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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

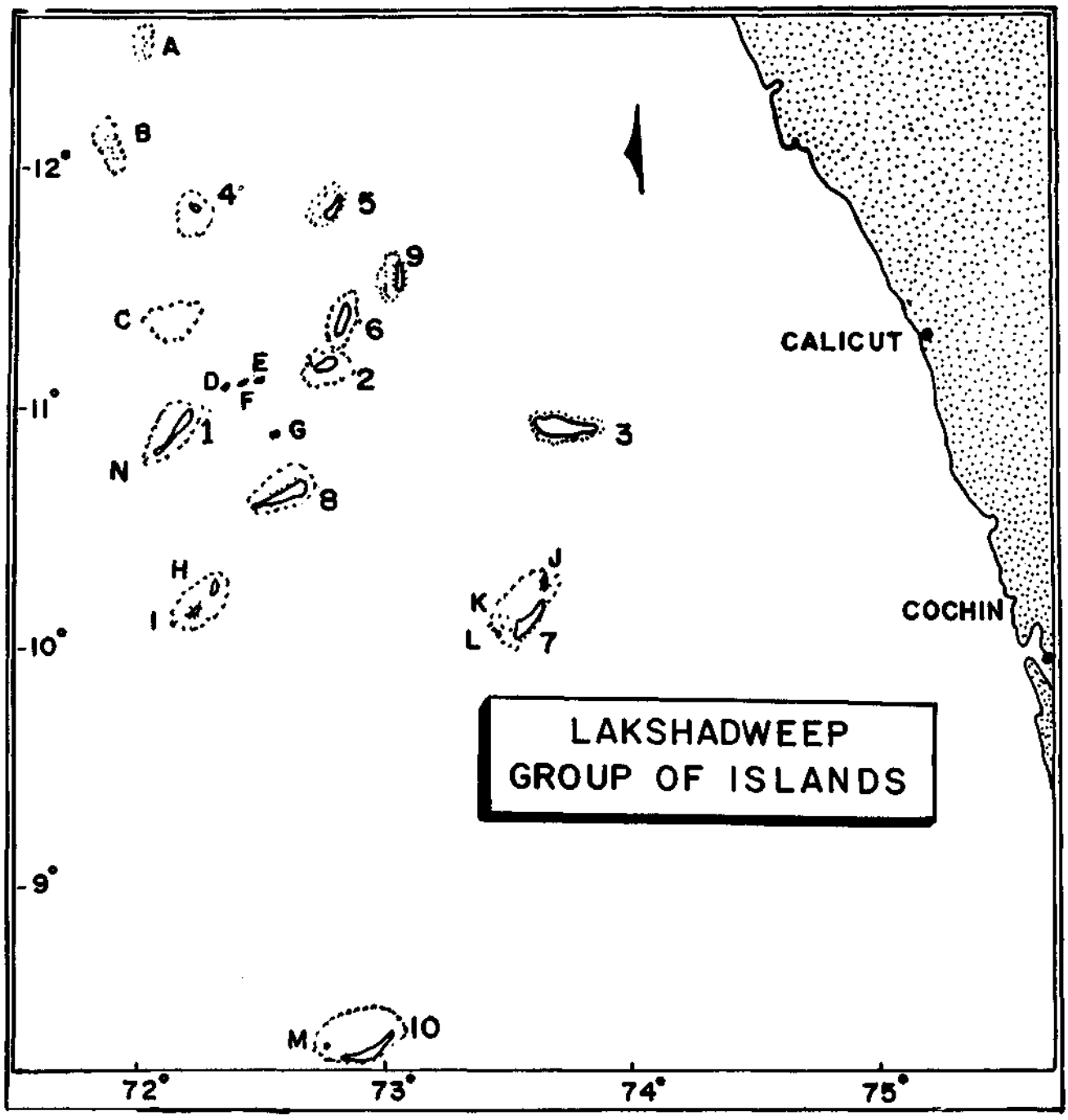

Fig. 1. Inhabited islands: 1. Agatti, 2. Amini, 3. Androth, 4. Bitra, 5. Chetlat, 6. Kadmat, 7. Kalpeni, 8. avaratti, 9. Kiltan and 10. Minicoy. Uninhabited islands: A. Cherbaniani or Baliapaniyam Reef, B. Byramgore or Chereapani Reef, (C) Peremul Par, (D) Bangaram, (E) Parali 1-3, (F) Tinnakara, (G)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

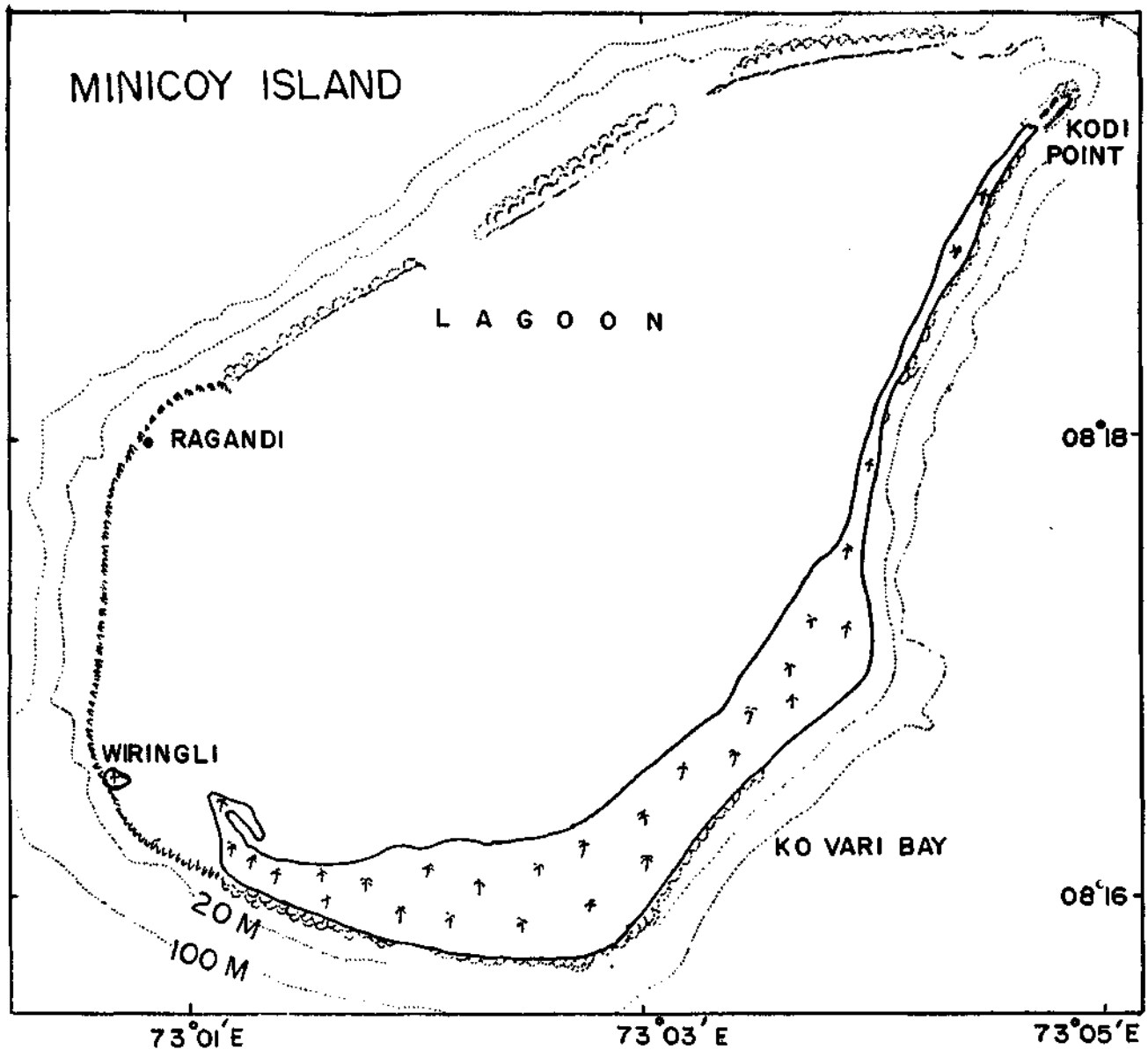

Fig. 2. Minicoy Island

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

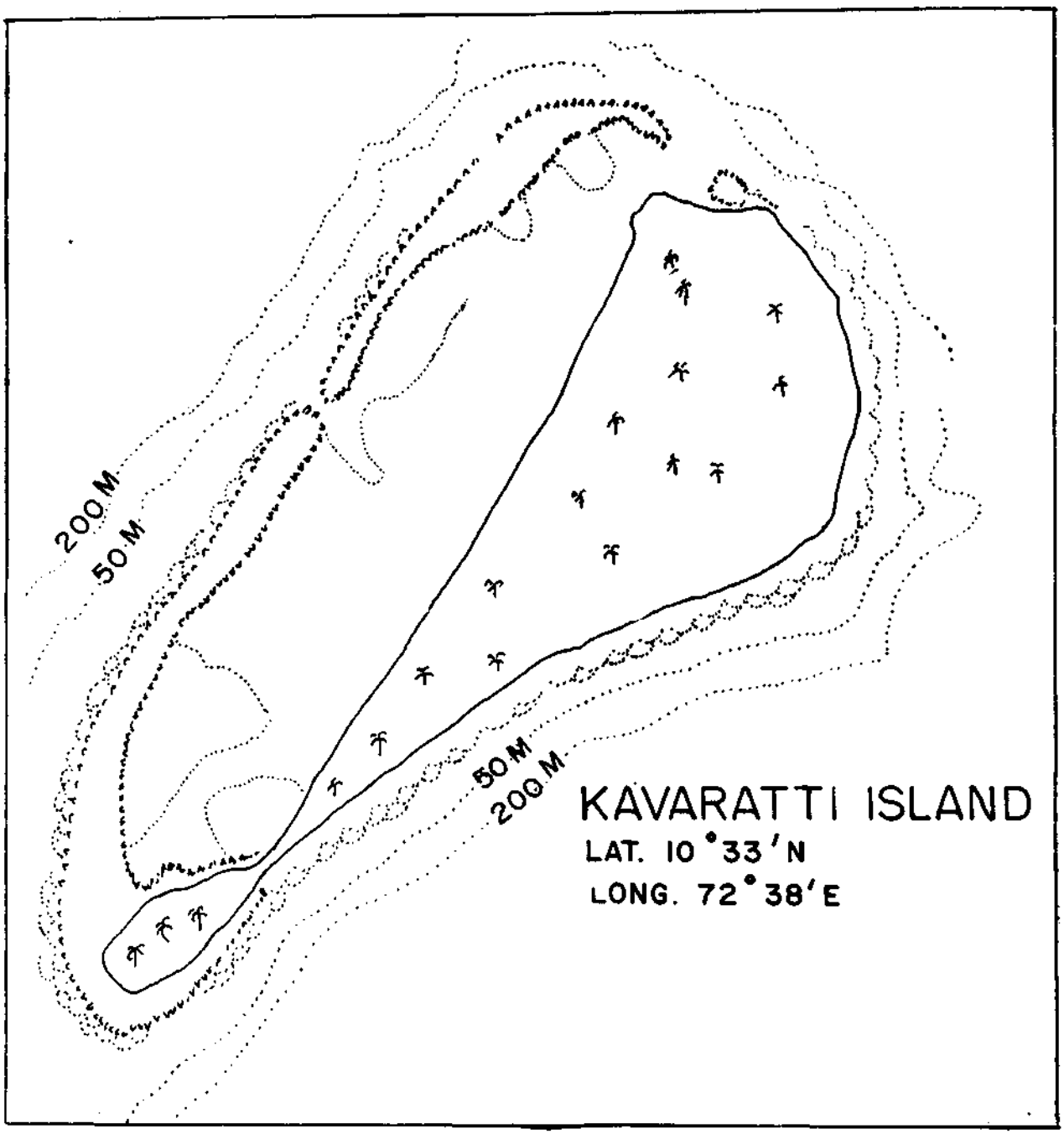

Fig. 3. Kavaratti Island

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.

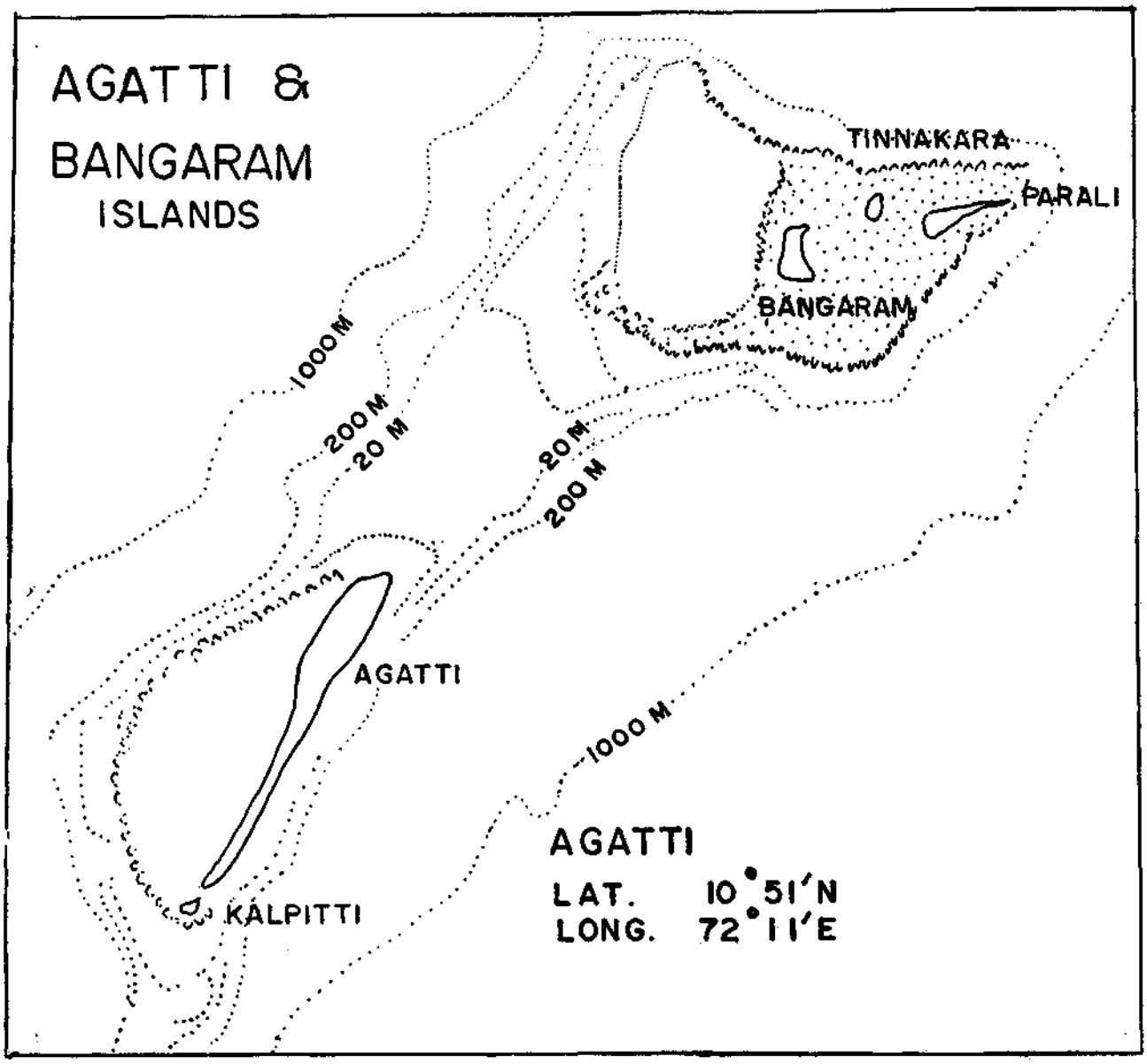

Fig. 4. Agatti and Bangaram islands

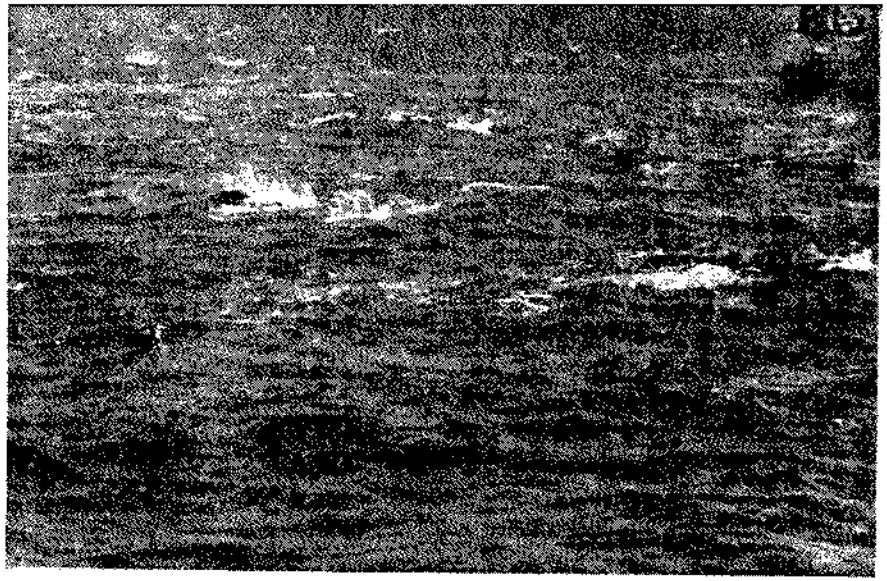

Fig. 5. Characteristic water movement caused by the 'boiling' nature of the skipjack tuna schools off Agatti Island.

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.

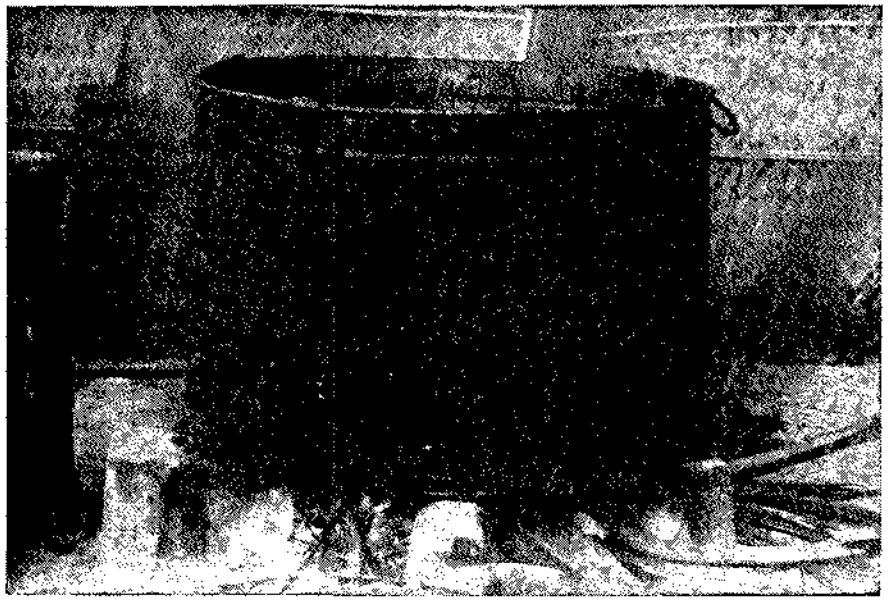

Fig. 9. Boiling of cut tunas in brine before smoking at Agatti Island.

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

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

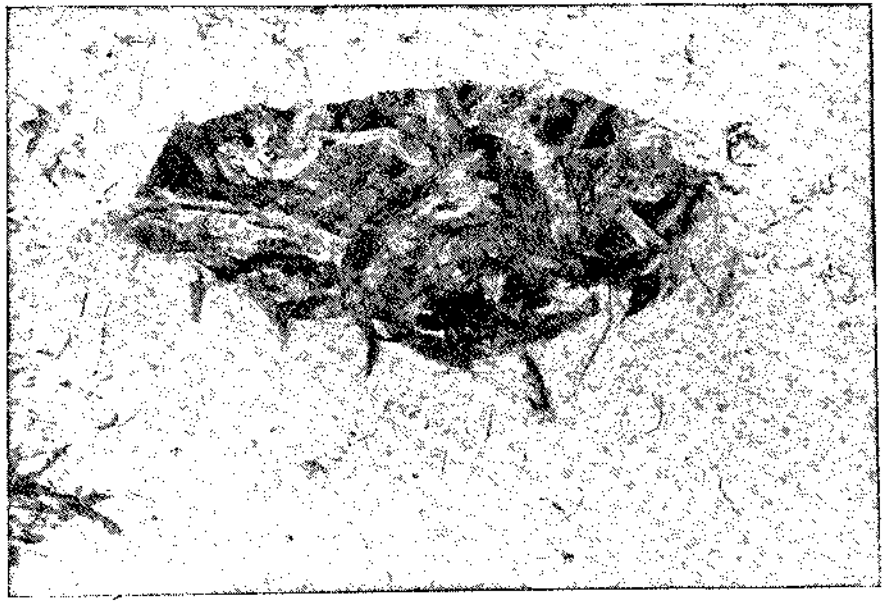

Fig. 12. A pit in which tuna wastes are buried on the beaches of Agatti Island.

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.

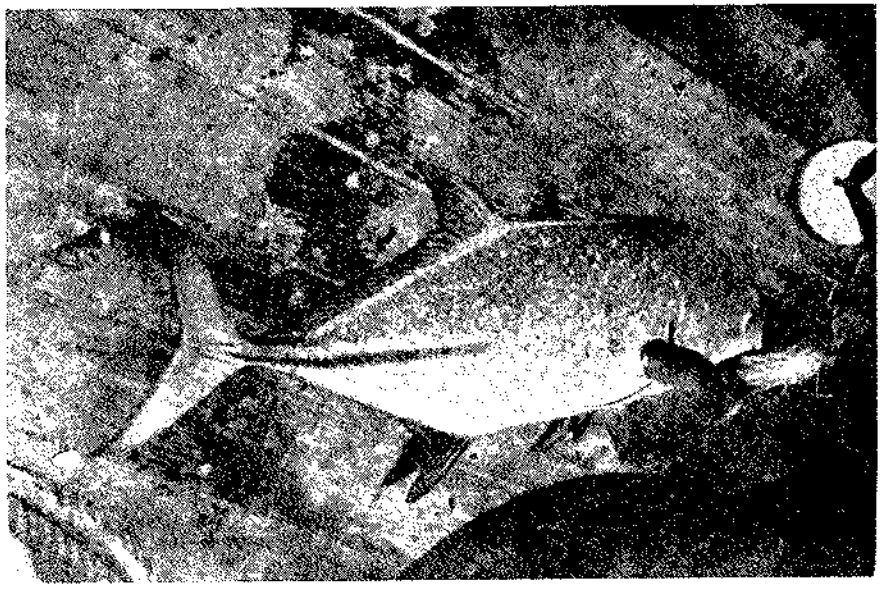

Fig. 14. *Caranx melampygus* caught on hook and line from deeper waters in Lakshadweep.

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.

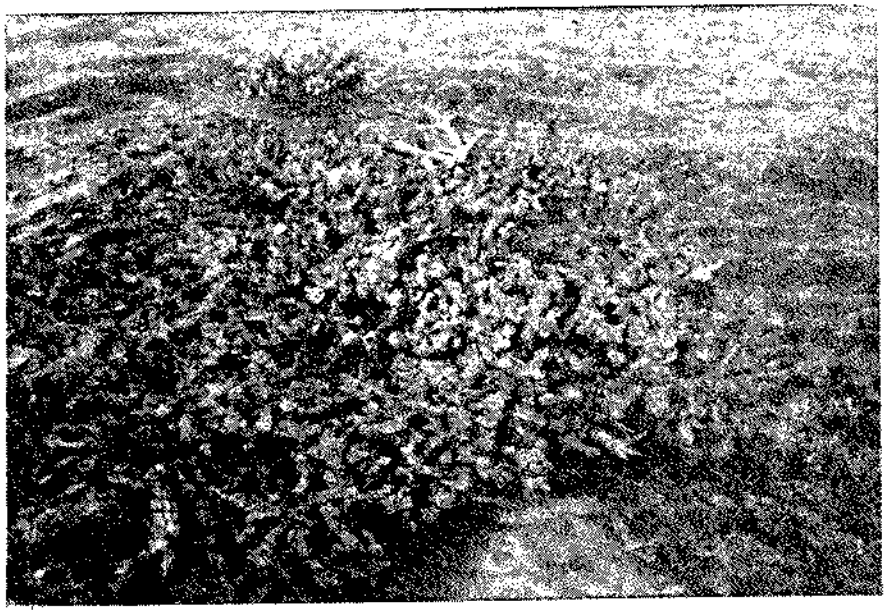

Fig. 16. An exposed reef flat in Bangaram Island during low tide.

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.

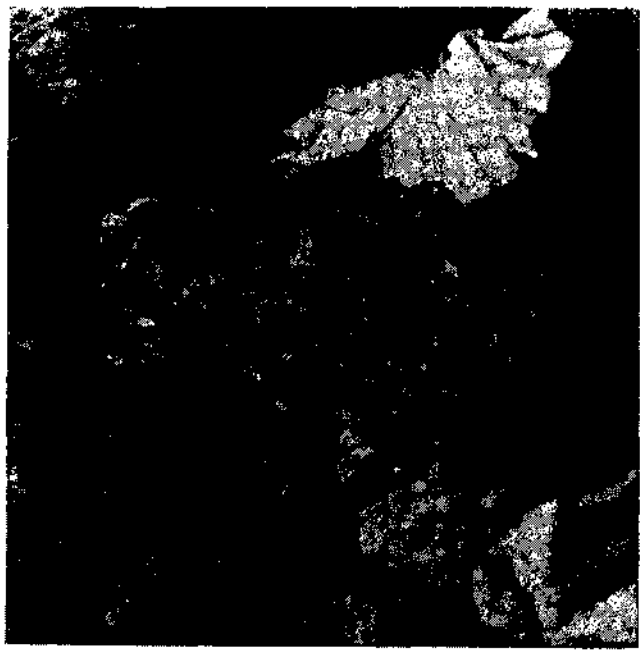

Fig. 17. The giant clam *Tridacna* sp. found in the lagoon of Bangaram Island.

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

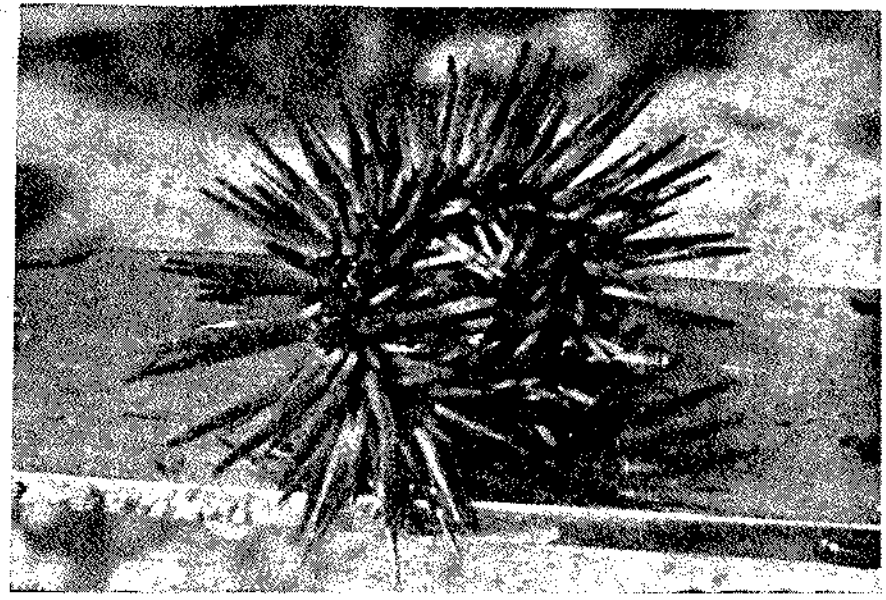

Fig. 18. *Echinometra mathaei*, a small sea urchin found associated with the corals in the lagoon of Bangaram Island.

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.

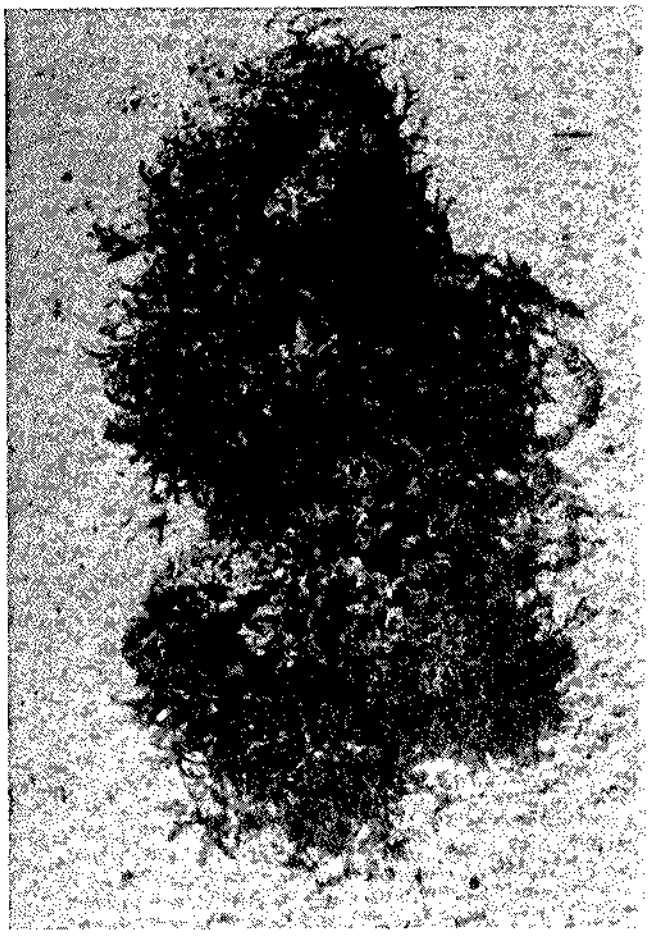

Fig. 22. The red alga *(Gracilaria crassa)* found growing on live and dead corals in the lagoon of Bangaram Island.

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.