

THE FISHING INDUSTRY OF MINICOY ISLAND WITH SPECIAL REFERENCE TO THE TUNA FISHERY

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INTRODUCTION

THE coral island of Minicoy (Fig. 1 *a* and *b*) in the Indian Ocean (Latitude $8^{\circ} 7' N.$, Longitude $73^{\circ} 18' E.$) is the most important tuna fishing centre in the Indian Union (Fig. 1). Situated between the two main groups of islands of the Laccadive and the Maldivic Archipelagoes, it is about 10 km. long and 820 m. broad in the centre and has an area of about 455 hectares and population of about 4,000 who speak the same Mahl dialect as the Maldivians to whom they are related ethnically. The main port of trade in India for the islanders is Cannanore about 420 km. away on the Malabar coast and specially built sailing vessels known as odams are used for carrying men and cargo to the mainland and back. Tuna fishery is the most important industry of the island and the chief product of export is the *mas min* or the cured and dried meat of tuna the value of which has recently risen to the record figure of over half a million rupees a year. Export of cured tuna meat contributes about two-thirds of the total income of the islanders while next in order of importance comes the money remitted by those serving as lascars in merchant vessels. The only other source of income is from the sale of produce like copra, jaggery, coir and vinegar from coconuts. There is practically no other source of revenue and the inhabitants have to depend entirely on the mainland for all essential items and necessities of daily life such as rice and other commodities. In view of this, a barter system of trade prevails there and the necessary goods are supplied by certain merchants at Cannanore directly or through their agents stationed in the island.

In view of the importance of this island from the tuna fisheries point of view the senior author has been collecting information on the fisheries and arranging the procurement of specimens from 1954 onwards through the courtesy of the Medical Officers stationed in the island. Towards the end of 1956 the junior author was sent to the island for about a month for collection of fish specimens and particulars of the fishing industry. A visit was made by both the authors early in 1958 on board the Research

Vessel "Kalava" of the Indo-Norwegian Project when additional information and material were collected for the preparation of this account.

There is no comprehensive account on the fishing industry of the island. Hornell (1910), Ellis (1924) and Mathew and Ramachandran (1956) have recorded their observations on the tuna fishery there. A note on the tuna bait fishery of Minicoy has been published by one of us (Jones, 1958). With the reorganisation of States the island along with the others in the Laccadive Archipelago has now come under the direct administration of the Government of India and it is felt that a detailed account of the fishing industry will serve as background information for any programme of fishery development for the above area.

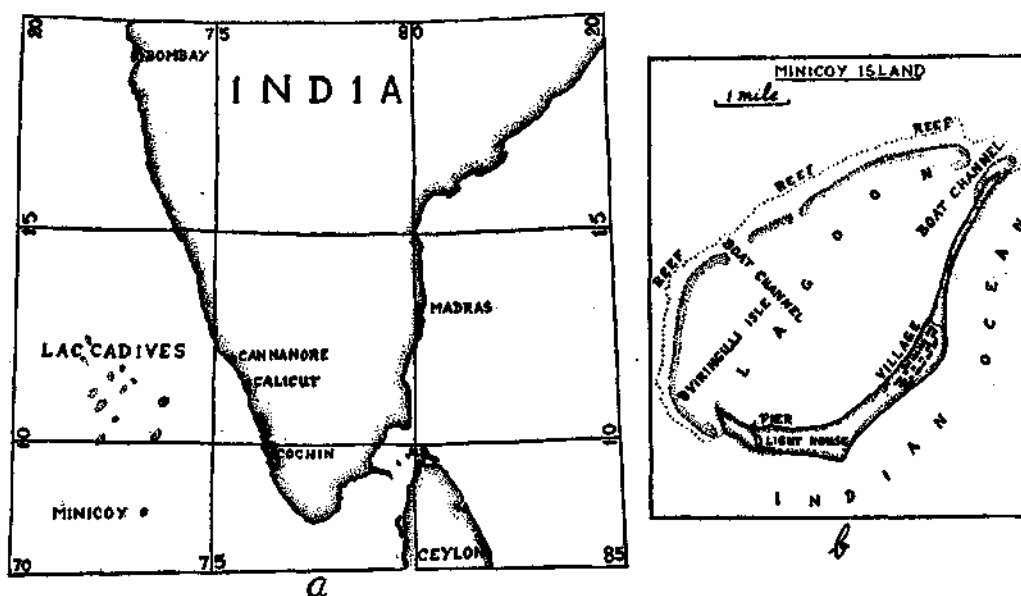


FIG. 1. (a) Peninsular India showing the Laccadive Archipelago; (b) Minicoy Island.

The inhabitants are all Muslims and are divided into four classes, viz., (i) Manikfans, (ii) Malmis, (iii) Thakrus and (iv) Ravaris. The Manikfans form only 4% and the Malmis who are mostly sailors by profession come next in order forming 6% and these communities are permitted to intermarry and interdine. The Thakrus who are sailors and boatmen form 50% of the population and the Ravaris are tree-climbers and toddy-tappers and form 40%. Intermarriage and interdining between the last two communities are allowed but not between them and the first two which form the high castes. There is a somewhat rigid social set-up in the island

governed by convention and this has its impact on the fishing industry also. The highest point in the island is hardly 2 m. above the high tide level and the drinking water is slightly brackish. Mosquitoes breed profusely in the numerous pits and stagnant pieces of water making life practically unbearable during the monsoon period. Occasional epidemics of smallpox break out, the infection being carried by visitors returning from the mainland. Those suffering from smallpox are isolated in the Viringilli Island (Fig. 1 b) where they are looked after by people who have survived the attack previously and developed immunity to it. There is a leper settlement in the northern section of the island.

The people of Minicoy are perhaps the most indomitable sea-faring men among the inhabitants of the countries bordering the central part of the Indian Ocean. A large number of them are employed in ocean going merchant ships as lascars and many of the older men are veteran sailors who have seen a good part of the world. Even for the children the call of the sea is hard to resist and it is not uncommon to see them swimming far out into the lagoon supporting themselves on boat-shaped pieces of wood or holding on to miniature outrigger canoes fitted with tiny sails (Plate I, Fig. 3). A large number of ships could be seen daily passing close by as the island with its tall and conspicuous lighthouse is situated between the 8° and 9° channels in the main shipping line between Aden and the Far East and the youngsters eagerly look forward to the day when they could follow in the footsteps of their elders and serve in one of those ships as lascars.

FISHERIES

Tuna fishery

As stated already tuna fishing industry is the chief economy of the island on which more than three-fourths of the people depend for their livelihood. The prosperity of the islanders depends almost entirely on the quantity of tuna caught and the price that the cured fish or *mas min* fetches in the export market. It is a well organised industry with a long-established tradition in the maintenance of which an unwritten code of observance is rigidly followed by the local people. The species that mainly contributes to the fishery is the oceanic skipjack, *Katsuwonus pelamis* (Linnaeus) [Fig. 5 a], while small numbers of yellowfin, *Neothunnus macropterus* (Schlegel) are also occasionally caught. The frigate mackerel, *Auxis thazard* (Lacépède), has also been collected from the area but it is doubtful if this constitutes a fishery of any magnitude. It is also reported that the little tuna, *Euthynnus alletteratus affinis* (Cantor) are caught from the sea around. Tuna fishery

is operative from September to April but the peak season is from December to March.

At the commencement of the tuna season the large fishing boats locally known as *mas odi* (Fig. 2 a) which are kept covered on the shore during the monsoon period are pulled by about 50 or more persons and launched in the lagoon. When it is necessary to launch or beach a boat the fact is announced by 4 or 5 'criers' who are sent out into the streets by the leader of the ward. All the available menfolk of the concerned ward or *athiri* irrespective of caste or profession are expected to assemble on the beach at the appointed time and anyone disobeying the call of the community is subjected to social ostracism. One of the punishments imposed is to pile up thorny shrubs and leaves on the doorway and path leading from the house making it difficult for the person concerned to move out of the house.

The tuna boat of Minicoy is in a class by itself and superior to any boat of its size in use on the mainland. It is of sturdy construction and has a remarkable degree of stability. It is locally built usually with coconut planks fastened by copper nails. Sometimes timber from the locally grown laurel tree (*Calophyllum inophyllum*) is also used along with coconut planks. The partitions and certain small parts within the hull are made of wood brought from the mainland. The boat is about 12.5 metres long and about 3 metres broad. It is broadest at the aft which is provided with a slightly raised platform (*peelaga*) which extends like wings outside the bulwarks. A piece of wood (*kumbukaphi*) about $1\frac{1}{4}$ to $1\frac{1}{2}$ metres in length and 20 cm. in breadth is fixed vertically on the platform. This helps to give a supporting hold to the person who steers the rudder and the aft mast is also kept on this when not in use. The *fen-fona-fori* or water-splasher is hung on one side. A curved piece of wood about 1 metre long, usually colourfully painted, called *unkanudhuni*, is attached to the rudder (*unkanu*) to facilitate its operation. There are 9 compartments in all, of which 4 in the middle have a series of 2 to 3 holes (*inguri*) at the bottom on each side for access of water from below. The inter-compartmental partitions have small holes for the free flow of water from one compartment to the other. The middle 3 or 4 sections (*eng-vy*) hold live bait-fish and the water that accumulates at the aft compartments is baled out regularly by a couple of boys with copper balers known as *diya-hikka-fe*. There is provision for 7 to 9 oars (*phali*) on each side. The blade of the oar (*phalidu*) is of wood about 30 cm. long and 20 cm. broad and the handle (*thandu*) is of coconut timber about 3.5 to 4 metres long. There are two masts (*kombu*) of coconut timber, a longer one about 8 metres long in the 8th compartment and a shorter one about

6 metres long in the 3rd compartment. The sails are of cloth. Smaller tuna boats are 8 to 9 metres long but these have no platform. Sometimes wooden rafts known as *Kanthu-fathi* (Fig. 2 *b*) are used for going to the boat anchored in the lagoon.

The skipjack is invariably caught near the surface and the gear used is the pole and line (*dhoi*) (Fig. 2 *c*) with lead-coated iron hooks of a simple type without any barb. The *dhandi* or the pole used is of light but strong bamboo of 3 to 4 metres in length, specially brought for the purpose from Calcutta. The length of the line is equal to that of the pole and the hook (*beuli*) is kept fixed to the base of the latter when not in use. The first $\frac{1}{3}$ of the line which is of cotton is known as *nanu* and the rest of the portion close to the hook is the *miyawali* or *avu naru* and used to be of steel wire formerly but is now of nylon.

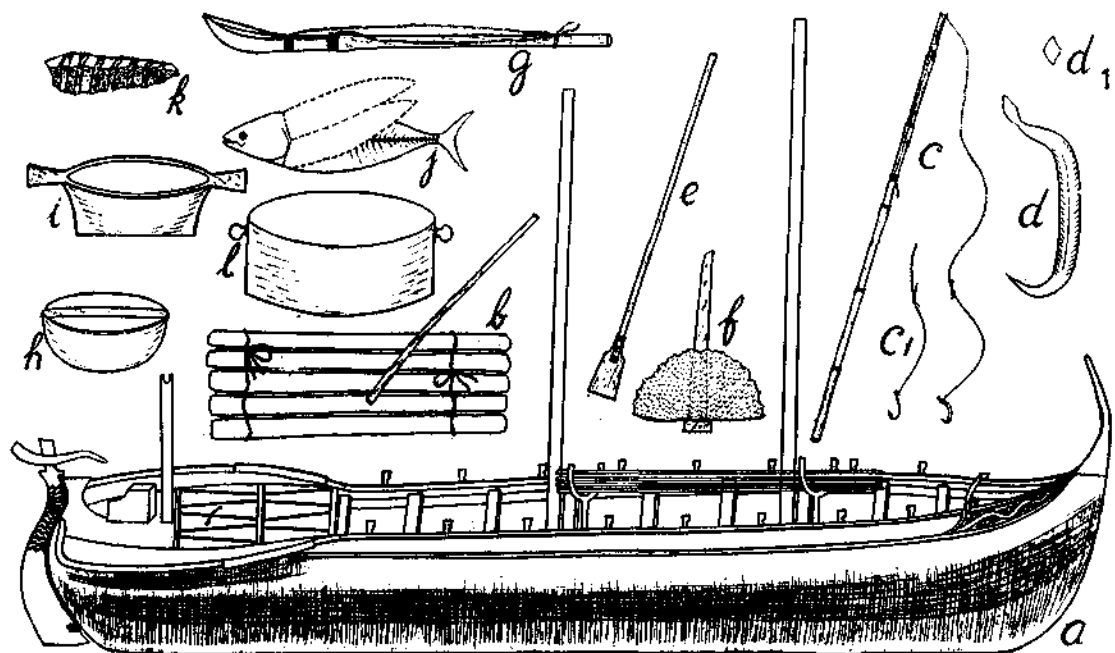


FIG. 2. (a) Tuna fishing boat; (b) Raft; (c) Pole and line used for tuna fishing; (c₁) Hook and a portion of the line used for fishing in the lagoon; (d) Tuna fishing hook; (d₁) Cross-section of a tuna fishing hook; (e) Oar used in fishing boats; (f) Coral stone anchor; (g) Water-splasher; (h) Water-baler; (i) Wooden trough used for carrying tuna; (j) Method of filleting tuna for preparation of *mas* (semidiagrammatic); (k) A piece of *mas* wound with split coconut leaf; (l) Copper vessel used for boiling tuna meat.

An essential prerequisite before the tuna fishing expedition is the collection of bait-fishes which consist of a variety of small-sized fishes in the

lagoon. The most important among them are pomacentrids which occur in very large shoals. These are caught in bait nets or *nilamahi-dou* and stored in bait baskets known as *labari* and *fy-labari*. Details regarding the collection and storage of bait-fishes have been given elsewhere (Jones, 1958).

About 20 to 30 people go in a boat at a time for tuna fishing. The fishing ground is generally close to the island and seldom beyond 16 km. depending on the success in locating the shoals. When a shoal is sighted, the vessel is steered close to it and every one gets ready for action. The captain (*kelu*) rushes to the bait well and scooping the bait-fish with an *eng-very* (see Pl. I) throws them out on either side and thus chums the tuna which dart about actively feeding on them. At the height of this frenzied feeding activity 4 to 5 men take up positions with pole and line on each side of the boat on the platform near the helm and deftly play the unbarbed naked hooks trailing it on the surface of the water. In the meanwhile two persons from the sides splash water with *fen-fona-fori* (Fig. 2 g) over the hooks to mask them. When there is good fishing, each swing of the rod brings one fish which is immediately retrieved from the hook and sent sliding into the fish-hold below. Fishing generally lasts from 10 to 30 minutes and if successful this time is enough to fill the boat with fish. Any hooked fish dropping into the water would scare away the shoal. Usually it may not be sighted again in the immediate vicinity. Another thing that scatters the shoal is the presence of the sailfish, *Istiophorus gladius* which is said to follow the skipjack. If this makes its appearance while the shoal is chummed close to the boat the fishermen throw a wooden dummy painted like a tuna tied to a string and weighted sufficiently to make it sink. The sailfish is said to follow the slowly sinking wooden dummy and leave the shoal to be tackled by the fishermen. The dummy tuna is retrieved by the string attached to it. If the sailfish comes sufficiently near, it is speared. The swordfish (*Xiphias gladius*) is also said to be caught occasionally in this manner. The vessels that go out in the morning for fishing return invariably by sunset if not earlier.

Sharing of catches

The fish caught are always shared between those who own the boats and other equipments and those who take part in the fishing operations as follows:

	Shares
<i>Athiri</i> (Ward) or owner of the boat ..	10
Supplier of sails	5

	Shares			
Supplier of hooks	5
Captain (<i>kelu</i>)	6
Each adult fisherman	5
Each boy	3
Supplier of bait net	2.5

Most of the boats are owned by the various wards and only three boats belong to individuals. The sails of these also are owned by the wards. The sharing is done in the boat itself as it proceeds to the landing place after the completion of the fishing operation. The guts and gills are removed by the boys and the fish are handed over to the womenfolk who gather on the beach awaiting the arrival of the boats. The women, who are attired uniformly in red overall skirts (with black lines), present a colourful and picturesque sight from a distance. A wooden trough with a handle locally known as *thakari* (Fig. 2*i*) is used for carrying the fish. Once the women take charge of the fish, the rest of the work including the sale of the meat is done by them.* When the catch is good a few fish are distributed free among the old folk and the children who collect at the landing place.

Preparation of 'mas min'

Immediately after the catch is delivered to the womenfolk, the fishes are filleted. Each side is again cut longitudinally into two making four chunks of meat from one fish as shown in the figure (Fig. 2*j*). In the case of very large specimens the flesh will be cut into 6 or 8 pieces. The meat is quickly washed in seawater and in freshwater without pressing out the blood. Each piece is carefully wound with the green, ribbon-like, split coconut leaves to prevent the meat from breaking up into pieces during the boiling process. The wrapped pieces are boiled for about $\frac{1}{2}$ to 1 hour, in a lead-coated copper vessel, *logung* (Fig. 2*l*) of about 70 cm. diameter and 25 cm. height containing seawater and freshwater in equal proportions. The vessel is then closed with a lid and allowed to cool for about 6 to 8 hours till next morning. The meat is then taken out and smoked for about 3 to 4 hours over an iron grate known as *dumari*. Coconut husks or split stems of coconut trees are usually used for this purpose. Generally the fish is sold in this condition to the merchants.

* There is a superstition that it is an ill-omen if a woman drops any fish on her way home. It is believed that the particular boat from which the fish came will have only a poor catch the next day.

The fillets require further treatment before they are fit for export. They are dried in the sun (see Pl. I) after removal of the leaves with which they are covered and smoked again and dried. The process is repeated 2 or 3 times till the product looks like dry sticks similar to the *Katsubushi* of the Japanese. The dried fish stick has about 25% of the weight of the fresh filleted meat. Before the fillets get completely dry, a mould grows on the surface evidently similar to the penicillin-producing *Aspergillus*. In the case of the Japanese fish stick this is said to help in flavouring and dehydrating the fish and to aid in removing fats and in breaking complex amino acids into their simpler forms (Shapiro, 1948).

Pieces of flesh which remain attached to the vertebral column and head after filleting are scraped out and boiled along with the fillets and dried and this is locally known as *Kundi mas*. The water in which tuna fillets are boiled is used for the purpose over and over again for four or five days till by evaporation a thick sediment impregnated with salt containing small pieces of meat is left behind. This, known as *Riha akru*, as also the *Kundi mas*, is entirely consumed locally whereas the dried meat or *Hikki mas* is mainly exported. Fresh tuna is either boiled and eaten or made into highly spiced curry preparations and taken along with rice. The dried fish sticks are sometimes eaten by the islanders as such or along with coconut kernel or dates. They are also crushed and used in various curry preparations.

Generally the skipjack weighs about 3 kg. to 4½ kg. and measures about ½ metre to ¾ metre in length, each fish giving about ¾ to 1½ kg. of cured fish stick. The price of this dry product in the island is about Rs. 1.50 to Rs. 2.00 per kg. The same is reported to fetch Rs. 3.50 to Rs. 4.00 a kg. at Cannanore, Rs. 5.00 to Rs. 5.50 at Tuticorin and Rs. 6.50 to Rs. 8.00 in Ceylon. Some quantities are exported to Malaya and Singapore where the price fetched should be higher.

Miscellaneous fisheries

Compared to the magnitude and value of the tuna fishery, the other fisheries are of little importance. There is some fishing in the lagoon and along the reefs bordering it especially during the off-season for tuna. Fishing within the lagoon is done only during the monsoon season when rough weather prevents the men from going out into the open sea. Apart from fish proper, squids and stray specimens of prawns are caught in shore-seines. Spiny lobsters caught from crevices between coral stones are not relished by the islanders except by a few Manikfans. Gastropods and bivalves are not eaten. Turtles are reported to come ashore during breeding time

Export figures of 'mas min' from Minicoy for 1952-58

Year	No. of bags (120 lb.)	Approximate value in Rs.
1952	1570	157785
1953	2221½	244365
1954	1921	230520
1955	1191	139283
1956	3110	334150
1957	5544	604931
1958	3406	392254

for laying eggs but these are never caught either for oil or for human consumption. The various methods of fishing are briefly described below.

Shore-seines.—There are two kinds of shore-seines both known as *bala-jaha*. The actual operation also is known by the same name. (*bala* = net; *jaha* = to haul.) For the first kind of shore-seine operation a combination of three units, viz., (i) *Fung-dou*, (ii) *ronu-dou* and (iii) *uai-dou* are utilized (Fig. 3 b). The above fishing is done only on very special occasions when a large quantity of fish is required for some common feast or any other purpose. Sections of nets are contributed by several individuals and about 60 to 80 people take part in the operation with half a dozen boats.

The *fung-dou* consists of a stout rope about 120 metres long to which about 100-120 coconut leaves are attached about a metre apart. The free ends of the ropes are tied to two coconut poles. *Ronu-dou* consists of rectangular pieces of coir nets, each about 9 metres long and 1½ metres broad with about 6 cm. mesh. A number of such nets are attached together to form a long net, with a stout head rope and a foot rope passed through it. This netting is not specially made for fishing but as cover for copra against crows, and when required for fishing, it is collected and joined together for the purpose. *Uai-dou* is a cotton net of 12 ply, 40 counts yarn, each piece measuring about 16 metres long and 120 cm. wide having mesh of about 1.5 cm. About 240 lead weights or *bury* weighing about 30 gm. each are attached to the ground rope (*etti*) at intervals of about 7 cm, and about 80

wooden floats or *fouli* measuring about 7.5×3.8 cm. are attached to the head rope (*etti*) at intervals of about 15 cm. A number of pieces are joined together by ropes (*deburi*) to form a stretch equal to the length of the *ronu-*

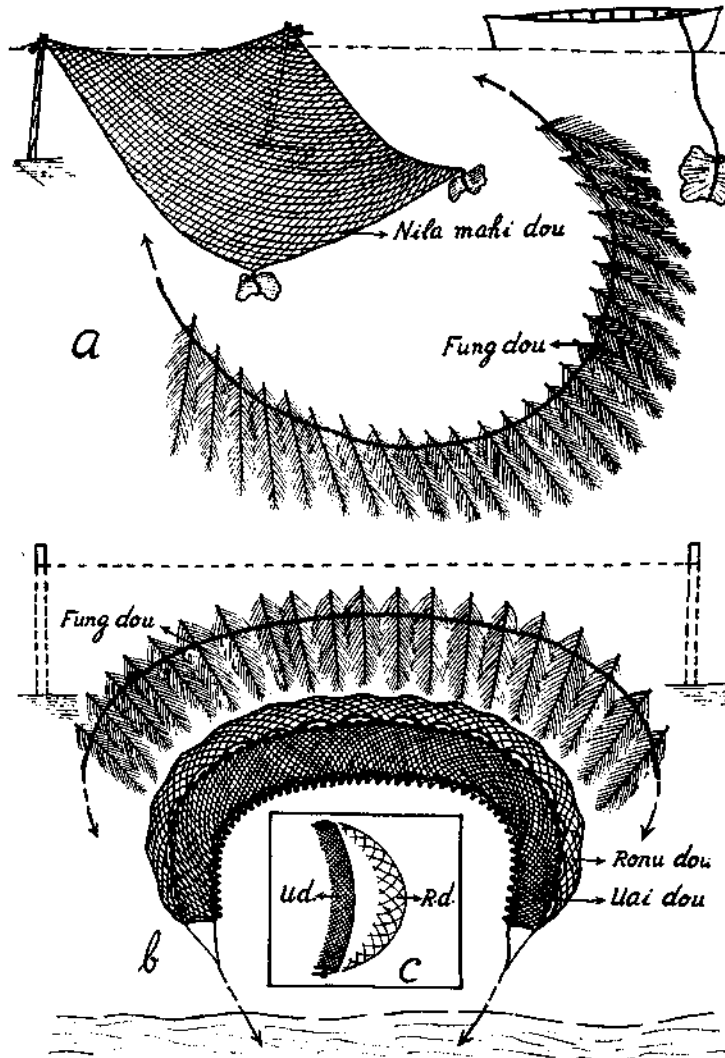


FIG. 3. (a) Semidiagrammatic sketch showing the operation of *nilamahi-dou* in the lagoon in combination with *fung-dou*; (b) Operation of *bala-jaha*. The dotted line indicates the original position of the *fung-dou*; (c) Cross-section of *ronou-dou* and *uai-dou* joined together for *bala-jaha* operation.

dou used and these two are attached together at short intervals to form a composite net as shown in the figure (Fig. 3 b), the inner one consisting of

the comparatively narrow and small meshed *uai-dou* and the outer one consisting of the wider and large-meshed *romu-dou*.

On the day previous to the fishing the *fung-dou* is fixed in the lagoon parallel to the shore about $\frac{1}{2}$ km. away. Fish gather under the shelter afforded by the row of coconut leaves and on the next day the composite net of *romu-dou* and *uai-dou* is taken and cast across the entire length of the *fung-dou* trapping all the fish congregated there. The composite net is gradually pulled to the shore by a number of boats and the *fung-dou* is

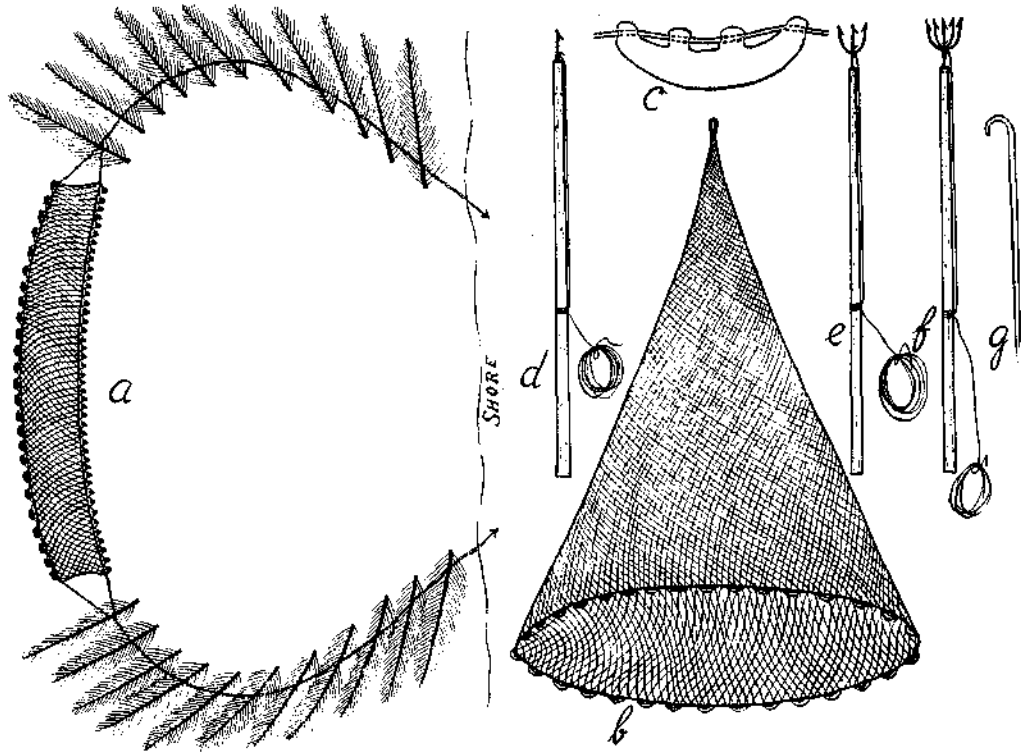


FIG. 4. (a) Semidiagrammatic sketch showing the operation of *Bala-jaha* (small type); (b) The cast-net (*ella-dou*) of Minicoy; (c) Lead weight of *ella-dou*; (d) One-pronged harpoon (*Enghili-kavaru*); (e) Three-pronged harpoon (*Thinghili-kavaru*); (f) Five-pronged harpoon (*Fasili-kavaru*); (g) The iron implement (*seek*) used for spearing lobsters.

also untied and brought up in the rear. When the nets come close to the shore, the end ropes are taken over by people waiting there. The coconut leaves are removed from the *fung-dou* while in the sea itself. A variety of fishes both large and small are caught by this method. They consist of perches, rays, hemirhamphids, leather jackets, sphyraena, surgeon fishes and a number of coral fishes. Large mullets are frequently caught but they

are adept in escaping by jumping over the nets. The whole catch is shared by all those who have contributed the boats and nets and who have assisted in the fishing operations.

In the second type of shore-seine operation (Fig. 4 a) which is also known as *bala-jaha*, four or five pieces of *ronu-dou* are joined into a single unit and to both ends 20 to 25 coconut leaves are tied to ropes close together. About 10 floats of 45 × 15 cm. are attached to the head rope and iron sinkers, consisting of bits of old anchor chains, to the foot rope. The net is paid out from two boats about $\frac{3}{4}$ km. away from the shore. First the end ropes are towed towards the shore by two boats and subsequently the people on the beach also help in the operations. Generally about 40 people take part in the fishing. Several kinds of comparatively large-sized fishes are caught and these are shared by all those who take part in the fishing operations.

Uai-dou.—One to three pieces of this net, already referred to under the first type of *bala-jaha* operation, are used by 2 to 4 persons as a drag-net close to the shore. Parties in need of fish for home consumption catch fish in this way from the lagoon in May, June and July.

Nilamahi-dou.—This net is generally operated for bait-fish for tuna and has already been described and figured (Jones, 1958). It is occasionally used for catching fish from the lagoon as described in the paper cited above. The method of fixing the net and scaring the fishes towards it with the help of *fung-dou* is shown in Fig. 3 a. Mostly coral fishes are caught from near Viringilli and of these the large ones are used for home consumption and small ones as bait-fish for hook and line fishing in the reef areas.

Cast nets.—The local type of cast net (Fig. 4 b) known as *ella-dou* is of a very simple type and differs from those used in the mainland in the absence of any casting rope or radiating draw strings. The net is provided with lead weights along the periphery and with a small ring-like knot (*fulluga*) at the apex large enough for a finger to pass through, which enables the fishermen to hold the net while casting it. It is operated in the lagoon or close to the reefs and any portion getting caught in the coral growths is retrieved by hand. No preservative is used for cast nets. The net is made of 6 ply 40 counts thread with a thick cotton twine passing through the lead sinkers along the border. The length of the net when gathered is about 3 to 3½ metres and the circumference when fully spread is about 12 metres. The size of the mesh at the apex is about 1.5 cm. whereas towards the border it is about 1 cm. There are 130 to 140 lead sinkers (*bury*) along the border and each sinker (Fig. 4 c) has four holes for the cord (*kurevi*)

to pass through. There are 11 nets of the above kind in the island and they are generally operated in shallow water adjacent to the coral reefs in June, July and August by persons requiring fish for home consumption.

There is another type of cast net made of thicker thread of 12 ply 40 counts yarn with 2 cm. mesh at the apex and 1.5 cm. at the periphery. The length of this net is about $3\frac{1}{2}$ metres and the circumference about $13\frac{1}{2}$ metres. The sinkers used are slightly heavier than in the cast net described earlier and number about 150. There are 24 nets of this kind in the island and these are generally used close to the reefs during the monsoon months. Only one cast net of the closing type with radiating strings is in use in the island.

Hook and line.—The pole and line used for tuna fishing described earlier is sometimes used for other fishes in the absence of the former after substituting a barbed hook (Fig. 2 *c*₁) in the place of the barbless one. Fishes are caught in this manner only very occasionally from the open sea but carangids and other large-sized fishes are caught from near the reef areas and small-sized fishes are caught from within the lagoon for local consumption. For fishing within the lagoon, small boats, 4 to 6 metres in length, are used and are generally manned by a single person while for fishing in the reef areas medium-sized boats 6 to 8 metres in length are used. The latter carry from 4 to 6 persons each, of whom two are normally engaged in rowing the boat. Barbed hooks of 3.5 to 5 cm. size are used and sometimes a few bait-fishes are thrown to attract the large fishes. Long lining (*vadu-nanu*) is sometimes carried out from tuna boats each of which carries a few of these primarily for catching sailfish which follow tuna and disturb them while being chummed. The long line is of cotton and measures 100 to 150 metres. The hooks are about 7.5 to 10 cm. in size and are covered by coloured chicken-feathers to serve as a jig. In addition to sailfishes, sharks, tuna and other large fishes are also caught with long lines.

Harpoons.—Harpoons are used for fishing only occasionally. Swordfish, sailfish and other large-sized fishes are harpooned when they are seen at close quarters in the course of tuna fishing operations. They are also used from the sailing boats which go to the mainland with cargo and passengers. There are three kinds of harpoons which differ from one another in the number of prongs.

Enghili-kavaru (Fig. 4 *d*).—This is a single pronged harpoon fixed at the end of a handle of coconut pole called the *dhandi* about 2 metres in length and 3 cm. in diameter. The detachable metal head is 22 to 25 cm. long and is tied to the pole by a stout cotton twine or *nanu* about 60 to 100 metres in length which serves as the retrieving cord. The harpoon head or *kavaru* is painted yellow.

Thinghili-kavaru (Fig. 4 e).—This is a three-pronged harpoon used from sailing vessels plying between the mainland and the island. The detachable harpoon head is about 30 cm. long and painted yellow. The handle and cord are similar to the previous one.

Fasili-kavaru (Fig. 4 f).—This is five-pronged harpoon with the metal part about 30 cm. in length. The handle and the retrieving cord are similar to the other two.

In addition to the above, a pointed iron rod about a metre in length known as *seek* (Fig. 4 g) with a curved head is used for catching lobsters and crabs.

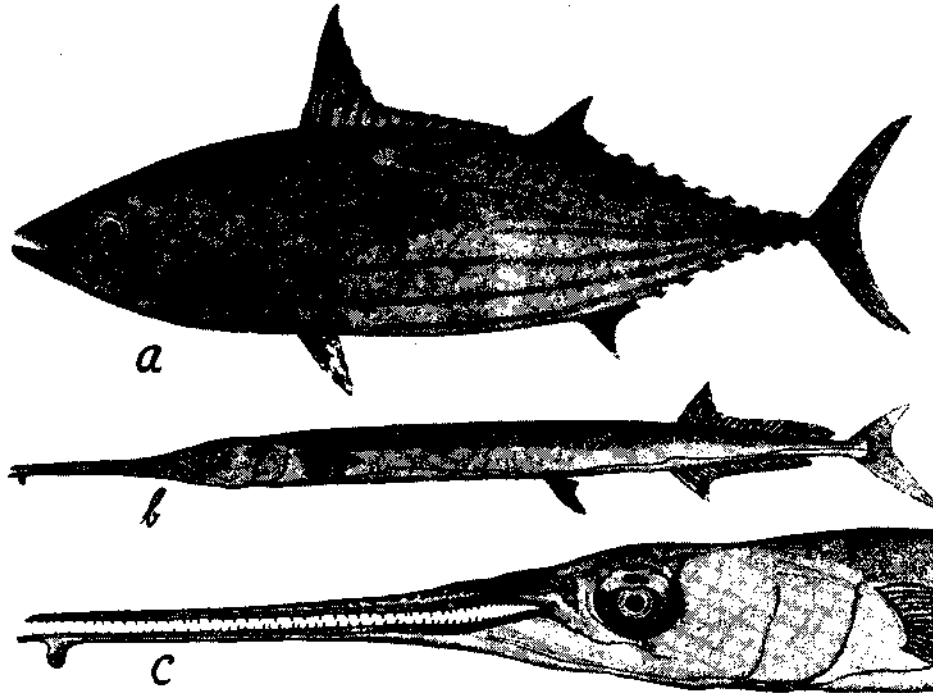


FIG. 5. (a) *Katsuwonus pelamis* (Linnaeus); (b) *Thalassosteus appendiculatus* (Klunzinger); (c) Head of *T. appendiculatus* (Klunzinger).

Crevices in rocks are probed with the pointed end of the *seek* and any animal found there is pierced through and drawn out.

FISHES OF MINICOY

A list of fishes actually collected and identified by us from the lagoon and the sea around Minicoy is given below. This is by no means comprehensive as in view of the special situation of the island further collections are bound to reveal more of coralline as well as oceanic types of fishes. There are in all 154 species

(excluding about 10 species which have not been identified) and brief notes on those of special interest are given at the end.

List of Fishes

Class TELEOSTOMI

Order CLUPEIFORMES

Family: ALBULIDÆ

1. *Albula vulpes* (Linnaeus).

Family: CLUPEIDÆ

2. *Sardinella melanura* (Cuvier).

Family: GONOSTOMIDÆ

3. *Cyclothone microdon* (Günther).
4. *Cyclothone signata* Garman.
5. *Gonostoma elongatum* Günther.

Family: CHAULIODONTIDÆ

6. *Chauliodus sloani* Bloch & Schneider.

Order SCOPELIFORMES

Family: SYNODONTIDÆ

7. *Saurida gracilis* (Quoy & Gaimard).

Family: SCOPELIDÆ

8. *Myctophum reinhardti* (Lütken).

Order ANGUILLIFORMES

Family: OPHICHTHYIDÆ

9. *Pisodonophis cancrivorus* (Richardson).

Family: MURAENIDÆ

10. *Gymnothorax undulatus* (Lacépède).
11. *Sideria picta* (Ahl).
12. *Uropterygius marmoratus* (Lacépède).

Order BELONIFORMES

Family: BELONIDÆ

13. *Thalassosteus appendiculatus* (Klunzinger).

Family: HEMIRHAMPHIDÆ

14. *Hemirhamphus dussumieri* Valenciennes.

Order *CYPRINODONTIFORMES*

Family: *CYPRINODONTIDÆ*

15. *Panchax panchax* (Hamilton).

Order *BERYCIFORMES*

Family: *HOLOCENTRIDÆ*

16. *Holocentrus ittodai* Jordan & Fowler.
17. *Myripristis murdjan* (Forskål).

Order *MUGILIFORMES*

Family: *SPHYRAENIDÆ*

18. *Sphyræna obtusata* Cuvier.

Family: *MUGILIDÆ*

19. *Crenimugil crenilabis* (Forskål).
20. *Plicomugil labiosus* (Valenciennes).
21. *Valamugil seheli* (Forskål).

Family: *ATHERINIDÆ*

22. *Allanetta forskåli* (Rüppell).
23. *Pranesus duodecimalis* (Valenciennes).

Order *POLYNEMIFORMES*

Family: *POLYNEMIDÆ*

24. *Polynemus sexfilis* Valenciennes.

Order *PERCIFORMES*

Family: *SERRANIDÆ*

25. *Cephalopholis argus* Schneider.
26. *Cephalopholis sonnerati* (Valenciennes).
27. *Enneacentrus miniatus* (Forskål).
28. *Epinephelus fasciatus* (Forskål).
29. *Epinephelus merra* Bloch.
30. *Epinephelus stoliczke* Day.
31. *Plectropomus leopardus* (Lacépède)
32. *Variola louti* (Forskål).

Family: *THERAPONIDÆ*

33. *Therapon jarbua* (Forskål).

Family: *KUHLIDÆ*

34. *Kuhlia taeniurus* (Cuvier).

Family: APOGONIDÆ

35. *Apogon frenatus* Valenciennes.
36. *Apogon hyalosoma* Bleeker.
37. *Archamia buroënsis* (Bleeker).
38. *Archamia lineolatus* (Cuvier).

Family: CARANGIDÆ

39. *Carangoides ferdau* (Forskål).
40. *Caranx ignobilis* (Forskål).
41. *Caranx malabaricus* (Bloch).
42. *Caranx melampygus* Cuvier.
43. *Caranx sexfasciatus* Quoy & Gaimard.
44. *Caranx stellatus* Eydoux & Souleyet.
45. *Chorinemus sancti-petri* Cuvier.
46. *Elagatis bipinnulatus* (Quoy & Gaimard).
47. *Trachinotus bailloni* (Lacépède).
48. *Trachinotus blochi* (Lacépède).

Family: CORYPHAENIDÆ

49. *Coryphaena hippurus* Linnaeus.

Family: LUTIANIDÆ

50. *Aphareus furcatus* (Lacépède).
51. *Aprion virescens* Valenciennes.
52. *Apsilus fuscus* Valenciennes.
53. *Lutianus gibbus* (Forskål).
54. *Lutianus johni* (Bloch).
55. *Lutianus kasmira* (Forskål).
56. *Lutianus malabaricus* (Schneider).
57. *Lutianus waigiensis* (Quoy & Gaimard).

Family: CAESIODIDÆ

58. *Cæcio coeruleus* Lacépède.
59. *Cæcio chrysozonus* Cuvier.
60. *Cæcio tile* Valenciennes.

Family: GERRIDÆ

61. *Gerreomorpha setifer* (Hamilton).
62. *Gerres oblongus* Cuvier.
63. *Gerres oyena* (Forskål).
64. *Pertica filamentosa* (Cuvier).

Family: LETHRINIDÆ

65. *Lethrinus frenatus* Valenciennes.
66. *Lethrinus rhodopterus* Bleeker.

Family: MULLIDÆ

- 67. *Mulloidichthys auriflamma* (Forskål).
- 68. *Parupeneus barberinus* (Lacépède).
- 69. *Parupeneus macronemus* (Lacépède).

Family: KYPHOSIDÆ

- 70. *Kyphosus bigibbus* Lacépède.

Family: PLATACIDÆ

- 71. *Platax teira* (Forskål).

Family: CHÆTODONTIDÆ

- 72. *Chætodon falcula* Bloch.
- 73. *Hemitaurichthys zoster* (Bennett).
- 74. *Heniochus monoceros* Cuvier.
- 75. *Linophora auriga* (Forskål).
- 76. *Megaprotodon strigangulus* (Gmelin).

Family: POMACENTRIDÆ

- 77. *Abudefduf biocellatus* (Quoy & Gaimard).
- 78. *Abudefduf lacrymatus* (Quoy & Gaimard).
- 79. *Abudefduf saxatilis vaigiensis* (Quoy & Gaimard).
- 80. *Abudefduf sordidus* (Forskål).
- 81. *Abudefduf uniozellatus* (Quoy & Gaimard).
- 82. *Abudefduf xanthozona* (Bleeker).
- 83. *Amphiprion bicinctus* Rüppell.
- 84. *Chromis caeruleus* (Cuvier).
- 85. *Chromis dimidiatus* (Klunzinger).
- 86. *Chromis ternatensis* (Bleeker).
- 87. *Dascyllus aruanus* (Linnaeus).
- 88. *Dascyllus marginatus* (Rüppell).
- 89. *Dascyllus trimaculatus* (Rüppell).
- 90. *Daya jerdoni* (Day).
- 91. *Pomacentrus cyanomos* Bleeker.
- 92. *Pomacentrus nigricans* (Lacépède).
- 93. *Pomacentrus tripunctatus* Cuvier.

Family: LABRIDÆ

- 94. *Anampses caeruleopunctatus* (Rüppell).
- 95. *Cheilinus trilobatus* Lacépède.
- 96. *Cheilinus undulatus* Rüppell.
- 97. *Cirrhilabrus temmincki* Bleeker.
- 98. *Coris formosa* (Bennett).
- 99. *Coris gaimard africana* Smith.
- 100. *Fissilabrus dimidiatus* (Valenciennes)

101. *Halichæres binotopsis* (Bleeker).
102. *Halichæres centriquadrus* (Lacépède).
103. *Halichæres scapularis* (Bennett).
104. *Macropharyngodon meleagris* (Valenciennes).
105. *Stethojulis albobittata* (Bonnaterre).
106. *Stethojulis axillaris* (Quoy & Gaimard).
107. *Stethojulis trilineata* (Bloch & Schneider).
108. *Thalassoma amblycephalus* (Bleeker).
109. *Thalassoma cupido-bipunctatum* Vasilii.
110. *Thalassoma hardwicki* (Bennett).
111. *Thalassoma purpurea* (Forskål).

Family: SCARIDÆ

112. *Calotomus spinidens* (Quoy & Gaimard).
113. *Leptoscarus vaigiensis* (Quoy & Gaimard).
114. *Scarus forsteri* Valenciennes.

Family: PARAPERCIDÆ

115. *Parapercis quadrispinosa* (Weber).

Family: BLENNIIDÆ

116. *Entomacrodus striatus* (Valenciennes).
117. *Entomacrodus vermiculatus* (Valenciennes).
118. *Salaria dussumieri* Valenciennes.
119. *Salaria edentulus* (Bloch & Schneider).

Family: SIGANIDÆ

120. *Siganus oramin* (Bloch & Schneider).

Family: ZANCLIDÆ

121. *Zanclus canescens* (Linnaeus).

Family: ACANTHURIDÆ

122. *Acanthurus leucosternon* Bennett.
123. *Acanthurus lineatus* (Linnaeus).
124. *Acanthurus lineolatus* (Valenciennes).
125. *Acanthurus matoides* Valenciennes.
126. *Acanthurus triostegus* (Linnaeus).
127. *Naso unicornis* (Forskål).
128. *Naso lituratus* (Schneider).

Family: THUNNIDÆ

129. *Auxis thazard* (Lacépède).
130. *Katsuwonus pelamis* (Linnaeus).
131. *Neothunnus macropterus* (Schlegel).

Family: SCOMBEROMORIDÆ

132. *Acanthocybium solandri* (Cuvier).

Family: ISTIOPHORIDÆ

133. *Istiophorus gladius* (Broussonet).

Family: ELEOTRIDÆ

134. *Eleotriodes sexguttatus* (Valenciennes).

Family: GOBIDÆ

135. *Bathygobius fuscus* (Rüppell).
136. *Gobiodon citrinus* (Rüppell).
137. *Gobiodon erythrospilus* Bleeker.
138. *Gobiodon quinquestrigatus* (Valenciennes).

Family: SCORPAENIDÆ

139. *Parascorpæna bleekeri* (Day).

Family: CARACANTHIDÆ

140. *Caracanthus zeylonicus* (Day).

Order PLEURONECTIFORMES

Family: BOTHIDÆ

141. *Bothus pantherinus* (Rüppell).
142. *Crossorhombus valde-rostratus* (Alcock).

Order TETRODONTIFORMES

Family: BALISTIDÆ

143. *Balistapus undulatus* (Mungo Park).
144. *Melichthys ringens* (Osbeck).
145. *Pseudobalistes flavimarginatus* (Rüppell).
146. *Rhinecanthus aculeatus* (Linnaeus).
147. *Rhinecanthus rectangulus* (Schneider).

Family: MONACANTHIDÆ

148. *Oxymonacanthus longirostris* (Bloch & Schneider).

Family: LAGOCEPHALIDÆ

149. *Amblyrhynchotes hypselogenion* (Bleeker).

Family: TETRAODONTIDÆ

150. *Arothron aerostaticus* (Jenyns).
151. *Arothron hispidus* (Lacépède).
152. *Arothron immaculatus* (Bloch).

Family: CANTHIGASTERIDÆ

153. *Canthigaster margaritatus* (Rüppell).154. *Canthigaster* sp.*Thalassosteus appendiculatus* (Klunzinger), Fig. 5 b & c.

This appears to be the first record of this belonid from Indian waters. The specimen collected from Minicoy and figured is 740 mm. Subsequently specimens of this have come to our notice from near Mandapam in the Gulf of Mannar and Ratnagiri.

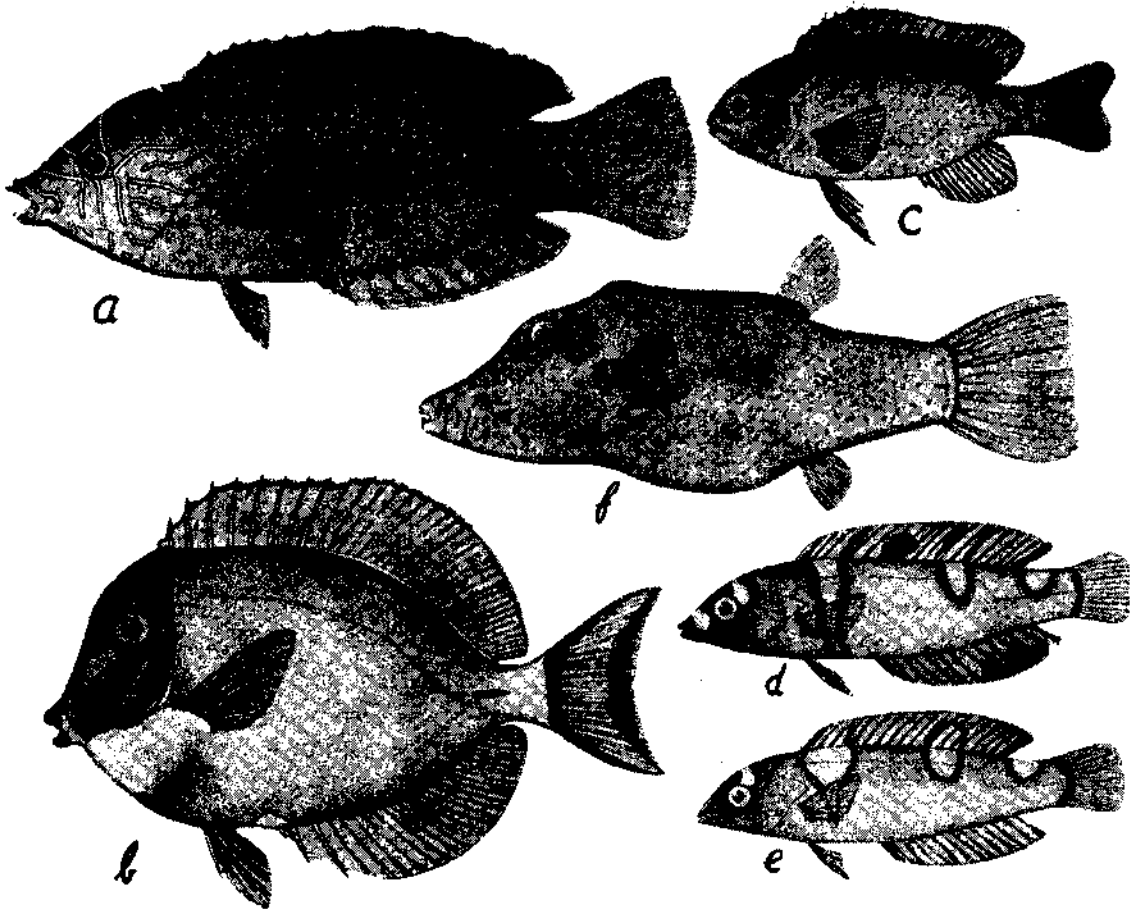


FIG. 6. (a) *Anampses caeruleopunctatus* Rüppell; (b) *Acanthurus leucosternus* Bennett; (c) *Abudefduf biocellatus* (Quoy and Gaimard); (d) *Coris formosa* (Bennett); (e) *Coris gaimard africana* Smith; (f) *Canthigaster* sp. (Fig. 6 c, d and e by Mr. K. G. Nambiar).

Panchax panchax (Hamilton)

This is found in fairly large numbers in the various tanks in the island and evidently has been introduced there as a mosquito larvicide from the mainland.

Megaprotodon strigangulus (Gmelin)

A specimen, 73 mm. in total length present in the collection, differs from the description of the species given by Weber and de Beaufort (1936) in the presence of a large semicircular black blotch with a white inner border at the posterior extremity of the soft dorsal and a small black blotch at the extremity of the anal. The unpigmented posterior edge of the caudal is broader.

Abudefduf biocellatus (Quoy & Gaimard), Fig. 6 c

Three specimens measuring 54 mm., 51 mm. and 49 mm. in total length were examined by us and the one figured is 54 mm. Only one blue line is seen in front of eye whereas Munro (1955) refers to two lines passing through eye. Only one ocellus is clear on the dorsal fin and this covers the base of the last seven soft rays and extends to the body as far as the lateral line.

Anampses caeruleopunctatus (Rüppell), Fig. 6 a

The specimen from Minicoy figured here is 182 mm. in total length and the pattern of lines on the head is different from those figured by Day (1878) and Smith (1949).

Coris formosa (Bennett), Fig. 6 d

This species is subject to various colour changes in the course of its development to the adult form. The specimen figured is 61 mm. in total length and resembles the 56 mm. specimen figured by Smith (1957).

Coris gaimard africana Smith, Fig. 6 e

There is one specimen measuring 57 mm. which is similar to the specimen of about the same size figured by Smith (1957) except for the presence of a median white blotch on the snout.

Acanthurus leucosternon (Bennett), Fig. 6 b

The only specimen in the collection, is 165 mm. in length which corresponds to the maximum size recorded so far. It differs somewhat in coloration from the description given by de Beaufort (1951). The dorsal, caudal and anal fins have narrow white margins and the bases of the soft dorsal and anal are chocolate-coloured. The white ring around sides and lower part of mouth are comparatively broader.

Oxymonacanthus longirostris (Bloch & Schneider)

Two juvenile specimens of this species measuring 37 mm. and 35 mm. are present in the collection and these differ from the one figured by Jordan and Seale (1906) in having only six rows of comparatively large spots on the body. There are three distinct lines on each side of the snout.

Canthigaster sp., Fig. 6 f

The description of a specimen measuring 86 mm., the specific identity of which could not be determined, is given below:

D. 10. A. 9. C. 10. P. 16.

Height of body $3\frac{1}{4}$ in total length. Head length less than height of body. Eye 3 in snout and about $1\frac{1}{4}$ in interorbital space. Depth at caudal peduncle about 2 in head length. Pectoral about $2\frac{1}{2}$ in head. The colour of the live specimen brown with bluish-black spots edged white on lower half of head and body as far as caudal peduncle. The spots on the head intermingled with white patches and those immediately behind and below the pectorals smaller while those in the caudal region larger and some linear. Four narrow streaks on the cheek with white border. Streaks across eye blue-black bordered with white. Faint reticulations on the back anterior to dorsal fin. Two dark bars below base of dorsal. A bluish band ventrally along the median line of abdomen. Dorsal, anal and caudal pale whitish.

Though it resembles *Canthigaster cinctus* (Richardson) (Jordan & Evermann, 1905) to some extent, it differs from it in shape in having a more prolonged snout which is concave but not steep, in the presence of streaks on the snout and in having spinules on the head and body except belly. The black spots are comparatively larger than in the above species.

GENERAL REMARKS

The fishing industry of Minicoy Island is a highly specialised one and depends almost entirely on a single species. As already stated, the success of the industry depends mainly on the availability of the oceanic skipjack in sufficiently large numbers in the fishing grounds adjacent to the island. Though regular statistics are not available, appreciable fluctuations could be noticed from the export figures. Investigations on the causes of fluctuations of this fishery are being initiated.

The skipjack fishery is carried out entirely with live bait-fish and a limiting factor that may have to be reckoned with in any attempt of the islanders towards the expansion of their fishing activities is the availability of sufficient quantities of bait-fish. In this connection in an earlier article by one of us (Jones, *op. cit.*) on the bait fishery of Minicoy the desirability of introducing *Tilapia* into the ponds and tanks in the island to be used as substitute for natural bait-fishes in the time of scarcity of the latter has been indicated. However, it remains to be seen how far this will satisfy the growing need in view of the small size of the island and limited extent of confined water areas in it. Perhaps the natural limitation in regard to

the bait-fish resources might tend to prevent indirectly, any outside enterprise encroaching into these waters.

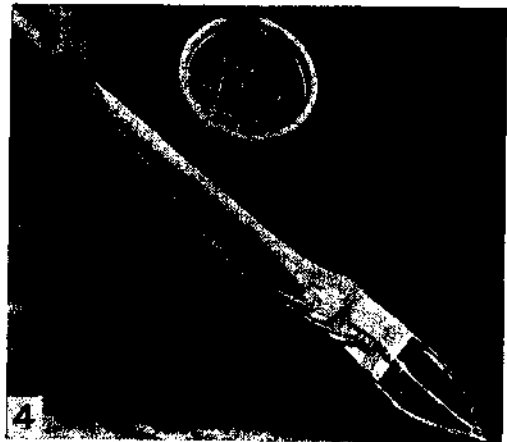
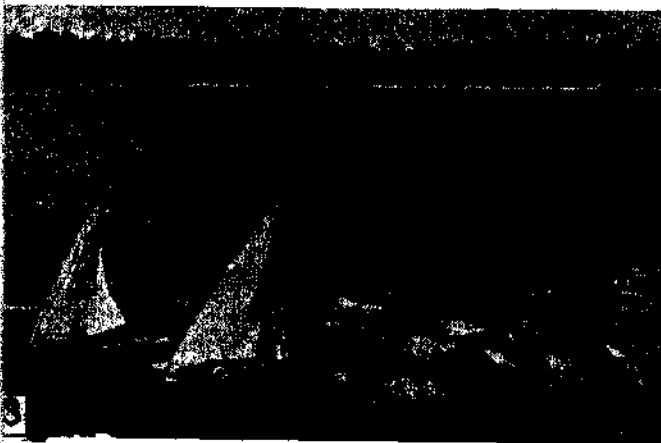
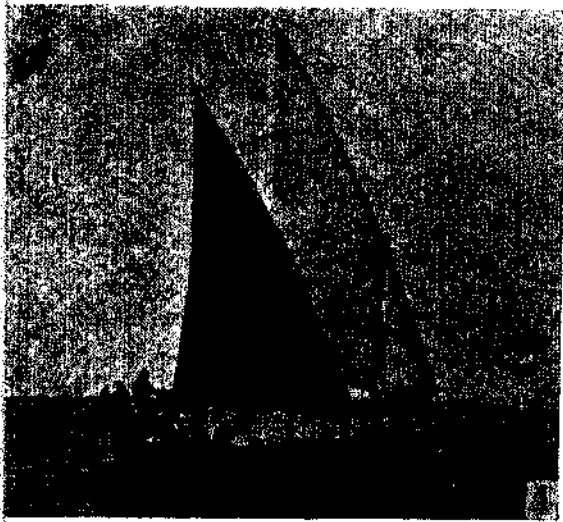
Tuna fishing operations as conducted at present in the limited area around the island are carried out in an efficient manner with the existing craft and tackle and very few suggestions could be made for improvement on this. It is reported that sometimes considerable scouting has to be done before sighting any shoal and therefore any system which would help in the location of shoals will be of great advantage. The possibility of extending the fishing operations to more distant fishing grounds could also be considered though there will be several practical difficulties with the existing craft and fishing methods. Provision of timber at subsidised rates for construction of fishing boats should give great incentive for the expansion of the fishing activities. There is considerable scope for drift-net and long-line fishing and supply of suitable material for the purpose will be encouraging. It is rather distracting to find fishermen who are excellent sailors uninterested in catching fishes other than tuna. Good quality fishes like *Scomberomorus*, *Acanthocybium*, Carangids, Serranids, etc., which are suitable for curing and which will fetch good price in the mainland are left unfished. Supply of adequate salt at concessional rates and local arrangements for the purchase of cured products should act as incentive in this direction.

To what extent the quality of the cured product could be improved remains to be studied. The traditional market standards and consumer preferences have to be objectively borne in mind while undertaking any work in this direction. *Mas min* of Minicoy is considered to be of good quality and demand for it is great. But there is considerable difference between what the fishermen gets and what the agent realises on the *Mas min* when exported to the consuming countries. The present system of disposal could perhaps be modified with advantage to minimize the gap. There is a sort of co-operative marketing by some wards or *athiri* but here again they are completely dependent on the agents on the mainland to whom the product is ultimately disposed off.

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FIGS. 1-4

- FIG. 1. A tuna boat returning after fishing. The island is seen in the distant background.
FIG. 2. Boiled tuna fillets kept in the open for sundrying after smoking.
FIG. 3. Boys swimming in the lagoon, supporting themselves on boat-shaped pieces of wood and miniature canoes rigged with tiny sails.
FIG. 4. *Eng-very* for throwing bait fishes (above) and *fen-sona-fori*, the water splasher (below).

GLOSSARY OF MAHL WORDS

Local names	Meaning	Explanation
<i>Athiri</i>	= village	A small ward or village
<i>Avu naru</i>	<i>Avu</i> = new, <i>naru</i> = cord	Piece of steel wire or nylon attached to fishing hooks
<i>Bala-jaha</i>	<i>Bala</i> = net, <i>jaha</i> = to haul	A type of shore-seine operation
<i>Beuli</i>	= hook	Barbed or unbarbed hook used for fishing
<i>Bury</i>	= lead weight	Elongated lead weights of <i>ella-dou</i> and lead weights of <i>uai-dou</i>
<i>Dagandu-gou</i> or <i>pana</i>	<i>Dagandu</i> = iron, <i>gou</i> = stone	Anchor made of coral
<i>Deburi</i>	..	Rope which connects two pieces of <i>uai-dou</i>
<i>Dhandi</i>	= rod	The bamboo pole of the <i>dhorl</i> and handle of the harpoon
<i>Dhorl</i>	= fishing pole and line	Fishing pole complete with hook and line
<i>Diya-hikka-fe</i>	<i>Diya</i> = water, <i>hikka</i> = throw out, <i>fe</i> = vessel	Copper or aluminium baler used in boats
<i>Dou</i>	= net	Fishing net
<i>Dumari</i>	= grating	Iron grate used for smoking tuna pieces
<i>Ella-dou</i> or <i>la-dou</i>	<i>Ella</i> = cast or throw, <i>dou</i> = net	Cast-net without draw strings.
<i>Eng-very</i> or <i>Em-very</i>	<i>Eng</i> or <i>Em</i> = bait, <i>very</i> = basket or bag	Small live-bait baler.
<i>Eng-vy</i> or <i>Em-vy</i>	<i>Eng</i> or <i>Em</i> = bait, <i>vy</i> = section	Live-bait tank of the fishing boat
<i>Enghili-kavaru</i>	<i>Enghili</i> = one pronged, derived from <i>ekke</i> = one, <i>hili</i> = prong, <i>kavaru</i> = harpoon	One-pronged harpoon used for fishing

Glossary of Mahl Words—Contd.

Local names	Meaning	Explanation
<i>Etti</i>	..	The head rope and foot rope of <i>uai-dou</i>
<i>Fasili-kavaru</i>	<i>Fasili</i> = five pronged, derived from <i>faye</i> = five, <i>hili</i> = prong	Five-pronged harpoon used for fishing
<i>Fen-fona-fori</i>	<i>Fen</i> = water, <i>fona-fori</i> = coconut spathe	Water-splasher used for splashing water over the hooks
<i>Fouli</i>	= wooden float	Small wooden floats attached to the <i>uai-dou</i>
<i>Fulluga</i>	..	Apical ring-like knot of the <i>ella-dou</i> or cast-net
<i>Fung-dou</i>	<i>Fung</i> = Coconut palm, <i>dou</i> = net	Coconut leaves attached to a stout rope used in shore-seine operation
<i>Fy-labari</i>	<i>Fy</i> = tin, <i>labari</i> = live-bait basket	Store basket for live-bait made of tin and wood
<i>Hikki mas</i>	<i>Hikki</i> = dry, <i>mas</i> = fish	Cured and dried meat of tuna
<i>Inguri</i>	= holes	Holes made in the live-bait tanks (<i>eng-vy</i>) of the boat
<i>Kanthu-fathi</i>	<i>Kanthu</i> = wood, <i>fathi</i> = bundle	Wooden raft
<i>Kavaru</i>	= harpoon	A simple device for catching fish
<i>Kelu</i>	= Captain or headman	Leader of tuna fishing boat
<i>Kombu</i>	= mast	Mast of the fishing boat
<i>Kumbukaphi</i>	..	Vertical wooden post fixed on the platform (<i>peelaga</i>) of the tuna fishing boat
<i>Kundi-mas</i>	<i>Kundi</i> = piece	Cured and dried pieces of tuna
<i>Kurevi</i>	..	Marginal cord of the cast-net
<i>Labari</i>	= live-bait basket	Store basket for live-bait made of cane
<i>Logung</i>	= pot or vessel	Vessel for boiling tuna fillets
<i>Mahl</i>	..	The language of Maldives and Minicoy

Glossary of Mahl Words—Contd.

Local names	Meaning	Explanation
<i>Mas</i> or <i>Mas min</i>	= fish or tuna fish	Cured and dried meat of tuna. This is known as <i>hikki-mas</i> also
<i>Mas dhoni</i> or <i>mas odi</i>	<i>Mas</i> = fish, <i>Dhoni</i> or <i>odi</i> = fishing boat	Tuna fishing boat
<i>Miyawali</i>	..	Piece of steel wire or nylon attached to fishing hooks
<i>Nanu</i>	= Cord	The long line of the harpoon and the fishing hooks
<i>Nilamahi-dou</i>	<i>Nilamahi</i> = common bait-fish	Bait-fishing net
<i>Peelaga</i>	= platform	Raised platform of tuna fishing boat
<i>Phali</i>	..	Oars used in boats
<i>Phalidu</i>	..	Wooden blade of the oar
<i>Riha-akru</i>	<i>Riha</i> = curry, <i>akru</i> = jaggery	Mixture of small pieces of tuna and other sediments left in the vessel after boiling tuna fillets
<i>Romu-dou</i>	<i>Ronu</i> = coir rope, <i>dou</i> = net	Net made of coir rope attached behind the <i>uai-dou</i> in <i>Bala- jaha</i>
<i>Seek</i>	..	Pointed iron rod used for spear- ing lobsters
<i>Thakari</i>	= wooden trough	Wooden trough for carrying fresh or cured tuna
<i>Thandu</i>	= pole or rod	Wooden handle of the oar
<i>Thinghili-kavaru</i>	Thing derived from <i>theene</i> = three, <i>hili</i> = prong	Three pronged harpoon
<i>Uai-dou</i>	<i>Uai</i> = cotton thread	A simple type of shore-seine
<i>Unkanu</i>	= rudder	Rudder of the fishing boat
<i>Unkanudhuni</i>	<i>Unkanu</i> = rudder, <i>dhuni</i> = steer	A handle attached to the rudder of the boat
<i>Vadu-nanu</i>	..	Single hook and long line for fishing