHAEOPHYTA				
7.	*Padina tetrastromatica* Hauck	+	—	—	—
8.	*Rosenvingea intricata* (J. Agardh) Boergesen	+	—	+	—
9.	**Chnoospora implexa* (Hering) J. Agardh	+	—	—	—
	RHODOPHYTA				
10.	**Grateloupia filicina* (Wulfen) J. Agardh	—	—	—	+
11.	**G. lithophila* Boergesen	—	+	—	+
12.	**Gracilaria corticata* var. *corticata* J. Agardh	—	+	—	+
13.	**G. verrucosa* (Hudson) Papenfuss	+	—	+	—
14.	**Hypnea valentiae* (Turner) Montagne	+	—	—	—
15.	**H. spinella* (C. Agardh) Kuetzing	—	—	—	+
16.	*Ceramium* sp.	—	—	—	+
17.	**Centroceras clavulatum* (C. Agardh) Montagne	—	—	—	+
18.	**Polysiphonia* sp.	+	—	—	—
19.	**Herposiphonia* sp.	—	—	+	—
	CYANOPHYTA				
20.	**Lyngbya* sp.	+	—	—	—
21.	**Oscillatoria* sp.	—	—	+	—
22.	**Phormidium* sp.	+	—	+	—

*Recorded for the first time; + Present; — Absent

† Prepared by V.S.K. Chennubhotla, CMFRI, Cochin and N. Kaliaperumal, Regional Centre of CMFRI, Mandapam.

OBSERVATIONS ON THE LANDING OF LANTERN FISH *MYCTOPHUM PTEROTUM* ALCOCK ALONG MAHARASHTRA COAST*

The lantern fishes are pelagic and are considered to be deep water forms, occurring upto 2000 m depth. Though this species has been known to be abundant in off-shore regions, a fishery for it has not been reported earlier. During October-November months of 1985, one species identified as *Myctophum pterotum* Alcock (Fig. 1) was noticed to have considerable fishery value along the Maharashtra coast. Details of the landings for the period Oct.-Nov., 1985 by bag net ('dol') at a depth of 25 m are given below:

Place	Total No. of units	Total catch (kg)	C.P.U. (kg)
Sassoon Dock	75	53,005	706.7
Versova	374	26,005	69.5
Madh	128	31,590	246.8
Navgaon (Alibag)	126	52,000	412.6

The highest catch and catch/unit were registered at Sassoon Dock during this period. At this centre the fishery was of short duration. This is because of the fact that more trawlers are in operation at Sassoon Dock and fishermen land penaeid prawns of large size owing to the great demand from the exporters to feed their processing plants located at Thane (Bombay). At other centres the fishery was prolonged where more 'dol' nets are in operation and facilities are available for sun drying than at Sassoon Dock.

The length of the fishes ranged between 35 and 45 mm. Normally the species attains a size of 100 mm. The ovaries showed indications of maturing. The stomach contents of 120 specimens analysed showed that *Acetes johni* Nataraj was the main food item. Incidently *Myctophum pterotum* appeared in association with swarms of *Acetes johni* especially at Versova and Sassoon Dock. This is indicative of its preference to *Acetes* as food and unusual landings are related to good catches of *Acetes* at the centres of observation. The only other food item in the stomachs of this fish was fish scales which formed only a very small percentage.

Fig. 1. Close-up view of *Myctophum pterotum* Alcock showing the luminous organs.

The fishery potential of myctophids has been reported to be considerable, though not in Indian waters. The myctophid *Diaphus dumerilii* contributed to 15 tonnes in a single haul off Uruguan coast of South America. It is possible that a tappable resource exists in Indian waters also as evidenced by the present report of heavy landings of *Myctophum pterotum*. Studies conducted in Soviet Union have established that myctophids are suitable for human consumption. It may therefore augment the much needed protein for the fish eating population in future. The catches were sun-dried for future consumption.

The authors are deeply thankful to Dr. P.S.B.R. James Director, Central Marine Fisheries Research Institute for encouragement in the preparation of this note. They are also thankful to Dr. K.Alagaraja, Head of Fishery Resources Assessment Division for guidance.

*Prepared by M. Aravindakshan, K.B. Waghmare, J.P. Karbhari, C.J. Josekutty and M. Shriram, Bombay Research Centre of CMFRI, Bombay.

STATUS AND DISTRIBUTION OF ESTUARINE TURTLES IN INDIA*

Introduction

While knowledge of the status, distribution and reproductive biology of marine turtles of the Indian seas has increased considerably in recent years, the estuarine turtles have been very much neglected. Two species of turtles occur in the estuarine regions of the country, the River terrapin *Batagur baska* (Emydidae: Batagurinae) and the Asian giant softshell turtle *Pelochelys bibroni* (Trionychidae: Trionychinae), both species extending their distribution further east into south-east Asia. The present article reviews the status and distribution of these two estuarine turtles.

Batagur baska (Gray) (River terrapin)

A large emydid turtle, with shell length exceeding 60 cm; snout-tip tilted, saw-jawed; carapace smooth and heavily buttressed; four claws on each forelimb. The species exhibits seasonal and sexual dichromatism. Breeding males from Burma have been described as having pale blue nostrils, intense black head and crimson neck and forelimbs. In Malaysia, the skin and shell of breeding males turn jet black, while at other times it is brown or grey. Females and juveniles paler in colour.

The species generally inhabits estuaries of large rivers and freshwater lakes, and canals in their vicinity and coasts near river mouths. In India, the River terrapin is confined to the Sunderabans of West Bengal, and has a small population which is endangered. Extralimital distribution and estimated population sizes are as follows: Bangladesh–indeterminate; Burma–minor; Thailand–minor; Malaysia–major; Indonesia–minor and Indochina–indeterminate.

Listed as 'endangered' by the IUCN Red Data Book, primarily because of overexploitation of eggs and adults for food and habitat destruction (Groombridge, *The IUCN Amphibia - Reptilia, Red Data Book, Part I, Testudines, Crocodylia and Rhynchocephalia.* IUCN, Gland, 1982), and under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), indicating that international trade in the species is prohibited.

*Prepared by Indraneil Das, Department of Limnology, Bhopal University, Bhopal.

Distribution in India

In the tidal rivers, channels, creeks and sea coasts of the Sunderbans of West Bengal. Nesting takes place on deserted sandy beaches and sandspits at Mechua, Kedo and Nagbarachar. Reported also from Kanak, the 1.5 sq km sandspit (washed away by floods in 1984) situated at the mouth of the Matla River.

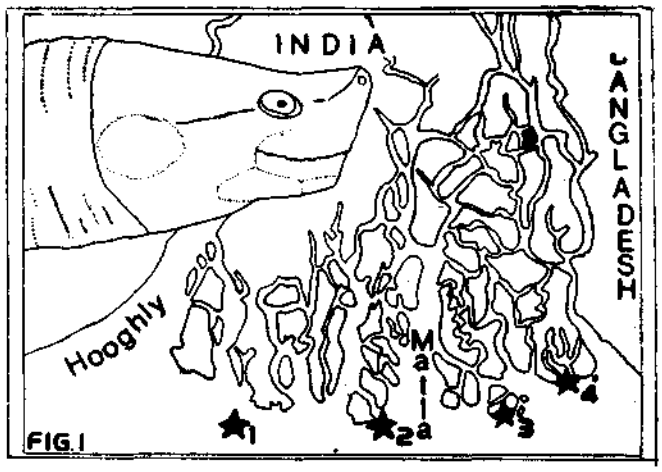

Fig. 1. Distribution of nesting beaches of the river Terrapin (*Batagur baska*) in the Sunderbans, West Bengal. References: 1. In Nagbarachar, 2. Kanak, 3. Kedo, 4. Mechua. Some sites determined from interviews with fishermen need to be confirmed. The small dot shows the locality of Kumirmari villages, where the species is kept as pets by villagers.

Several specimens, some trapped in nets, others hatched from eggs are being kept as pets in village ponds at Kumirmari and elsewhere north of the Sunderbans Tiger Reserve. The species is caught in offshore nets for sale along with Olive ridley *Lepidochelys olivacea,* during the winter months, from the vicinity of Sagar Island, in the western Indian Sunderabans.

Conservation measures proposed

Inclusion of species in Schedule I of the Indian Wildlife (Protection) Act, as it is endangered; enforcing existing legislation and thereby preventing capture of adult terrapins and collection of egg from the Tiger Reserve area; identifying nesting grounds which may exist outside the Reserve and extending protection to these; public education; setting up a breeding programme, perhaps using only the captive stock available as it causes no further capture from the wild population and continued research on the status and ecology of the species.

Pelochelys bibroni (Owen) (Asian giant softshell turtle)

The largest softshell turtle in the world, known to attain 168 cm in shell length and 250 kg weight. Head small and broad, snout short, rounded; eyes situated close to the nostrils; dorsally olive, dotted with yellow; ventrally whitish.

The species is known from estuaries and sea coasts in the country but the population seems to be small. Outside, it has also been documented from inland waters, like rivers and streams. Extralimitally in Burma, China (Foochow, Canton, Kwangtung and Hainan), Indonesia, Malaysia, New Guinea, Philippines, Thailand and Viet Nam. Precise information on status in much of its extensive range is unavailable, the species being caught for food in a number of countries. It has been reported from Bangladesh.

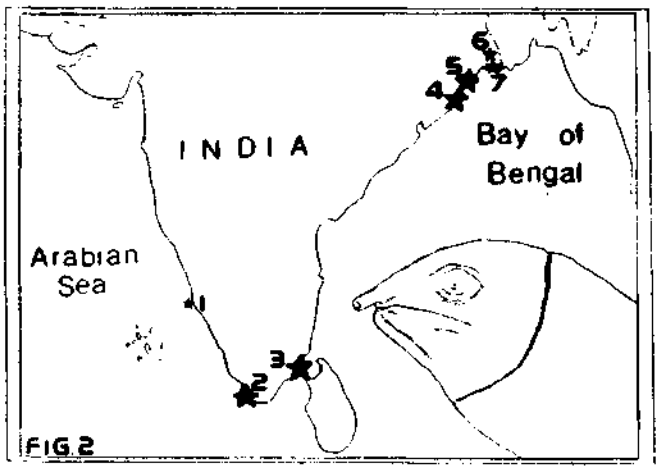

Fig. 2. Distribution of the Asian giant softshell turtle *(Pelochelys bibroni)* in India. Large stars refer to reliable records mentioned in the text; small stars refer to records of unknown reliability. References: 1. Mahe, Pondicherry, 2. Trivandrum, Kerala, 3. Vicinity of Mandapam, Palk Bay, Tamil Nadu, 4. Gahirmatha, Orissa, 5. Udaipur village, Subarnarekha river Orissa, 6. Calcutta, Hooghly river, West Bengal, 7. Sunderbans, West Bengal.

Unlisted by the IUCN Red Data Book or under the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Distribution in India

Known from a few localities both on the east and west coasts of India. The east coast sites include the Brahmini–Baitarini delta at Bhitar Kanika Wildlife Sanctuary, Orissa, where the species is reported to nest, Subarnarekha River at Udaipur village, Orissa, near the West Bengal border and the vicinity of Mandapam, in the Palk Bay. Smith *(Fauna of British India including Ceylon and Burma. Reptilla and Amphibia. Vol. I. Lonicata, Testudines.* Taylor and Francis, London, 1931) questioned its occurrence in Bengal, but, the turtle is recorded from Bangladesh, once a part of Bengal. There is a single record from West Bengal (collection of the Zoological Survey of India, Calcutta, Reg. No. 1781), by the naturalist John Anderson in the nineteenth century, labelled 'Hughli R. Calcutta'.

The only confirmed record of the Asian giant softshell turtle from the west coast of India is from Trivandrum beach, Kerala. However, there is a view that this could be *Gymnopus indicus* (Syn. *Chitra indica*) whose estuarine habits are well documented.

Conservation measures proposed

Inclusion of the species in Schedule I of the Indian Wildlife (Protection) Act, as it is rare and localised in the country (presently it is under Schedule IV); public education in localities where it is captured for food; survey of areas where the species is likely to occur and their subsequent protection and further research on the status and ecology of the turtle.

Acknowledgements

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NEW ALL-WEATHER FISHERY HARBOUR FOR VERAVAL*

Veraval forms one of the major fish landing centres of the Saurashtra coast with fish landing ranging from 59,930 tonnes in 1984–'85 to 42,535 tonnes in 1985–'86. The commercial trawling by private entrepreneurs started only in 1967 and since then there has been a steep increase in the number of trawlers and other boats. There are about 511 trawlers, 120 OBM boats, 45 IBM boats and 20 non-mechanised boats in Veraval. Such a situation has necessitated the construction of a full fledged fishery harbour comprising a landing quay, berthing basin, an out fitting quay for replenishing fuel, water and other accessories and a slipway or dry dock for repairs to cope up with the increasing fishing vessels as well as the catches.

Realising this fact, the Government of India in the IInd Five Year Plan period together with the UNDP as an executing and participating agency of the FAO, jointly planned a Pre-Investment Survey of Fisheries Harbours Project (PISFHP).

The PISFHP which started its functions in 1968 from Bangalore, conducted a pre-investment survey in Veraval in the year 1974, during which time, Veraval had 465 vessels of various sizes.

The all-weather fishery harbour plan was approved and the World Bank sanctioned Rs. 342 million for constructing one each at Veraval and Mangrol.

In Veraval the execution of the project was initiated in the year 1977–'78 by the Fisheries Terminus Division (FTD) of the Department of Fisheries. About Rs. 300 million has been already spent, out of which Rs. 190 million alone is spent in Veraval. The fishery harbour is nearing completion. The general lay out of the harbour and the facilities being provided are as follows.

1. All-weather entrance channel protected by break-waters. The length of main break water is about 375 m and that of secondary one is about 480 m (Fig. 1).
2. Protected basin for berthing the vessels throughout the year.
3. Landing quay of about 788 m for landing fishes (Figs. 2, 3)
4. Five finger jetties of 500 m length and quay of 272 m for idle berthing of boats (Fig. 4).

*Prepared by A.P. Lipton and S.G. Raje, Veraval Research Centre of CMFRI, Veraval. The help rendered by Shri Vasavada, Director, F.T.D. Veraval in the preparation of this note is gratefully acknowledged.

The harbour has also got facilities for repair. These include:

1. Slipway workshop in which boats are lifted by a moving crane and placed in the repair yard.
2. Sloping yard and minor repair facilities such as berthing facilities of 465 m, repair yard of 75,000 sq m and concrete apron of 2,500 sq m.
3. Net repair area of 1,494 sq m in three gear shades.

However, the harbour still requires a fitting-out jetty for fixing and removing engines along with service workshop facilities.

The other important facilities available in the new fishery harbour are given in Table 1.

Table 1. *Auction hall and other facilities available at Veraval Fishery Harbour*

Facilities	Area and location	Number/area/production capacity
1. Auction hall	100 x 25 m	3 (7,500 sq m)
2. Packing room	4 x 5 m	45 (900 sq m)
3. Ice plant	i) Near landing quay - Auction hall	3 (production:48 t) storage:125 t)
	ii) Near out fitting jetty or quay	2 (production:40 t) storage: 155 t)
4. Cold storage	i) Chilled –near landing quay	3 (cap. 800 t)
	ii) Frozen - near out fitting jetty	1 (cap. 100 t)

The harbour has also got facility for parking all types of vehicles and has an area of 2,800 sq.m. The infrastructure facilities such as roads, electricity, water supply and drainage are also provided.

Although these facilities do exist, there are a few more, which are yet to be developed. For example, storing facilities for fishing gears, fish processing area, areas for ancillary industries like net making, and a shopping complex for providing requirements for fishermen who go on voyages are a few among them.

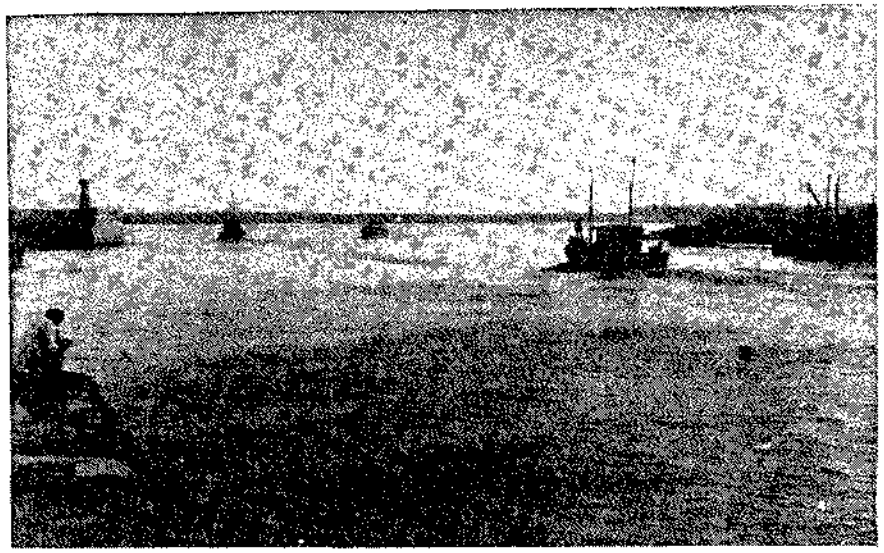

Fig. 1. Entrance channel.

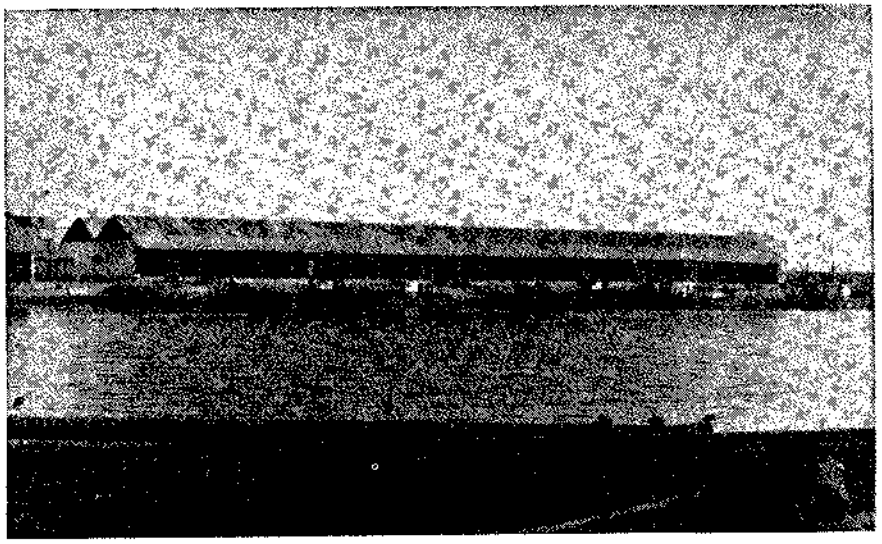

Fig. 2. Landing quay.

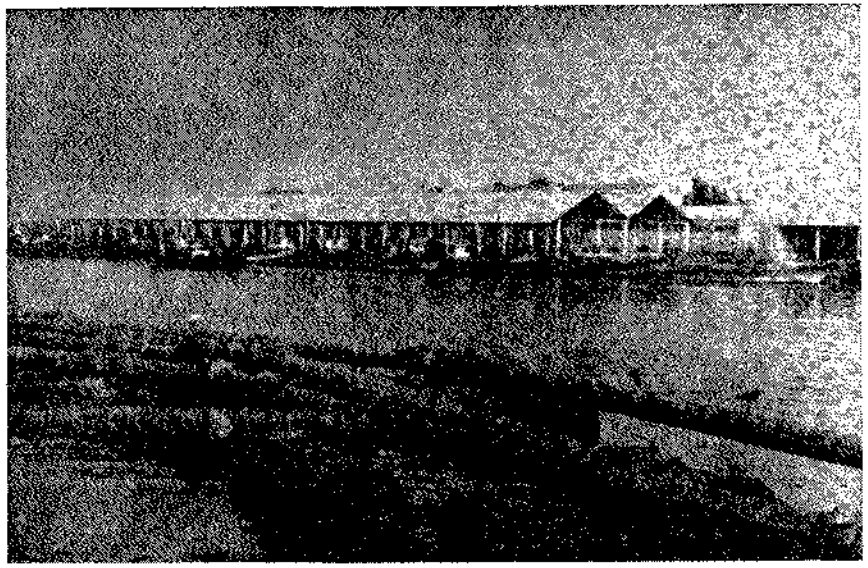

Fig. 3. Landing quay for trash fishes.

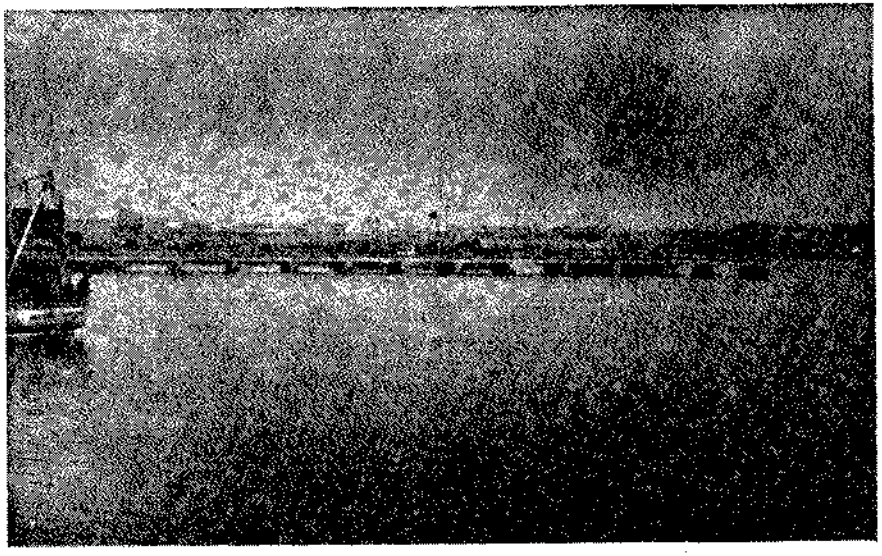

Fig. 4. Finger Jetty.

The fish auction facilities are owned and operated by the FTD. The FTD also regulates the route of vessels. The incoming vessels should come along side in front of the auction hall, unload the catch except the trash fish on to the quay and then proceed to the auction hall and to the merchant booths. The vessels then proceed to the quay in front of the trash fish platform where the trash fish will be unloaded and there after the vessels proceed to the out fishing quay where facilities for deck washing, fueling, supply of provisions, potable water, and fishing gear are provided. Then the vessels could berth along the side of berthing quay in readiness for the next fishing trip.

Good quantities of trash fish are landed in Veraval and it is suggested to have more fish meal plants. At present only one plant is available. Insulated bogies in train may be of great use in transporting quality fish to out stations. Similarly insulated vans like 'Cold-chain' as available in Karnataka state can also be introduced to supply fishes to far off interior places in the state. The drainage of Veraval Municipality at present is allowed to fall in the fishery harbour which may be diverted to some other location.

NEWS

SYMPOSIUM ON TROPICAL MARINE LIVING RESOURCES

The MARINE BIOLOGICAL ASSOCIATION OF INDIA, Cochin announces its proposal to conduct a Symposium on Tropical Marine Living Resources – their Ecology, Stock, Exploitation, Utilization, Conservation and Management from 12–16 January, 1988 at Cochin, India. The main objective of the Symposium is to promote research, development and management of the tropical marine living resources as a multi-disciplinary science, by involving scientists, technicians, extension workers, administrators, planners, farmers and industrialists.

The Symposium will consider all scientific and technical aspects of tropical marine living resources, their management and development. Towards this endeavour, the sponsoring agency invities:

- regional/country review papers on the present status of tropical marine living resources investigations including exploitation, utilization, conservation and management.

- experience papers on:

* population characteristics and stock assessment of the marine living resources
* environmental impact on resource characteristics
* exploitation and capture technology
* fishery technology, marketing and trade
* bio-active agents from marine living resources
* fishery economics and sociology
* education and man-power training
* legal aspects of exploitation, extension and co-ordination
* planning, conservation and management.

Intending participants are required to pre-register their names by sending particulars in prescribed form so as to reach the General Convener of the Symposium on or before 30th September, 1987. The abstract (s) of paper (s) in duplicate may be sent to the General Convener before the above date.

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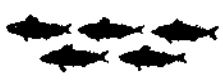

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