

THE FISHING METHODS OF THE MADRAS PRESIDENCY

PART II THE MALABAR COAST

BY

JAMES HORNELL, F.L.S., F.R.A.I.

Formerly Director of Fisheries, Madras

*Report No. 1 of 1937,
Madras Fisheries Bulletin, Vol. No. 27*

MADRAS

PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

1938

THE FISHING METHODS OF THE MADRAS PRESIDENCY

BY

JAMES HORNELL, F.L.S., F.R.A.I.
Formerly Director of Fisheries, Madras

PART II.—THE MALABAR COAST.

For the purpose of this paper I shall consider the Malabar Coast to extend from Cape Comorin in the south to Kundapur in the north, that is, from the southernmost point in Travancore to the boundary of South Kanara with the Bombay Presidency, a distance of rather more than four hundred miles.

Three sections with distinctive types of fishing craft and fishing methods are to be distinguished on this extensive stretch of coast-line—a southern, a median and a northern.

The southern section may conveniently be called the Catamaran Coast, for here the people are Tamil-speaking and kindred to those fishing communities who inhabit the western coast of the Gulf of Mannar. They use boat catamarans of nearly the same type and their fishing methods are closely related.

The median section, the Malabar coast in the restricted sense, being the coastal region dominated by Malayalam-speaking people, extends from a point some distance south of Quilon in Travancore to one north of Cannanore. The fisherfolk characteristically use dugout canoes and employ totally different methods of fishing from those practised by the Tamil-speaking people of the Coromandel Coast.

The third and most northerly section is coincident with the entire coast-line of the South Kanara district, inhabited by a population speaking Kanarese and Tulu. Dugout canoes continue in evidence for inshore and backwater fishing; for offshore fishing these are replaced by plank-built boats of larger carrying capacity but many are, however, seasonal visitors from the Konkan Coast. Outrigger canoes are also in evidence but are of comparatively recent introduction from Ratnagiri and Raipur in the Bombay Presidency. The native fishermen are generally less enterprising than their Malayali brethren;

they work generally close inshore, the deep-sea fishery being prosecuted by Konkanese from the north who operate sailing machwas—Mangalore is the principal headquarters of these northerners, favoured because of the good shelter to be had in its spacious harbour and of the location there of several important fish-curing firms.

A.—THE SOUTHERN SECTION.

This locality is relatively unimportant when compared with the central and northern sections. Its extent is short, its fisherfolk poor and unprogressive. Although living on the West Coast they belong ethnically and linguistically to the Tamil folk of the Tinnevely district. In the main their fishing methods are similar, so it is necessary to treat only of the one where divergence is shown. This is the primitive trawl described below.

KURUKKU MADI.—By this name is known the principal fishing net used by these people. It is an improved variety of the Tamil *Madi valai* and is a bag-net trawl operated by two catamarans which tow it between them while sailing, after the style of the Italian trawling *paranza* boats working in pairs. An ingenious addition has been made to the Tinnevely form of this net which adds considerably to its effectiveness. This consists of a sleeve or funnel-shaped length of netting inserted within the mouth of the net, thereby forming a trapped entrance. Fishes which enter the mouth of the net, which is also the mouth of the sleeve-trap, pass without check into the main body of the net but return and escape are rendered all but impossible owing to the form of the trapped entrance. (See Text-fig. 1.) To keep the sleeve from collapsing, four cords attached to the margin of the narrowed inner end extend to the posterior and upper part of the *madi* bag at its junction with the fore margin of the cod end, which is made as usual of stouter twine of very small mesh.

The use of this device makes the net a great improvement upon the ordinary type. The bag part of the net without it is so short that at the slow speed at which it is towed, active fishes after passing into the net have ample opportunity to escape through the wide untrapped mouth if instinct should lead them to swim in that direction. The trapping of the mouth prevents this. The device is said to have been introduced soon after the beginning of this century from a Singapore source. Two coir wings are attached to the mouth, one on each side. They are of the usual very large mesh, furnished

with wooden floats along the headline, and with stone sinkers suspended from the footrope. This net is used for the capture of small shoaling fishes and in particular for *nethali* (*Engraulis*) and sardines.

The catamarans employed are frequently made of four logs, secured at each end by a horned crossbar or stretcher, to which the extremities are securely lashed; three-log examples are also used, a number never deviated from in the catamarans in use on the Tinnevely Coast. (See Pl. I.)

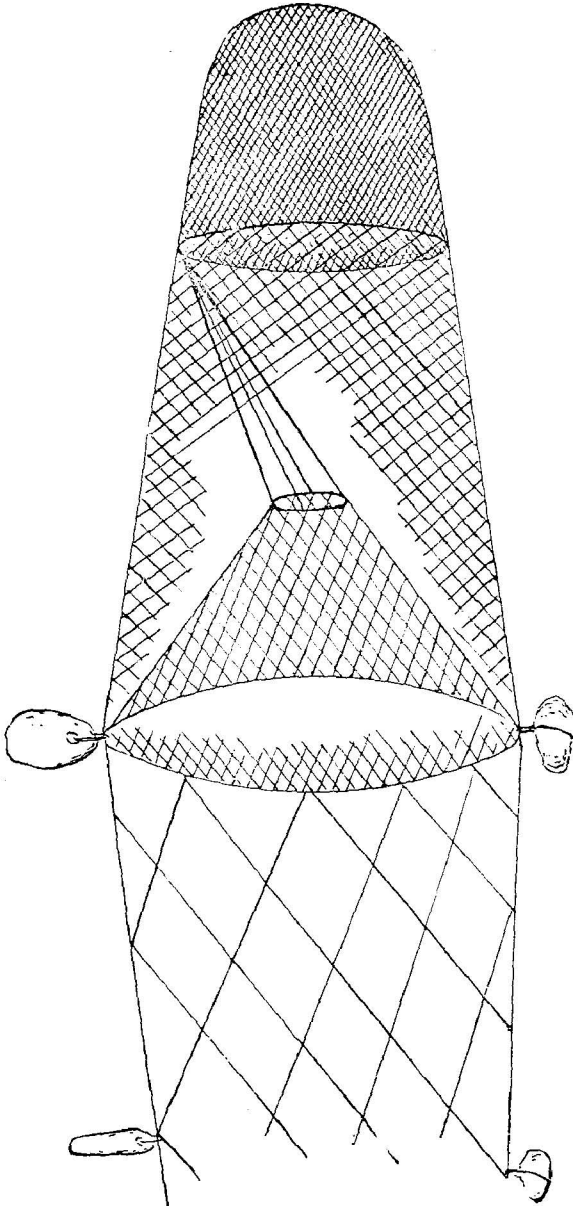


FIG. 1. DIAGRAM OF A KURUKKU MADI, SOUTH TRAVANCORE. ONE ONLY OF THE TWO WINGS IS SHOWN (IN PART).

B. AND C. MEDIAN AND NORTHERN SECTIONS.

These sections may conveniently be taken together as the methods used in many instances in both regions are similar or differ but slightly. When a method is not mentioned specifically as being employed in South Kanara, it is to be understood, however, that the description and the designation apply exclusively to Malabar, using the term as covering the region inhabited by Malayalam-speaking people.

A.—BACKWATER AND ESTUARINE FISHING.

The art and practice of fishing arose in the first instance through the adaptation by primitive man of the weapons of the chase to the catching of fishes in inland waters—backwaters, rivers and lakes. The earliest men to catch fish were still in the hunting phase of developing culture. Apart from the use of their bare hands, it is reasonably certain that the earliest implements employed were, first, the spear and perhaps the harpoon, followed at a considerably later date by the blow-gun and by bows and arrows in localities like Malabar where these inventions were developed for the shooting of the birds and jungle animals upon which the people of this district depended for their main supply of food. Some of the traps and drives used for capturing the creatures of the forest were also adopted whenever possible to the catching of fish ; several of these are exceedingly ingenious and effective.

1. FISH SPEARS.—The ordinary type of hunting spear armed with a single or lance point is not used in Malabar at the present day for spearing fish. For this purpose its place is taken by the compound spear or 'grains', having several prongs or branches, each barbed on one side only. The two principal varieties are the *mupalli* and the *ampalli*, armed respectively with three and with five prongs fitted at the end of a light pole. These are rapidly falling into disuse and are now of negligible account ; like the hunting bow next to be mentioned, they have long been replaced by more effective devices.

2. HARPOONS.—The form of harpoon which is extensively used at sea for the capture of sharks, rays and other large fishes is also employed occasionally in the seaward parts of backwaters. Known in Malabar and Cochin as *chattuli*, its description will be given in the Sea-fisheries Section, as it is essentially a marine fishing implement.

3. THE HUNTING BOW (*Thettal*).—The use of the ordinary stringed bow has all but disappeared alike in hunting and in fishing. The fishing-bow (*Thettal*) did, however, exist a few years ago for I have seen specimens, similar to that shown in figure 2, which came from Malabar. As will be seen from the figure, it is a modification of the pellet-bow ; it has twin bowstrings, with a pad at mid-length to take the projectile. This, normally, is a rounded pebble or a dried ball of clay but in the case of the fishing bow, a barbed harpoon arrow is substituted. A long and thin cord tied at one end to the bow close to one extremity, is attached at the other end to the butt of the arrow in order to form a retrieving line. The arrow head is of iron, barbed on one side only.

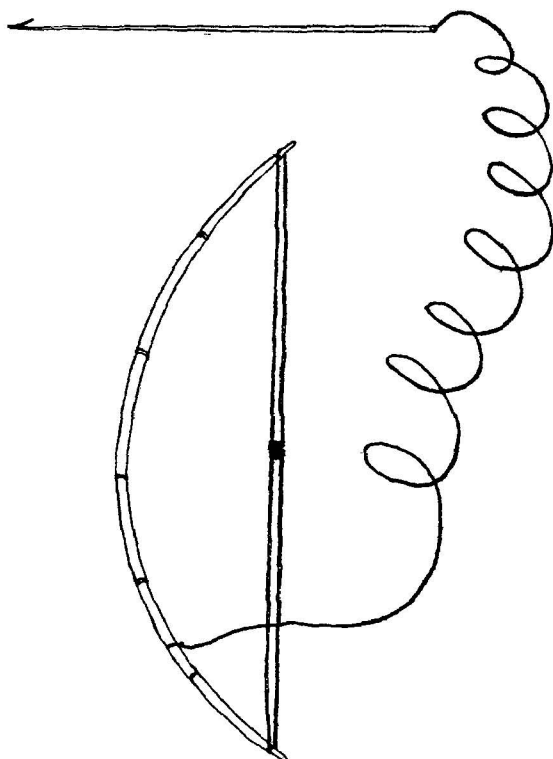


FIG. 2. A PELLET-BOW (*THETTAL*) ADAPTED FOR SHOOTING FISH WITH A BARBED ARROW, MALABAR.

It is probable that this form of pellet-bow was in general use in Malabar for shooting fish prior to the comparatively recent adaptation for this purpose of the more powerful crossbow type next to be described.

4. THE CROSSBOW (*Parangi pathi*)—Figs. 3 to 6, and Plate II.—In South Malabar, Cochin and Travancore an all-wood crossbow is in extensive use. It is employed almost exclusively to shoot fish in the streams and quiet backwaters which occupy extensive areas in the coastal region. Reference to the accompanying photograph and figures made during a tour in 1923 will facilitate description.

As will be seen, the bow is compound, made up of several thin wooden leaves, varying in number from two to four, arranged in the same way as the leaves in a carriage spring (Text-fig. 3). In some instances these are beautifully fashioned and fit together accurately; in others they are coarsely made and rudely put together. At intervals the component leaves are secured in position by encircling bands of coir yarn (sennit).

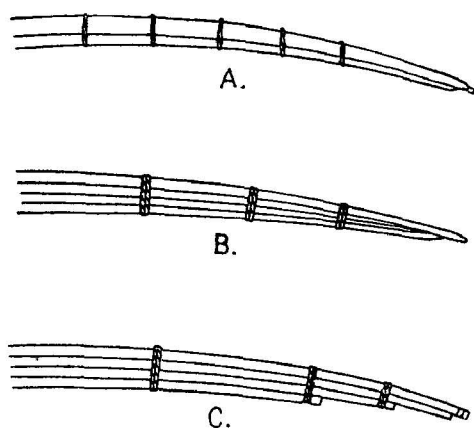


FIG. 3. OUTER ENDS OF THREE VARIETIES OF THE COMPOUND BOW OF THE MALAYALI CROSSBOW. IN A TWO LEAVES ARE EMPLOYED; IN B AND C FOUR. IN B THE TWO MIDDLE LEAVES ARE TAPERED AND SHORTER THAN THE OUTER ONES.

The stock also varies considerably in detail; in the better made the butt is obviously a more or less close imitation of that of a musket or rifle. The distal portion, some few inches from the end, is perforated by a rectangular hole running from side to side; through this the bow part is passed halfway and then locked in place by means of thin wood wedges. A shallow groove runs lengthwise along the upper side of the stock forward of the butt region; in this the arrow lies prior to discharge. The bowstring is a coarse cord of coconut fibre (Pl. II, and Text-fig. 5).

The release is notable. As seen in the figures the details are identical with those of the typical medieval crossbow, as used in the sixteenth century in Europe. (See Text-figure 4.)

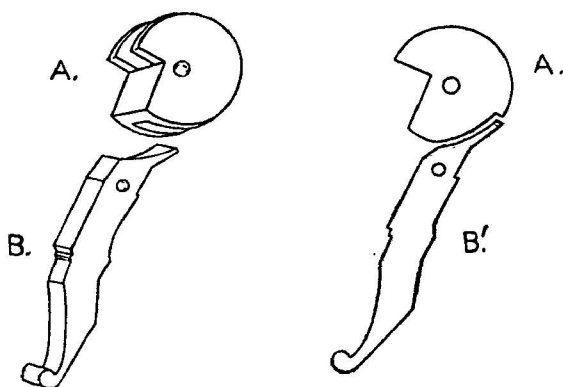


FIG. 4. DETAILS OF THE TRIGGER (B AND B¹) AND WHEEL-NUT (A AND A¹) OF A MALAYALI CROSSBOW. A AND B ARE SEEN IN PERSPECTIVE; A¹ AND B¹ IN SECTION.

The arrows used vary considerably but are generally of harpoon design. The most common is that where a barbed steel head is socketed at the base to fit the pointed end of a light wooden shaft. One end of a length of line is tied to the steel head while the other passes through a hole in the wooden shaft and thence to an open-ended cylindrical receptacle made from a bamboo joint, fitted upon one side of the bow close to the stock (figure 5^B). In this receptacle the slack of the harpoon line is neatly coiled, ready to run out when the arrow is shot. Other forms are shown in figure 6; these come from North Travancore.

The dimensions of a typical Malayali crossbow are as follow:—

Length of stock overall	88'0	centimetres.
„ from distal end to trigger ...	62'4	„
Thickness of stock at mid-length ...	2'8	„
Length of bow when unstrung	143'0	„
Length of arrow	76'3	„

The Malayali users of the crossbow are often extremely expert and withal patient. They will wait for hours to get a shot at a fish ; they seldom miss, and, when they hit, the arrow not infrequently transfixes the body of the fish, so powerful is the force of discharge.

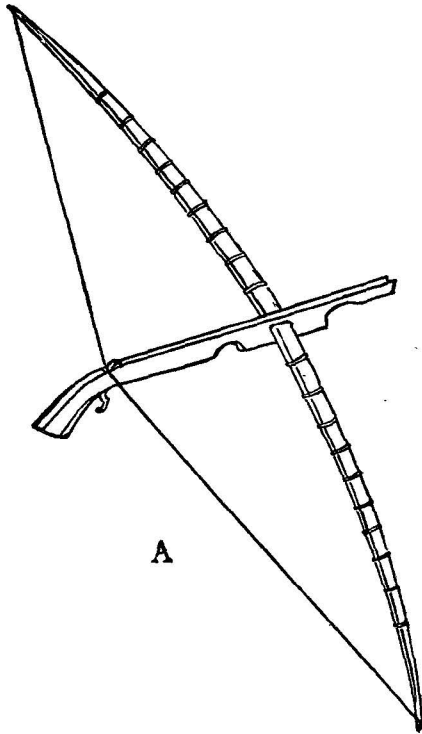


FIG. 5A. A CROSSBOW FROM ARATHINKAL, TRAVANCORE. FOR THE SAKE OF CLEARNESS THE ARROW GROOVE AND LINE-HOLDER ARE OMITTED.

There can be no doubt that the Malabar crossbow is not indigenous. Two considerations suffice to prove this ; the first is the deduction to be drawn from the vernacular name and the second is the character of the release. The name is *parangi pathi* ; as is well known *parangi* is the Dravidian corruption of *feringhi*, itself a corruption of

“ Frank ” ; in later times it came to connote all *western* Europeans. In South India the Portuguese being the earliest Europeans with whom in modern times the inhabitants came into intimate contact, the term *parangi* has come to be accepted as the virtual equivalent of “ Portuguese ”, hence the local term definitely associates the Portuguese with this weapon ; the inference is clear that its general form was borrowed from this source.

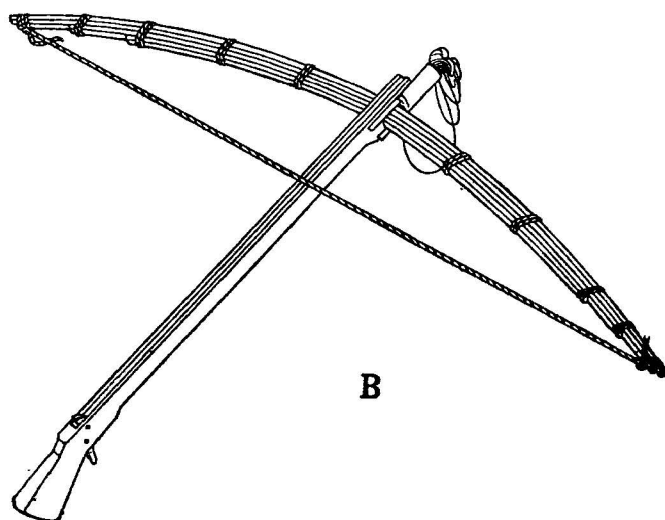


FIG. 5B. A MALAYALI CROSSBOW FROM VALAPAD, SOUTH MALABAR ; THE BOW IS COARSELY MADE AND THE STOCK LONGER THAN IN THE OTHER (5A).

The identity of the release with a common European type has already been stated, so we arrive at the definite conclusion that the South Indian crossbow, in common with that of West Africa, is undoubtedly of European origin ; consideration of all the circumstances points definitely to the conclusion that the model

imitated was a Portuguese one, such as was in use by Portuguese soldiers during the earlier years of the Portuguese domination of the coastal lands of South India.

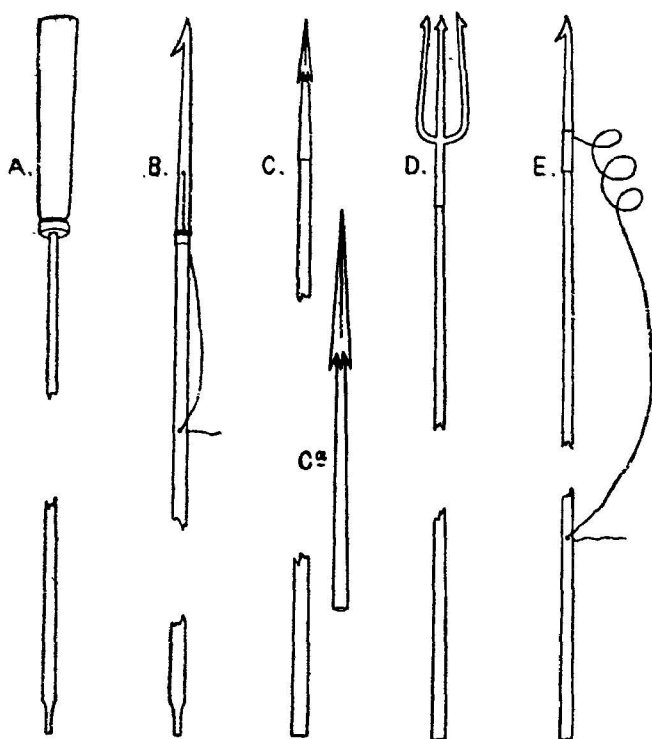
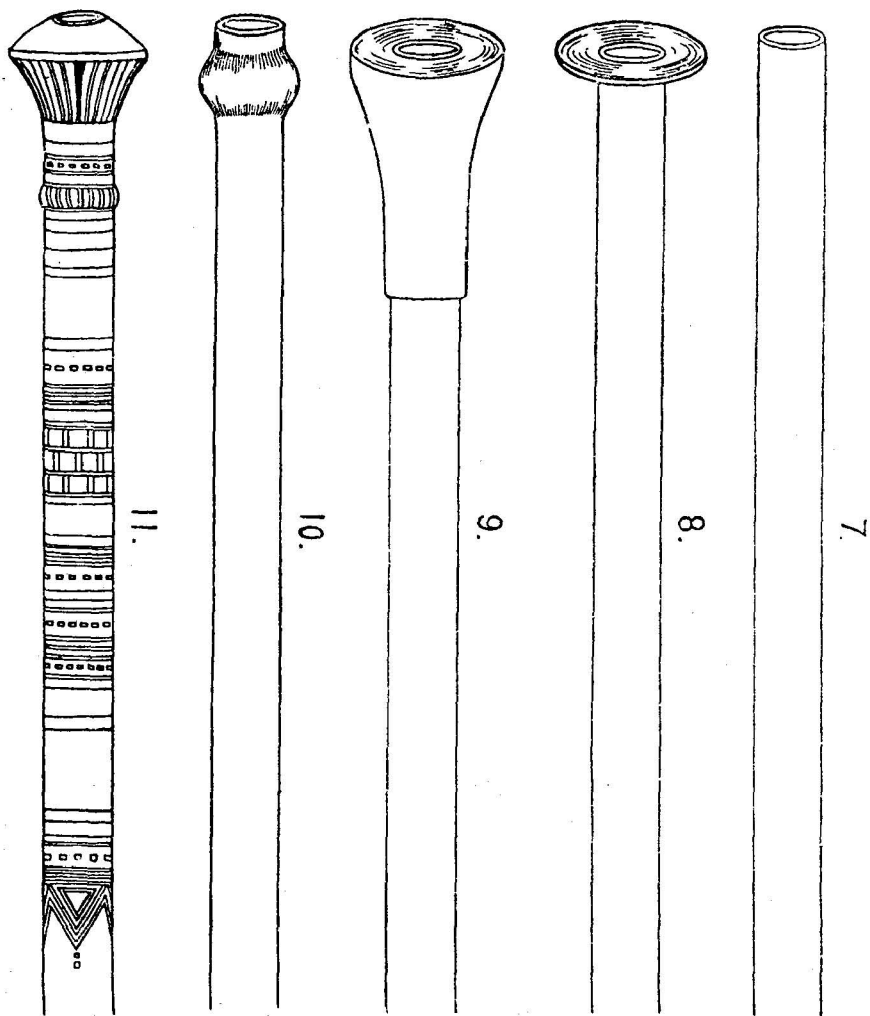


FIG. 6. VARIETIES OF CROSSBOW ARROWS USED IN SOUTH INDIA. A IS A BIRD BOLT, B AND E THE FORMS OF FISH ARROW IN GENERAL USE, C AND D BEING RARER VARIETIES OF THE SAME.

5. THE BLOW-GUN (*Thumbithan*)—Figures 7—15.—In the localities where the crossbow is employed for shooting fishes, the still more primitive blow-gun is also employed for a like purpose, albeit its use is rapidly dying out. The form used in the Malayali country is subject to a wide range of variation in its details, both with regard to the material of construction and to the form of the mouthpiece. This fact connotes usage over a very lengthy period and a high antiquity for its invention or introduction. It is used exclusively for shooting fish.

In its simplest form (figure 7) as employed by the poorest classes of users, the Malayali blow-gun or *thumbithan*, is made from a reed (*Ochlandra* sp.) obtained from the neighbouring forest. If

one perfectly straight be found of suitable length, it is taken home and dried thoroughly by filling it with dry river sand. If none quite straight is to be had, the best is selected and straightened by either of two processes. The first is with the aid of fire. In this case the crooked section is soaked with oil and then straightened over a fire by bending. This done the tube is, as usual, filled with dry sand to extract the moisture remaining and dry it in proper shape.



FIGS. 7 TO 11. VARIETIES OF THE MOUTH-PIECE OF THE MALAYALI BLOW-GUN. FIGURE 7 IS A PLAIN REED TUBE WITHOUT ANY ADDED PARTS. IN FIGURE 8 THE MOUTH-PIECE IS A DISC OF COCONUT SHELL ; IN FIGURE 9 IT IS TURNED OUT OF WOOD ; IN FIGURES 10 AND 11 IT IS BUILT UP OF SEVERAL LAYERS OF GUMMED CLOTH PAINTED OVER. THE BUTT END OF FIGURE 11 IS ORNAMENTED WITH BANDS OF YELLOW AND RED ON BLACK. THE BARRELS OF ALL ARE MADE FROM THE STEMS OF THE *ita* REED.

If, however, the whole length of reed is slightly curved and not merely bent at one or may be two definite points, then the straightening is done by splitting the reed lengthwise very carefully into two equal longitudinal halves, reversing these end for end and reuniting them by the edges with mucilage obtained from the glue-tree (*Diospyros embryopteris*). When this method is adopted it becomes necessary to wind a spiral bandage soaked in the same kind of gum around the whole length of the tube in order to keep the two gummed edges in contact while drying and to prevent the tube from cracking subsequently.

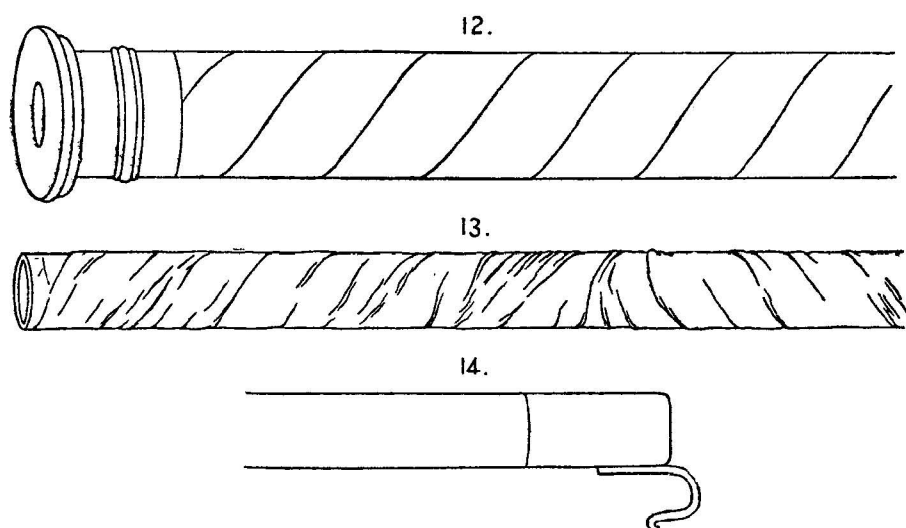
This bandage is also commonly adopted in certain districts (e.g., Palghat) even when the reed has not been split and reunited. In others the tube is used in its naked condition. Nowadays the bandaging is done usually with narrow strips of mull cloth (muslin) by people called Kuruppanns, who are the lacquer workers of the district.

In Palghat taluk it is the general custom to add a built-up ridge or ring round the tube, composed of numerous layers of gum-soaked cloth strips, a short distance beyond the mouth of the tube, to form a mouthpiece. When dry, an initial coat of paint is given over the bandaging and later, a coat of black is applied over the whole length. Finally about ten inches of the butt is ornamented with a pattern of fine lines of red and yellow lacquer or paint according to the fancy and skill of the workman. Figure 11 represents a typical example.

In the extreme south of Malabar a trumpet-shaped mouthpiece turned out of a block of wood is slipped over the oral end of the tube. If the tube be lacquered the mouthpiece is similarly treated. In certain villages in Calicut taluk (Olavanna and Peruvanna) blowguns are fitted with a disc of coconut shell as mouthpiece.

In many instances the better made tubes have a metal hook (Figure 14) tied on by wire or twine to the muzzle end to serve as a-retrieving hook wherewith to pick up the harpoon line from the

water when the dart has missed its mark. Or the hook may be soldered to a band of thin metal fitted around the muzzle.



FIGS. 12 TO 14. FIGURE 12 IS A VERY MASSIVE BLOW-GUN IN THE TRICHUR MUSEUM, COCHIN. THE BUTT END IS ENCASED IN A TURNED BRASS MOUTHPIECE CAP. THE BARREL IS SPIRALLY WOUND WITH STRIPS OF FIBRE, PAINTED BLACK. FIGURE 13 IS THE END OF AN OLD BLOW-GUN FROM VALAPAD, SOUTH MALABAR, MADE OF WOOD AND SPIRALLY WOUND WITH ANIMAL MEMBRANE. FIGURE 14 IS THE RETRIEVING HOOK ON THE MUZZLE OF THE TRICHUR BLOW-GUN.

Side by side with guns made from reeds are others shaped out of timber by the local carpenters. This variety is fashioned on the same principle as those reed guns made by splitting and reuniting two longitudinal halves of a reed stem. Two battens of wood of the requisite length are taken. Each is grooved on one side in semicircular manner, great care being taken to keep the gauge uniform; the other side is suitably rounded. Finally, the two half tubes are glued together by their edges to form a cylinder. To keep them in juxtaposition the whole length of the tube is bound

spirally with a wrapping that may consist of cloth, bark or animal membrane. A mouthpiece of any form may be added at the fancy of the owner. Nearly all are painted black but they may or may not have red and yellow lines of lacquering on the butt.

An example of average length is about $5\frac{1}{2}$ feet long but the range is between $4\frac{1}{2}$ and $6\frac{1}{2}$ feet. Diameter of the bore 16 mm. ; of the gun itself from 42 mm. at the butt, tapering to 24 mm. at the muzzle in the case of wooden guns. Reed guns are about 20 mm. in diameter with a bore of about 10 mm. Most of the wooden barrels are made of a hard, dark-coloured wood, probably 'Rosewood' (*Dalbergia latifolia*); in the Calicut neighbourhood, I was told that there they are made from the wood of the Areca palm.

The dart used is of the harpoon variety. It consists of a wooden shaft, 160 to 170 mm. long, a steel or iron single-barbed head about 50 mm. in length, a long, carefully twisted cord connecting the two, and a wad of threads, cloth or pith at the butt end of the shaft (Fig. 15).

The Malayalam terms for its several parts are as follow :—

Pongu, *ponthu* and *ulithandu*, the shaft of the dart, which also serves as a float ; *Uli*, both the dart as a whole and also the barbed steel head ; *Kotuppu* and *Poduppu*, the wad at the butt end of the *pongu*.

The shaft of the dart is made of different materials in different localities. In Palghat the side twigs of the spiny bamboo are used ; in parts of Travancore, the wood of the areca palm and in South Malabar, the stem of lemon grass. Whatever be used must be light or else, as in North Travancore, it must have a pith wad added in order to float in water and so indicate either the course of the wounded fish or the position of the barbed head if the dart has missed its mark. The wad on the butt of the shaft in Palghat taluk is formed of a mop of short cotton threads, mixed with some thicker woolen ones. This wad is attached to the shaft in two different ways ; either the threads are tied across their mid-length within a shallow groove encircling the end of the shaft and with the lower half reflected upwards to form a mop, or else a conical pit is excavated in the end of the butt, and a hole bored obliquely from the bottom of this

pit to a point on the outside of the shaft $\frac{3}{4}$ inch from the butt end (Fig. 15). The proximal end of the harpoon cord is passed through the

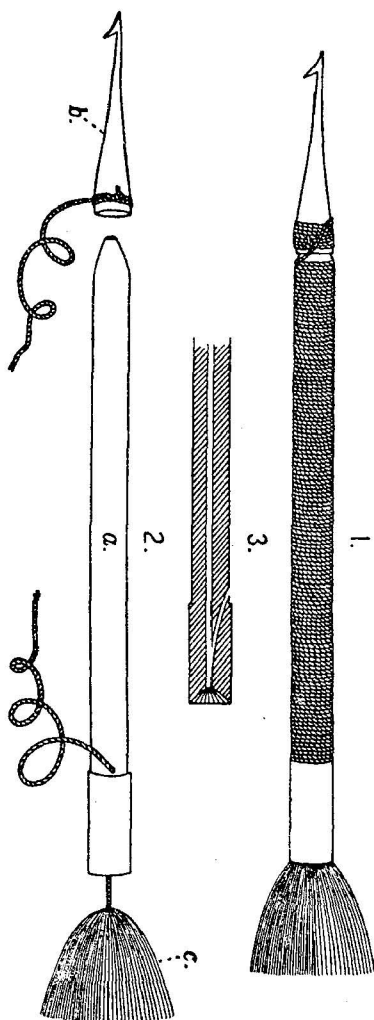


FIG. 15. THE MALAYALI BLOW-GUN HARPOON DART. 1, SHOWS IT READY FOR USE, WITH THE LINE NEATLY WRAPPED AROUND THE SHAFT; FIGURES 2 AND 3 GIVE DETAILS—(b) THE BARBED STEEL HEAD; (c) THE MOP-LIKE WAD, ITS BASE NOT YET PULLED DOWN INTO THE CAVITY WITHIN THE HEAD OF THE SHAFT. FIGURE 3 SHOWS THE HEAD IN LONGITUDINAL SECTION WITH THE OBLIQUE PERFORATION THROUGH WHICH THE CORD IS PASSED.

centre of a mop of threads, a knot being made on the end to prevent it from pulling through. By pulling on the cord the base of the mop of threads is drawn within the conical basal pit and secured there by a hitch made after passing the cord twice round the shaft. In Ponnani and to the south (Chetway, Valapad, etc.) the wad is often of several disc-shaped layers of cotton cloth nailed through the centre into the head of the shaft.

In certain parts of North Travancore a tapering or conical plug of the pith of *thirupulu* takes the place of a thread or cloth wad. This plug is from 1 to 1½ inch long with the narrow end truncate, into which the sharpened butt of the wooden shaft is driven.

The form of the barbed head never varies. It consists of a slender, cylindrical shaft expanded at the base to permit of a conical hollow being worked in the end, and of a single-winged barb at one side of an attenuate and very sharp point (Figure 15*b*). The forward margin of the barb is ground to razor-blade keenness. The distal end of the shaft is made conical and fits into the hollow at the base of the iron head sufficiently loosely to become detached when anything be struck. The harpoon cord connecting the two is very carefully laid and is tanned periodically to preserve it. When the dart is inserted into the tube this line is wound tightly and evenly around the wooden shaft, leaving no slack (Figure 15-1).

Sighting is done with the right eye, and then, moving the head while keeping the arms steady, the mouth is brought up to the mouthpiece and the dart expelled by a strong, sharp puff. Boys practise aiming at a plantain stem as this target is soft enough not to damage the point of the dart.

Local range.—The use of the Malayali blow-gun has a geographical range coinciding approximately with that of the Malayalam language except that it does not appear at the present time to extend north of the Calicut taluk, while conversely, it extends some distance eastwards into Coimbatore through the Palghat gap—the highway of communication between the Tamil and Malayalam speaking folk. Trivandrum and Vaikom mark approximately its southern limit, Calicut taluk its northern.

In no locality is this form of blow-gun used except for shooting fish. Its use is not restricted to any caste or section of the population. Generally Mappillas take the greater interest in this form of sport than do the Hindus. It is used neither on the coast nor in the seaward parts of the backwaters ; chiefly along the banks of streams and pools.

The murrels (*Ophiocephalidae*) are said to be the commonest of the fishes shot as they have the habit of coming frequently to the surface of the water, where the trouble caused by refraction can be ignored when aiming. Grey mullets (*Mugilidae*) and the Pearl-spot. (*Etroplus suratensis*) are other species sometimes shot.

In most localities the use of the blow-gun is much more restricted than formerly : The crossbow is supplanting it as being more effective.

6. THE SICKLE.—Allied to the preceding which are adapted or developed from weapons of the chase, is a fishing implement derived from an agricultural source—the fish-sickle. This is used in conjunction with torches (*chut*) made of coconut leaves bound into a long bundle. On dark, moonless nights the fisherman attracts large fishes to the surface by the lure of the light of a flaming torch held in his left hand. This he waves constantly to and fro to make it burn fiercely. Any fish drawn by the spell of the light to within striking distance is slashed at and hooked out of the water by means of an ordinary sickle held in the man's right hand.

This is a most unusual method of catching fish and it is noteworthy that it is also practised so far away from India as the Channel Islands and the northern coast of France where sand-eels (*Ammodytes* sp.) are dislodged from sandy stretches at low tide by means of sickles and hooks ; no lights are used as the sand-eels lie quiescent, hidden in the sand.

ANGLING.

7. HAND LINES (*Kai chunda*).—The hand-line or *kai chunda* is used extensively from anchored canoes in the backwaters during the south-west monsoon. Each canoe is manned by several fishermen who work independently but in friendly association. If a fish hooked be specially large and shows fight, a companion will go to the help of his fellow ; in such case a fourth share of the prize is the helper's reward.

The fisherman usually holds a line in each hand. The lines are of sunn-hemp or of black fibre from old leaf-stalks of the palmyra and kitul palms. They are armed with hooks of European manufacture, bought in the bazaar. Prawns form the usual bait.

8. ROD-AND-LINE FISHING.—This method is also practised, usually from a small, one-man dugout (*chunda manji*). Prawns again form the common bait ; a number are kept alive in a little water in the bottom of the canoe as live bait.

A light bamboo, tapered to a thin point, serves as rod ; the line is of cotton with snooding of the strong dark fibre of the sheathing petioles of the *Chundapana* or Kitul palm (*Caryota urens*.)

9. BAITING FOR CROCODILES.—The widely distributed method of fishing for crocodiles by baiting a large hook attached to a line having a buoy at the other end is sometimes practised in these backwaters. The hook used is double, having two shanks back to back with the two barbed arms turned outwards in the same plane after the fashion of a ship's anchor. As the two hooks are formed by the village blacksmith from a continuous rod of iron, they join at the proximal ends where a loop is fashioned; through this the link at one end of a chain several feet in length is passed and made secure. To the other end of the chain a short rope is tied with a coconut husk at the free end to serve as a buoy.

The double hook after being buried in the body of a fowl, cat or small dog which is to serve the purpose of bait, is hung over the crutch of a forked pole fixed in a slanting position in the mud in such wise as to hang a few inches above the margin of the water. As the bait decays the putrifying odour serves to attract the crocodile to the spot. It approaches cautiously, looks at the bait searchingly, smells it, and then—according to my informant—usually gives it a vicious smack with its tail, turns quick as lightning, swallows it and retreats hurriedly.

No attempt is made to retrieve the buoyed rope till some hours later when it is judged that digestion has caused the liberation of the barbed hooks within the crocodile's stomach. The men who have been deputed to keep a watch upon the movements of the coconut float then call their comrades; one of them brings the buoy ashore and the others haul upon the rope and drag their enemy ashore to be there clubbed to death. But this is not accomplished without a great struggle.

TRAPS AND TRAPPING.

BASKET TRAPS (*Kudu*).—Contrivances for trapping fish may reasonably be presumed to antedate the invention of nets. The great majority are basketwork filters which filter or sieve out whatever fishes happen to be in the stream of water passing through the basket or else are forms of hand-traps used to imprison fishes which have been located in shallow water. Being inexpensive to buy or to make they are in universal use. As a consequence the number of types is considerable and the local variations exceedingly numerous. Every village has some detail peculiar to the basket-traps which its people favour.

The PLUNGE-BASKET.—This device, called *ottal* in Malabar, is employed to catch fish in very shallow or knee-deep water, and particularly in inundated paddy fields. Typically sub-conical in form, having the apex cut off, it consists of a tapered cylinder of closely-set ribs, made either from thin branches of a hardwood tree or bush or of splints of bamboo. These splay outwards from above downwards. Both ends are open, the upper the narrower and just wide enough to admit the hand and arm. The lower end or mouth is widely spread, and encircled by the free terminations of the splint ribs, each sharpened to a point. To keep the ribs in position the trap is hooped at intervals with pliable material woven in and out of the ribs; these hoops are usually of split cane or of coir cord. The common size varies between 20 and 24 inches in height, with a diameter of about 20 to 22 inches at the lower end. Larger sizes are occasionally seen. The width of the bamboo splints used as ribs is $\frac{3}{8}$ inch.

The Malayali plunge-basket never has a protective wickered band around the actual margin of the upper and smaller aperture as is typical of African types¹.

A good example of the most common type seen at Chetwayi was made with ribs cut from thin branches of the *Chinna* shrub, strengthened at intervals by the intercalation of lengths of split bamboo. Three woven hoops of coir cord encircled the cone at fairly equidistant intervals; the uppermost and the median hoops were of single rows of lacing; the lowermost, placed about three inches above the mouth, of two rows. Inside were two stout bamboo splint hoops; one just inside the narrow upper opening, was served with coir yarn, the other, about eight inches down, was bare.

At Palghat the shape of the *ottal* is less typical. It tends towards a truly cylindrical form in the lower half of its height; only the upper half is tapered. In consequence it is taller than the ordinary type. Four hoopings of interwoven coir twine encircle it, one around the upper opening, another round the shoulder, and the other two, spaced at equidistant intervals between the shoulder and the mouth. A carrying loop of coir rope is attached to the uppermost hooping. Dimensions: total height, 26 inches; circumference of upper opening, 18 inches; of shoulder, 38 inches; and of the lower opening (mouth), 34 inches. (See Pl. III; middle fig.).

¹ Leth, T. and Lindblom, K.G., "Two kinds of Fishing Implements," *Riksmuseets Etnografiska Avdelning*, No. 12, Stockholm, 1933.

A couple of iron rings are sometimes inserted to give additional rigidity, one just inside the upper opening, the other on the inner side of the shoulder. In the example examined the former was wrapped round with coir in order to avoid chafing the arm when thrust within.

Methods of use.—(a) When used during the day as is the ordinary procedure, the *ottal* wielder, who is as often as not a woman, wading in shallow water, plunges the implement into the water every few steps, pressing the spike-armed mouth into the mud with one hand; the other is then passed in through the narrow upper opening and gropes around in the trap for any fish that may have been covered and impounded. This method is used in flooded paddy fields after the harvest and in pools and tanks which are in course of drying up.

(b) Along the borders of the backwaters where the water is quite shallow, it is a common practice for fishermen to go there after sunset with their *ottals*. Each man carries a lighted torch in one hand; the *ottal* in the other. The glare of the light has the effect of attracting fishes and when one comes within striking distance, the man skilfully drops the *ottal* over it and traps it.

FILTER TRAPS.

The variety of these is numberless but as the variations generally concern minor details, the following representative examples will suffice.

The KANNILLATHA KURITHI or "eyeless trap" is a simple cylinder of closely set midrib slivers of palm leaflets (*irkal*); one end is open whereas the other has the ends of the slivers bunched together and tied around tightly so as to close this end of the trap. A couple of bamboo hoops usually encircle it on the outside, one at the open mouth and one at mid-length. In large traps three hoops may be present. To keep the slivers from opening under pressure, a number of encircling lacings—usually six or seven—made with palmyra fibre are added. A carrying handle made from a strip of the tough cortex of a palmyra leaf-stalk or sometimes of a length of coir rope, completes the apparatus; one end is tied to the bamboo hoop around the mouth, the other around the closed apex. The total length ranges from 22 to 24 inches; the diameter is between 11 and 12 inches (Pl. III, fig. on left).

It is used to catch small fish and fry during the emptying of small areas that have been bunded off for the purpose by the raising of low earthen embankments or bunds. This emptying and filtering out of fish is effected usually by the primitive method of splashing water into the open mouths of these traps ; alternatively, these may be placed in small outlets in the bunds through which the water is draining away.

At Chetway this basket filter goes by the name of *nakillatha kurithi*.

The NAKULLA KURITHI.—A trap thus named at Chetway is called *Kannitta Kurithi* in the Palghat area. It is an improvement on the simple *Kannillathi kurithi* just described. It consists of two parts : one is a *kannillatha* cylinder of specially large size, the other is a curved, fan-shaped apron, one end of which is inserted into the open mouth of the cylinder when the apparatus is placed in position at an opening in the bund of a paddy field or wherever there is a runnel of water. The outflowing water flows on to the apron and any small fish and prawns that come with it are led by the converging sides of the apron into the cylinder behind, where they are trapped. The tail end (apex) of the cylinder is tied around by one end of the carrying handle of coir and this is loosened if it be desired to extract the contents without removing the trap itself.

Like the cylinder the apron is made of coconut irkals, reinforced by three transverse slivers of bamboo. Before insertion it has a rectangular mat form, 21 inches across and about 12 inches front to back. Along the front margin is laced one sliver of bamboo ; two others are sewed on respectively at one-third and at two-thirds of the length from the front margin. The irkals in the inner third are free ; this enables the sides to be bent together and to form a narrow slit-shaped aperture when inserted into the mouth of the cylinder (Pl. III, fig. on right).

Dimensions.—Length of cylinder from mouth to point where the tail end is closed by tying, 33 inches. Diameter of mouth, 10 inches. Apron, 21 by 12 inches.

PARI.—The *pari* is a basket-filter made on the principle of the *nakulla kurithi* but larger and with the body and the mouth-trap incorporated in a single unit instead of being separate.

In transverse section the trap is elliptical as is the mouth and the closed hinder end which, however, is slightly shorter along the long axis of the ellipse owing to the body of the basket tapering slightly. The walls are made of closely set irkals strengthened at each end and at mid-length by split bamboo hoops tied on outside ; numerous circumferential lacings of palmyra fibre cord are also set at close intervals to keep the irkals in position.

The mouth end is closed by a fringe of irkals pointing obliquely inwards and to the centre at such an angle as causes them to meet and interlock along a median line some inches inwards from the mouth opening. Along the median line where they interdigitate they are bound together with fibre except at the two extremities of the line where at each a small opening is left free, sufficient to permit prawns and small fish to enter by pushing aside the weak and flexible free irkals at these points.

The hinder end of the contrivance is closed by closely set slivers of bamboo and has a small door at one side whereby the catch may be extracted. This door is secured by a bamboo skewer passed through interstices in the basket and door.

Dimensions.—Body, 18 inches long ; trapped mouth, 26 by 9½ inches ; hinder end, 21 by 6 inches.

INTERCEPTING BARRIERS.

EARTHEN BUNDS.—Simplest and most primitive of all trapping devices is the separation of some shallow area of water from connection with the main body by the throwing up of a low earthen bund or embankment. By baling out the water within the cut-off section the fishes therein are left stranded in the mud on the bottom. Groping in the mud with bare hands enables the villagers, men, women and children, to find and capture these fish.

TRAPPED BUNDS.—When the contour of the land permits of the bunded area being emptied at will by draining the water to a lower level through small openings, this permits of the placing of filter-traps in these miniature sluices. By this arrangement the fishes effect their own capture. All that the owners need do is to make periodical visits to the traps in order to empty them of the catches made.

SCREEN BARRIERS (*Thattu vala*).—These are in extensive use in Malabar, particularly in shallow, tidal backwaters or where an extensive tract of flooded land is in process of being drained.

The material used in construction consists of narrow strips of split bamboo laced together with coconut twine arranged in transverse rows spaced about a foot apart. This design is similar to that of the sun-blinds called 'tatties', used in South India to exclude excess sunlight from rooms and verandahs; the make of the fish-tatties is, however, stouter and rougher. The individual strips of bamboo are approximately three-eighth inch in width, with a length of from five to six feet; distance apart, about three-sixteenth inch.

Such screens are arranged as a vertical wall either to block the entrance to a blind creek within tidal influence or disposed along the chord of a semi-circular area of shallow water in a tidal stream of which the shore forms the arc. (See Pl. IV.) At intervals in the vertical wall of screening are set circular, heart-shaped, or rectangular trap chambers also made of vertical screens having a narrow entrance on the inner side. Each of these trapped chambers is formed by arranging a length of screen in such manner that while the middle part of its length forms a circle, an ovoid or even a rectangle, each end is curved inwards until the two are brought so close together that only a narrow passage is left between, leading into the chamber within which thus forms a trap from which escape is extremely difficult. As the tide falls the fishes within the area enclosed are forced to pass into these trap chambers; here they remain until the tide has fallen sufficiently for the men tending the screens to be able to enter the chambers and there dip out the fish. This is done with a small, handleless scoop net, about a foot across the circular ring of cane which forms the mouth whereon is strung the margin of a shallow bag of netting.

The screen wall and the trapped chambers are supported to intervals as required by strong posts driven into the soft bottom. To prevent such fish as the grey mullets from leaping the barrier, the trapped chambers are commonly roofed over with cadjans.

BUSH FISHING.—A variation upon the preceding method is to place piles of leafy branches in a backwater channel, with stakes around to keep them from displacement by the current. After the lapse of a fortnight or thereabouts the staked piles are surrounded by a circle of bamboo tattie screens. This done, men enter the

enclosure, throw out the bushes and then proceed to catch the fishes that have been sheltering among the branches with dip-nets. Each of these nets is formed of two parallel sticks between which a shallow bag of netting is suspended or stretched. A man when using one, holds the inner ends of the sticks, one in each hand, and sifts out the fish by alternatively dipping the net into the water and raising it above the surface.

The obstruction to the current caused by the bushes lying for comparatively lengthy periods on the bottom of a channel has a definitely silting effect ; this is usually objectionable and therefore this mode of fishing is prohibited in many localities.

NET FISHING.

The nets used in inland waters are so varied that many of them must be described individually. Each stands apart from its fellows, differing radically either in design or in method of usage. In this characteristic, backwater and estuarine fishing nets differ from those used in marine fisheries. The latter, while more numerous, are readily arranged in classes, each distinguished by unity of design and in method of employment ; the differences between the members in each class are restricted mainly to variations in the dimensions of the several parts making up each net. The majority of backwater nets are comparable to single species genera, whereas marine nets are paralleled in zoology by those genera which contain numerous closely related species in each.

1. The VELLA VALA or SCARE-LINE.—This is strictly a net-precursor and not a true net ; it is convenient to place it here because it is probably a survival of an archaic fishing device from which the most primitive type of net was evolved.

It consists of a long line having a small loop at mid-length. The two long arms thus formed are arranged to diverge in V fashion from the median loop and upon each of these " warps " are tied at short intervals tufts of long, yellowish leaflets torn from the young leaves of the coconut palm. It is used in shallow water in the following manner :—

The crew required to work the device consist usually of a man and two boys. Each boy takes charge of the free end of one warp and begins to draw this rope slowly along through the water. At the same time the man, who is stationed at the median loop kneels

on his left knee and places his right foot through the loop. Then while slowly advancing in a semi-crawling way as the boys pull the warps along, he gropes in the mud in front for any fishes that have been scared by the flaunting decorations strung out upon the warps. In trying to escape, the fishes swim toward the apex of the triangle formed by the diverging warps.

Equally primitive is the use of a length of cloth drawn by two people, each holding one end, for the purpose of catching fry and prawns in shallow water. This is the true forerunner of the small hand-seine in which each end of a length of netting is laced or tied to a stick placed transversely to the width and hauled vertically through shallows by two persons, each holding one of the end sticks.

ENDI BALAI.—At Kundapur in South Kanara, a related form of net called *endi* or *yendi balai* is in use to catch grey mullets (*Mugilidæ*). The net part is a rectangular strip, 27 feet long by 10 feet wide, tied at each end to a transversely placed bamboo pole. Mesh, 2-inch bar. Two men handle the net, one at each end. They place it flat upon the bottom in shallow water in the estuary and then wait while two other men bear down upon the submerged net from a distance, dragging between them a scare line hung with the tender, yellowish-green leaflets of the coconut palm. As they run they make all the noise they can, shouting and splashing. The frightened fishes swim away in front of them. At the moment when the scare line arrives close to the net, the men tending it raise it suddenly, capturing any fishes that may be above it.

2. ARIPPU VALA (*Sieve-net*) or VATTU VALA.—The *Arippu vala* is a small bag-shaped hand-net used to dip out prawns. The bag part is of very small mesh, slightly less than one-quarter inch bar. The meshes around the mouth are threaded upon a piece of cane or thin bamboo bent into an ovate shape, the ends overlapped and tied together. The size of the bag varies, but is never larger than can be easily worked by one hand.

3. CHAVITTU VALA.—This net which may be called the "Half-hoop net" is a stationary bag-net with the mouth kept open by a half-hoop of bamboo. This half-hoop is formed of a suitable length of strong bamboo bent into a permanent semi-circular or bow-shape by means of a coir cord passed through a hole bored through each end and knotted on the outer side. The bag of netting is not attached

directly to the half-hoop ; instead, the upper part of its mouth is laced to a second bamboo half-hoop of the same length as the first but thinner. This done, the second and lighter half-hoop is placed in contact with the stout one and the two tied together at intervals. The lower section of the net's mouth is laced to the cord connecting the two horns of the stouter half-hoop.

When in operation the fisherman sets the half-hoop upright on the bottom, horns down, facing the current, in water from two to two feet and a half deep. One foot holds the foot rope of the mouth against the bottom, whilst a line attached to the centre of the foot-rope is held in his hands at the top of the hoop frame. (Pl. V.) The entry of a fish into the net is made known by the vibration caused ; as soon as this is sensed, the man's foot releases the foot-rope which is then hauled up by the cord held in his hands. This causes the half-hoop to lie horizontal on the surface, preventing the escape of the fish which is then lifted out.

Dimensions—Half-hoops.—Length of the chord of the arc, 5 feet ; height of the arc at centre, about 3 feet.

Bag-net.—Length about 6 feet ; mesh, half-inch bar.

The material used is cotton thread, No. 20.

4. THE CAST-NET (*Vichu vala*).—The cast-net is in general use everywhere. It is of the same type as that made use of by sea fishermen, having interior branched cords operated by a pulling cord passing through a ringed aperture at the centre (apex). For a detailed description see the Marine Section.

5. CHANGALAPAYIKKAL or CHANGADAM.—This is a highly specialized fishing device in use on the southern backwaters (Cochin and Northern Travancore) for the capture of grey mullet (*Mugilidae*). These fishes have the habit of leaping from the water when frightened and this Changalapayikkal method is based upon knowledge of this characteristic.

To operate it, two long and very narrow dugout canoes of equal length are required. These are connected in such a way that the hulls diverge forwards from the stern. (Pl. VI.) This is accomplished by means of two connecting poles ; one of these is placed athwart the bows, the other crosses the sterns immediately in front of the steersmen. As the forward pole is twelve feet long, and the after one only eight feet long, and as they are lashed by their extreme

ends to the canoe hulls, the bows are held apart rigidly at a distance of nearly twelve feet whereas the sterns are less than eight feet distant from one another.

A net extended outboard upon seven sticks slanting upwards and outwards runs the whole length of the outer side of each canoe. Each of the extending sticks is about 54 inches long; of this about 18 inches are inboard, leaving a length of 36 inches to project outboard at an angle of about 25 degrees from the horizontal. The netting, usually measuring about 30 feet in length, is tied to the projecting sticks both at the foot and at the head in such way as to bag slightly between each pair of sticks. These are spaced apart from $3\frac{1}{2}$ to 4 feet.

As a low freeboard is desirable, several spadeful of sand are placed in the bows and also amidships of each dugout; none is required at the stern as here the weight of the man who forms the entire personnel of each canoe, is sufficient for the purpose. Stakes are next placed athwart each canoe just below the gunwales and these are loosely laced together by a network of thin branches.

Finally a long dragging device made up of short pieces of chain connected by lengths of rope, is stretched from bow to bow of the two dugouts, of length sufficient to form a slack semicircle reaching back to abaft amidships between the two dugouts. To keep it in position a cord runs from the centre of this rope-chain to the centre point of the connecting pole at the stern of the canoes.

When the canoes are loaded and manned the gunwales are depressed close to the water. In this condition they are paddled or poled slowly along the backwater in places where mullets and prawns are expected to be plentiful. The purpose and utility of the chain sections in the drag rope are now apparent. The clanking of the links and the disturbance caused by their rough passage over the bottom frighten the fish which leap wildly into the air; some fall into the canoes where the tangle of branches hinders their escape by a fresh leap; others, which take longer jumps, land on the sloping nets disposed along the outer sides of the canoes.

This method of fishing is of comparatively recent introduction, dating, it is locally said, from about the beginning of this century. The person who introduced it had probably received inspiration

during a visit to Bengal, Burma or the Malay Peninsula, where analogous methods are in use ¹

Dimensions, etc.—Hull of each canoe :—length, from 28 to 30 feet ; beam, 18 inches ; depth, 9 inches.

Number of transverse ridges (*munnikal*) left when hewing out the hull and answering in function to ribs—12 ; they are spaced apart about $2\frac{1}{2}$ feet. Thwarts, 4.

Length of net when fitted, 27 feet ; width, 30 inches.

DRAG-NETS.

VADI VALA.—This net is of similar type to the *konda valai* of the Coromandel Coast. It consists of a length of broad net partially doubled upon itself lengthwise and laced up at each end. This forms a long, trough-shaped bag whereof the dimensions are variable at the owner's discretion. To keep the long mouth open sticks are placed vertically between the opposite margins and tied in place at intervals of two to three feet, along the whole extent of the net. The length of the sticks is usually from two to three feet whilst the width of the net before being fitted is usually about three times as great. The mesh varies from seven-eighths to two inches, bar.

Two men are needed to operate it. Each of the men, carrying half of the net bunched up, with the sticks brought together by threading them upon one arm, wades out alongside his companion into waist-deep or even breast-high water. There the two begin to cast off the sticks at the middle of the net, whilst walking away from one another. When the whole of the net has been paid out, the men turn toward the shore and work the net in seine fashion dragging it to the bank where they empty it of its contents. While dragging the net they keep the foot rope on the bottom by the help of the foot or rather of the big toe. An almost identical net is used on the coast as a hand seine ; in Malabar it goes by the name of *Koru vala*, while in South Kanara it is termed *Goru balai*.

TELLIKANNI VALA AND PATTUKANNI VALA.—These nets are used similarly to the *vadi vala*, but here the mouth is kept open by the buoying of the headrope with globular floats fashioned from the spongy wood of the *othallam* (*Cerbera odallam*). They vary greatly

1. Hornell, J., "The Fishing Methods of the Ganges," *Memoirs of the Asiatic Soc. of Bengal*, Vol. VIII, Calcutta, 1924, p. 216.

in length and width. The chief distinction between them is that the *tellikanni vala* has a very small mesh, seldom exceeding half-inch bar, whereas the *pattukanni vala* is of two inch bar. Material, cotton.

OLA VALA.—The *Ola vala* is of similar form and dimensions as the *Pattukanni vala*; it is indeed the same net but used with an accessory device in the form of a scare-line. Four men are necessary to the operations. Two lay out the net, dragging it in the usual semi-circular form; the other two station themselves at a considerable distance in front of the net, holding between them the ends of a long scare line consisting of a coir rope hung with coconut leaflets (*ola*). When the signal is given by the first pair, the holders of the scare-line advance slowly converging upon the crescent of the net, splashing and shouting, in order to frighten any fish in the area and to drive them in flight toward the net.

GORATI BALAI.—This is a Kanarese net and marks the highest development of the class of nets just described. It is a specially long form of the *Kuzhi valai* of the Negapatam backwaters 1, which is a *Konda valai* with the netting broken up into a series of pouch-like sections, just one less than the number of sticks crossing the long, horizontal mouth common to all the pouches.

In the Kanarese net the long, common mouth is crossed by from 30 to 40 short sticks. Between and behind each pair of sticks the net forms a separate or individual pocket, 18 to 28 inches deep with a mouth 15 to 18 inches wide, this being the distance apart at which the vertical extending sticks are spaced. The length of the sticks and the vertical height of the mouth is 8 to 9 inches. Mesh $\frac{1}{2}$ to $\frac{5}{8}$ inch bar.

The length of the net is considerable. One measured consisted of eight pieces, laced end to end; each had the netting divided into 30 pockets, giving a total of 240 pockets for the entire net. The total length was 350 feet.

To float the net a number of *loose* canes are slipped behind the upper ends of the mouth-extending sticks. The men operating the net, extend it between them in a wide crescent and run with it for some distance straight ahead and parallel to each other, afterwards converging till they meet.

1. Hornell, J., "Fishing Methods of the Madras Presidency," Part I. *Madras Fisheries Bull.*, Vol. XVIII, page 73, (1925).

It is used specially for the capture of garfishes (*Belone* spp.) ; on the occasion when I saw the net in use in the river estuary at Kundapur in 1921, a fair number of these fishes were caught.

THE STAKE-NET.

VALU VALA. —The Malayali *valu vala*, otherwise *unni kuthu vala*, is typical of that class of nets termed Filter-nets. It is a conical bag-net set in streams and tidal waters to filter out whatever small fish and prawns are not strong enough to make headway against a strong current and are, in consequence, swept along in its course. Larger fishes which have the habit of entering backwaters on the flood tide are also liable to be caught on their return with the ebb.

Malabar stake-nets of this description, unlike their namesakes in the Bombay Presidency, are confined entirely to the tidal backwaters. They are particularly common in Cochin and Northern Travancore, where they constitute the most important method of backwater fishing. They are also used but of smaller size and far less extensively in the estuaries of rivers in South Kanara.

These nets can be used effectively only where and when a strong current runs, that is, during spring tides when both flow and ebb run swiftly.

As the name implies the stake-net is a stationary engine, held in position by posts or stakes driven into the muddy bottom. Two vertical stakes are necessary for the support of each net ; these are set from three to four feet apart. Two obliquely placed propstruts may or may not be employed to buttress the stakes against the force of the current when the net is in position and thereby offering obstruction to the free flow of the water.

Stake-nets occur in linear sets or series, each set being known locally as a *padu* or *unipadu*. The number of nets in each *padu* varies greatly ; there may be only three or four or they may exceed one hundred ; the number depends upon the depth and width of the backwaters and the nature of the bottom.

Generally the stakes are permanent, never removed unless renewal is necessary, but at Pallipuram the stakes are lighter and are usually taken up after each haul and replanted when required again. Each pair is owned independently of the others but the ownership may be shared by two, three or even four men who take daily turns in rotation in the fishing.

The net itself is a conical bag with an elongated, tapered tail or cod-end. A stout coir rope, half inch in diameter, encircles the mouth and at four equidistant points rings are attached—a lower and an upper pair. When a net is to be set the fishermen paddle out to the stakes in a dugout canoe and slip the rings attached to the two lower corners of the mouth of the net over the tops of the two stakes. With the aid of a pole, forked at one end, the rings are pushed down to the bottom. The two rings at the upper corners are afterwards slipped on to the posts and made fast at a height sufficient to extend the sides of the net to their full extent. This setting of the net is done soon after the tide has turned and begun to ebb.

When the ebb tide begins to slacken the fishermen return to the stakes and lift the net bodily into their canoe. They disengage the rings tying its upper side to the stakes and draw up these which were pushed down to the lower ends. Then they paddle for the shore. The womenfolk, whose duty it is to attend to the subsequent operations connected with the curing of the catch, are there, awaiting their arrival.

The tail-end, which is not sewn up, is closed while in operation by a lashing passed several times round it; this is untied as soon as the net is landed and the catch emptied into baskets brought by the women, who wade into the water and wash the contents of the baskets by swirling them several times round in the water.

The duration of the fishing season is variable. In the vicinity of channels leading to the sea, fishing goes on throughout the year; in more inland situations fishing is suspended during the floods of the monsoon season, being resumed when the water again becomes saline.

Two fishing periods of six to eight days occur each lunar month. The first period or *thakkam* usually begins two or three days before new moon and lasts from three to five days thereafter. The second *thakkam* similarly falls during the spring tides around the date of full moon. The fishermen sometimes set their nets twice during the twenty-four hours, in the morning and the evening; these are named respectively *Polarchakettu* or "morning tying," and the *Andhikettu* or "evening tying." More commonly only the evening tying is practised as catches during daylight are much inferior to those made at night.

Description of the net.—The length of the net usually varies between 20 and 30 feet, but one of the largest size may run to about 50 feet in length and have a mouth aperture of 48 feet or more in circumference.

Typically a net is made up of eleven cylindrical sections diminishing in diameter progressively from the mouth towards the tail, as also does the mesh size. The two sections immediately behind the mouth are of coir twine, the rest are of cotton.

The names and mesh sizes of the sections in a large net are as follow :—

Section and name.	Approximate length. FEET.	Size of mesh (bar) in centimetres (approximate).
1 Porum	4	22—25
2 Kayattuvala	6	10
3 Bavala	2	7
4 Thelikanni	3	4
5 Pannikettu	3	3½
6 Nanur	6	2½
7 Munnur	3	2
8 Erunuthombathu	3	1·75
9 Erunur	3	1·50
10 Thonnur	3	1·20
11 Chovudu	12	1·00
Total	48	(Many nets are shorter).

The names of the sections refer generally to the number of meshes in each square of netting used in making the section. Thus *Munnur* signifies that 300 meshes form the unit or *pali*; this measures approximately 2 feet square.

Cotton thread bought in the bazaar is used for the nine hinder sections. This is spun into thicker thread of 3, 4, 5 and 6 strands by means of the *chadu*, the common spinning implement in use in South India (a spindle with expanded base). The cod-end is made of the thickest cotton twine; as the mesh is very small (1 cm. bar), the combination results in the retention in the cod-end of even the smallest fry and prawns.

The nets are frequently barked. The most usual material is the bark of the *Kalisjam* or *Odyan maram* (*Odina wodier*); this is ground fine and boiled in water. When the resultant decoction, known as *uthi*, is cool, the net is soaked in it for some time; after

drying on a scaffold, the net is run through a second time. As the nets are used only at the times of the spring tides advantage is taken of the intervals to give the nets a re-tanning once a fortnight. With careful usage and regular tanning and repair, nets last from three to five years. Indeed, as damaged sections are replaced when necessary by new ones, the net may continue to exist for an indefinite period although none of the original sections may be present.

The backwater fishermen belong generally to the Valan caste. In Cochin they had formerly the exclusive privilege of fishing in the backwaters and of paddling the Raja's State barge on all ceremonial tours on the inland waterways. The long "Snake boats" of Cochin and Travancore were also manned by men of this caste.

DIP-NETS.

Two kinds of Dip-nets are in use ; one, simple in construction and quite small in size, is used to catch crabs ; the other is of such large size as to require a highly complex mechanism for its manipulation. These nets are represented in Britain by the closely related Hoop-net ; no true Dip-net is there known although in France they are common, being known under the names of *Carrelet*, *Echiquier*, and *Hunier*.

1. THE HAND DIP-NET.—In operation and size this net is kindred to the European Hoop-net. It consists of a shallow conical bag suspended from the ends of two curved sticks which cross at their mid-length at right angles. Each of the four ends is attached to the mouth of the net at equi-distant points. They thus perform the same function of keeping the mouth open which the ring of cane or iron wire does in the case of the hoop-net. One end of a length of cord is tied at the crossing of the two mouth sticks and by this the net is let down vertically into the water from a jetty projecting into the backwater.

To attract the crabs for which this method of fishing is used, bait is tied at the centre of the net. The size ranges up to two feet square.

This net is probably a simplified form of the one next to be described.

THE CHINESE BALANCED DIP-NET (*Cheena vala* or *Kambu vala*).—This highly specialized net is greatly in evidence in the channel leading into Cochin Harbour. A few years ago

as many as eighty of these nets were counted within a half mile stretch. They are also met with singly or in small groups within the backwater for a distance of about ten miles on either side of Cochin. Beyond this they become scarce and reduced in dimensions. They reappear, however, in the Azhikode neighbourhood in the Cranganur district which is a second centre of distribution.

A typical net may be described as similar in form to the hand-net described above but so increased in size and complexity that mechanical means have to be employed to operate it. It consists of a complicated, counterpoised movable framework by means of which a large net is alternately let down into the water and raised again at short intervals. (See Pl. VII.)

The net part is a square-mouthed, shallow bag-net, terminating in a narrow cod-end (*bolsa*). Each side (*borda*) of the mouth is from 30 to 35 feet long. Arching over the mouth to keep it distended are two long compound poles, about 70 feet long; these cross one another at mid-length and are there lashed together at right angles. This arrangement gives four arms (*bras* or *boras*) curved downwards, radiating from a common centre. Their distal extremities are attached to the four corners of the mouth of the net.

The crossed bamboo poles are slung by a very short rope from the outer end of a long lever in the form of a two-limbed crane; this crane-lever (*poramkazhakol*) consists of two bamboo poles forming the long sides of an isosceles triangle having a basal stretch of about six feet. The spread lower ends are pivoted upon a horizontal bar (*capsanti* or *cowsanthi*) fixed between the heads of two stout posts (*stako*), firmly implanted in the bottom. Each end of the horizontal bar fits into a socket hole in the side of its respective supporting post.

To partly balance the crane-lever, a similar one—the balance-crane (*karakazhakol*)—is set at a diverging angle of about 120 degrees; this is also pivoted on the *capsanti* bar turning in sockets in the coconut-trunk piles. The apices of the two crane-frames are connected and stayed by a long bamboo pole.

As the water is usually shallow for several feet from the shore, a roughly made wood-framed jetty or bridge (*ponti*) runs from the shore to the two piles supporting the two balanced triangular cranes. Sometimes, owing to the shallowness of the water, the crane supports

have to be planted so far from the shore that a platform (*esthain*) has to be built at the landward end of the *ponti*, to furnish working space for the fishermen. This may be reached from the land either by means of a bamboo rail tied to posts fixed in the bottom or by canoe.

The remaining equipment includes three to five heavy stones (*ballaston*), each 20 to 30 pounds weight, slung on ropes disposed at short intervals upon the arms of the balance crane, and two long ropes (*corda*) attached to its apex, which are used by the fishermen at the shore end of the jetty when they wish to pull down the head of the balance-crane.

All being ready, a stop which holds the head of the balance-crane is released; this allows the outer or net-crane to be dragged down by the weight of the net and its fittings; their weight is arranged to be slightly greater than that of the stones used as counter-weights at the shore end. This movement carries the net under water to such depth as the lengths of the various parts may permit.

Dimensions.—The triangular crane-levers run from 30 to 35 feet in length; each of the four arms (*bras*) of the net is about equally long, while the sides of the net mouth measure about 30 to 40 feet. The meshes diminish from 2-inch bar at the mouth to one-sixteenth inch in the tapered cod-end.

Manipulation.—Two men form the working minimum. After a short interval during which the net has rested on or near the bottom, two men haul upon the ropes running to the apex of the balance crane; this effort, aided by the weight of the counterpoising stones, causes the two cranes to rotate on their pivot points about 90 degrees and so to raise the net as the outer crane is pulled upward toward the vertical. If several fishes are seen to have been caught in the upward rush of the net, a man runs out along the jetty, hauls in a cord attached inside the net at the centre of the cod-end and scoops out the catch with a landing net.

When the net is located in a tideway where the current is particularly swift, rope stays have to be run from the crossed bamboos spreading the mouth of the net, to the shore in order to steady the net frame and prevent it being swept out of position.

The alternate lowering and raising of the net continue for five or six hours each tide, night as well as day; when several are in operation the action resembles that of a number of buckets going down

and up continuously. It is used all the year except during the height of the monsoon—June, July and August—when there is no night work.

The more enterprising of the fishermen hang a kerosene lantern from the apex (*suri*) of the crossed net-frame during night fishing, particularly on dark nights ; this attracts certain fishes and is recognized as a valuable adjunct. Again, sometimes a length of rope strung with the fluttering yellowish leaflets of young coconut leaves is stretched along the margin of the net on the side toward which the tide flows in order to scare fishes from passing beyond the range of the net.

Still more ingenious is a practice followed in the Cranganur district (Azhikode, etc.). Here a boy is often stationed in the crown of a coconut palm overhanging the fishing station or in a specially built straw hut perched atop of several bamboo poles, 18 or 20 feet above the water. From this vantage point the boy, who has provided himself with ample ammunition in the form of a pile of stones, watches for fish to approach the net lying outspread on the bottom. When he espies some swimming near the net, he throw stones into the water close to the fishes, aiming dexterously in such manner as to frighten them toward the net which is raised the moment they cross over one of its sides.

When work ceases, the cod-end is drawn up through the mouth by its hauling string and the landward or balance crane is secured in a horizontal position ; this raises the whole net clear of the water. Once a month the net is disengaged from its frame and tanned by immersion in an infusion of *panachika*, the unripe fruit of *Diospyros embryopteris*, which contains a large amount of tannin.

The nets are usually owned by the proprietor of the land adjoining the fishing station, or he may rent out the right to set up a net. The daily proceeds are shared equally between the owner of the net and the men who work it, provided the catch be sold for a sum of five annas or upwards. Should the proceeds be less than this amount, the owner foregoes his share.

The cost of one of these nets complete with all the framework and gear, ranges from Rs. 100 to Rs. 200 according to size and locality.

Origin.—Nowhere else in India is this highly developed net to be found, whereas in China it is to be seen in every imaginable variation studding the banks of all estuaries ; even far inland this

balanced dip-net is one of the most common fishing devices wherever local conditions are favourable to its employment, either as a huge balanced engine of great elaboration or of size small enough to be operated by a fisherman, single-handed. In the larger sizes work is facilitated and rendered less laborious by the employment of a windlass to heave in the rope governing the head of the balance crane.

In view of these facts the name commonly applied to this net in Cochin—the *Cheena vala* or “China-net”—assumes great significance and implies definitely that this method of fishing is an introduction from China, as are several other items in the material culture of Malabar. We know that in mediæval times, particularly during the centuries immediately prior to the arrival of the Portuguese, trade with China flourished exceedingly; Chinese junks arrived annually in the ports of Calicut, Cochin and Quilon, and Chinese sailors were familiar figures in these towns. In monsoon storms, as we learn from Ibn Batuta, junks were wrecked on the coast and the junk fleet held up in port by the bad weather. Such conditions were favourable to the introduction of the net most popular of all among Chinese fishermen. Against this theory of direct introduction by the Chinese, is the fact that the technical terms in use in Cochin for the principal parts of this complicated fishing engine are of Portuguese derivation, often mutilated and corrupt but still recognizable. Of these the principal are—

Term in Malayalam.	Portuguese equivalent.	English translation.	Fishing significance.
Ponthe	Ponti	Bridge	Jetty or bridge.
Bras or Boras	Braço	Arm	The crossed arms expanding the mouth.
Ballaston	Ballista	Engine for throwing stones.	Counterpoise weights (stones).
Borda	Borda	Edge or border	Border of the net.
Capsanti	?		Pivot bar.
Corda	Corda	A rope	Rope controlling the crane.
Esthain	Esteio	A prop	The platform supported on props.
Bolsa or Prolsa	Bolsa	A purse	Cod-end of net.
Stako	Estaca	A stake or palisade.	Stakes supporting platform and bridge.
Karzhakol	Calce	A wedge	The triangular cranes.
Odar	Tira	A brace	The braces or stays running to the crossed arms of the net.

The Portuguese are a nation of fishermen and the world owes much to their enlightenment in introducing improved fishing methods wherever they have settled or held power. Cochin was their chief settlement on the Malabar Coast and there can be little doubt that they introduced the balanced dip-net into India after having noted to what effective purpose the Chinese put this particular net.

Anantha Krishna Iyer's statement¹ that the net is not known in China, "nor for that matter in any other country except in Cochin", is altogether erroneous for, as stated above, it is exceedingly common in China and even more highly developed than in Cochin. I have seen scores of these nets in operation on the way up the Wusung River to Shanghai; all writers on Chinese fishing methods devote much space to their description—there can be no question of its Chinese origin. That the technical terms used for the various parts of this net in the Malayalam language are of Portuguese origin and neither derived from Chinese nor from any Dravidian language, is, however, exceedingly strong presumptive evidence that the *introduction* was due to the Portuguese and not directly to Chinese influence exerted prior to the sixteenth century.

DRIFT-NETS.

KOLA VALA.—Although drift-nets are essentially marine nets, there is one important kind, called *kola vala*, used in the deep estuarine parts of the larger backwaters in the vicinity of the seaward channels. It is of comparatively large size, measuring about 150 fathoms in length with a depth of $2\frac{1}{2}$ fathoms. It is employed to catch any large fishes that enter from the sea; even porpoises are sometimes entangled in it. It is made of strong hemp with a mesh of 8-inch bar. Only by night is it used being shot after nightfall from a canoe. The head rope is buoyed at intervals of about two feet with floats of light wood about four feet in length. The foot rope has stone sinkers, each weighing about a pound, attached at distances apart of 6 to 7 fathoms.

After shooting the net, the canoe, to which the end of the net remains connected by means of the head rope, drifts with the net in the direction taken by the current. When hauled, the smaller fishes are found gilled, whereas the larger, when caught, have fouled the net and become so entangled as to be unable to free themselves.

1. *Cochin Tribes and Castes*, Vol. I., page 248, Madras, 1909.

Unlike the majority of backwater nets, the *kola vala* is not barked ; it is said to last for one year only.

One canoe manned by three men is required to fish this net. The catch is divided equally between the owner of the net and the crew.

KANDADI VALA.—Is a smaller form of the *kola vala*. It is used at nights to catch various medium-sized fishes ; the mesh is about 2-inch bar.

THE SEA FISHERIES.

MISSILE IMPLEMENTS.

HARPOONS (*Uli* or *Chattuli*).—Fish-spears are not employed in sea-fishing, whereas harpoons are in general use by those fishermen who specialize in capturing large fishes—sharks, the larger rays, 'dolphins' (*Chorinemus*), kora (*Sciaena aquila*), etc. They use small canoes, usually manned by two or exceptionally by three or four men, who may or may not work long lines concurrently.

The harpoon consists of a smooth cylindrical shaft made of palm wood (coconut or palmyra) and of an iron head, barbed on one side. The wooden shaft measures from eight to ten feet in length ; the head eight to fourteen inches, with a barb flange at the far end, diverging at an angle of about 30 degrees and from two to three inches long. The shank is usually rectangular in section except at the butt where it expands into a hollow cone, some three inches deep for the reception of the bluntly pointed distal end of the wooden shaft.

The farther end of a cord, the harpoon line, is made fast to the head just beyond the broad socket. It is also attached indirectly to the wood shaft, passing through a small loop given off by a cord made fast around the shaft near the proximal end. The line is of considerable length, up to 40 fathoms. Sometimes a second harpoon is tied to the tail end of the line for use should the first harpoon fail to disable the fish.

The *chattuli* may be used either as the sole fishing implement or it may be used in conjunction with long lining. Indeed the big-hook liners generally carry a harpoon in their canoe on the chance of having opportunity or need to use it.

ANGLING AND LINING.

ANGLING.—The only forms of fishing that can come under the head of angling are *Surf-casting* from the beach and very localized *Whiffing* for seer (*Cybium* spp.). The former is practised to a limited extent although it gives good sport and is fairly remunerative to those who engage in it as a means to improve the family's food supply. No rod is used; a leaded line armed with a baited hook, whirled around the fisher's head several times in order to gain impetus, is shot out seawards and then drawn back through the surf, to be repeated time and again till success be achieved.

Whiffing is foreign to the fishermen of this coast but in the south, in Cochin and Travancore, it is occasionally employed under way. A brass snood is used baited with a live fish, a piece of white rag or a strip of coconut flesh.

The use of this method of fishing is due to intercourse with Ceylon and is not indigenous. It is not known in Malabar or South Kanara, so far as I am aware.

LONG-LINING.—This way of fishing is also stated by the older fishermen to be foreign to this coast. They allege that it is comparatively a recent introduction from the Bombay Presidency, and this is supported by the fact that in the southern section, in Cochin and Travancore, it is almost unknown south of Cranganur, where it has been introduced by Ponnani fishermen. Prior to its introduction, hand-lining was the system in use, one man tending four lines.

Two descriptions of long-lines are in use :—

- (a) *Cheria beppu* or *Ayiram chundu* ('thousand hooks'), which is a small-hook line, and (b) *Valia beppu* or *Sravu beppu*, one armed with specially large and strong hooks for large and powerful fishes.

CHERIA BEPPU OR AYIRAM CHUNDU.—This kind of long-line ranges generally from 250 to 600 fathoms in length, with a tendency to increase wherever it is valued highly as a profitable method of fishing and a few run to about 900 fathoms. Hooks (1" to 2" long) are attached every five or six feet by nine inch snoods, so in the case of the largest lines the name of *ayiram chundu* is actually justified. The line is buoyed at each end by a large and conspicuous buoy of branched wood with numerous smaller floats at intervals along the whole length of the line. The length of the buoy lines is regulated

to suit the depth at which fishing is to be done. A stone sinker, hung from each end of the complete line, anchors it in position at the requisite depth.

The fish caught are chiefly catfish, seer, palamin, small kora, katuwa, dogfish and rays. The bait employed consists of pieces of sardines, mackerel, and other small fish, also prawns, purchased from net fisherman. Small canoes manned by two or three men are used in this fishery; they leave shore at daybreak and reach the fishing ground generally between 9 and 9-30 a.m., returning home in the afternoon. The share system prevailing at Ponnani is—boat, lines and hooks, two shares; bait, one share, and each of the crew when three are working, two shares; total, nine shares.

VALIA BEPPU or SRAVU BEPPU.—The fishes sought by the large hook long-liners are limited mainly to sharks of large size; 'dolphins', large kora and ray fishes are occasionally captured. The line used is short, from 100 to 200 fathoms in length with the hooks suspended at 10 fathoms' intervals from the ends of jointed ironwire snoods about 18 inches long. Stout, village-made hooks are used, measuring from five to nine inches in length and are baited with large pieces of other fishes, more especially dogfishes; beef is also said to be used when procurable at sufficiently low price (the men who operate long-lines are exclusively Moplahs). The line is buoyed as in the case of the cheria beppu by a large wood buoy at each end and smaller ones at intervals between. Frequently the universally useful kerosine tin takes the place of the large terminal buoy at each end. Two stone sinkers anchor the two ends.

The same small dugout canoe as used by the small-hook liners is favoured, manned by two men or by three as maximum; one reason why they prefer a small to a large canoe is that a large shark is more difficult to load into a high-sided canoe of greater size than into a small one. The latter may be canted over and the shark slipped in; if need be the men jump overboard, submerge the canoe and bring it under the shark, subsequently baling out the water.

The shark liners proceed farther seawards than any of the other fishermen on this coast with the exception of the Ratnagiri drift-net men. They seldom go farther than seven miles off shore, fishing in depths of 16 to 20 fathoms. Even fishing at this distance from land is of comparatively recent adoption; I have been told that this extension

seawards of the shark fishery was not practised until the beginning of this century ; furthermore, long-lining of any kind was not practised in many places until the same time.

All lines are of cotton and are periodically tanned with an infusion made from local materials, such as *panachika* bark, the fruit of *Diospyros embryopteris* (*panachi*, Mal.).

NETS AND NETTING.

In the prosecution of the sea-fisheries of this region, with the exception of the use of hooks and harpoons already described, no other implements or engines are employed except nets. Of these there is great variety in dimensions and mesh size, but these variations are reducible to a small number of classes, namely :—(a) shore seines, (b) boat seines, (c) drift-nets, (d) gilling-nets, (e) tangle nets, and (f) cast-nets. Trammels, barrier nets such as stake nets and weirs, filter nets, baited traps, trawls and dredges are not employed. The attention of the net fishermen is concentrated almost entirely upon the capture of shoaling fishes, migratory and pelagic. Scant regard is given to the netting of demersal fishes, a branch of the industry left almost entirely to the line fishermen, who form, however, a very small proportion of the fishing community.

Until the early nineties of last century, net fishing in the main was confined to the use of cast-nets (*vichu vala*, Mal.), bag-shaped boat-seines (*Odam vala*, Mal.), a few drift nets such as the *odu vala* and tangle nets for sharks and rays. According to common report, various forms of novel nets were introduced from Goa and Ratnagiri about the time mentioned. Chief among these were the great shore-seine called *Rampani* and certain gilling nets that came to be called *Thattu vala* from the noise made by the fishermen during their operations. The *Rampani* net appears to have been first introduced by fishermen from Goa who settled in South Kanara owing to political disturbances in Portuguese India in 1895*, whereas the *thattu* nets are said to have been introduced by Ratnagiri men but it has been impossible to verify this. Owing to the superior catching power of these nets, the use of several of the indigenous types of nets has declined considerably ; the number of cast-nets in particular have suffered decrease.

* Thurston, E., "The Sea Fisheries of Malabar and South Canara", *Madras Museum Bulletin*, Vol. III, No. 2, 1900, p. 158.

The nets in most common use are—

- (a) The *Rampani* shore-seine in the north of South Kanara ;
- (b) The *Odam* or *Peru vala* and its varieties, used chiefly in the Malabar and Cochin districts ;
- (c) Drift nets for pelagic fishes ;
- (d) Cast nets, particularly in South Kanara.

CAST NETS.—It is probable that the cast-net was at one time the distinctive and predominant fishing net in use along the whole of the Malabar Coast. In South Kanara it was almost the sole net in use until the introduction of boat seines (*vai balai*, etc.), towards the close of the nineteenth century.

The cast net, usually called *vichu vala* in Malabar and *vichu balai* in South Kanara, is peculiarly well adopted for the capture of small shoaling fishes when they come close inshore in localities where small dugout canoes are available at small cost. The net itself is cheap to make, for its size is small compared with that of drift nets or of boat seines ; its construction is so simple that the fisherman can make it himself with a few hanks of cotton thread while to operate it, he wants neither help nor canoe if he uses it from the shore or in shallow water. The help of a couple of paddlers and the use of a canoe do, however, add greatly to remunerative results when the pursuit of sardine shoals is involved.

Two types are in use, the simple type called *kattum vala*, without internal closing strings and the more developed *vichu vala* or *vichil vala*, which possesses them.

THE STRINGLESS CAST-NET (*Kattum vala*).—This is the primitive type from which all others have been derived. It is a simple piece of net, circular in form, with a strong cord rove through the peripheral meshes ; around this cord at short intervals, small lengths of sheet lead are wrapped, to serve as sinkers. The net is completed by the attachment of one end of a long and supple hauling line to the central point of the disc of netting ; this point becomes the apex of a cone of net when suspended from the end of the hauling line. To operate the net, the fisherman piles the bulk of it in orderly folds upon his left arm with the apical remainder on his right arm, and then swinging his body sharply a quarter round and shooting the

right arm forwards, the net flies outward centrifugally, helped by the leads around its margin. As it flies, it opens and so covers an area nearly equal to its own when it lands expanded upon the surface of the water (Pl. IX). The peripheral weights carry the margin rapidly downwards until it comes to rest on the bottom. Any fishes that happen to be swimming immediately under the net when it falls are in this way trapped. This simplest of the forms of cast-net can be used only in shallow water or thrown from the beach. It is used to catch sardines but is little used except by very poor fishermen, or by men of other callings to augment their scanty earnings, or to provide their families with a dish of sardines free of cost.

Material.—Thin cotton thread, neither tanned nor otherwise treated. The mesh varies but is usually larger than in the stringed form described below.

THE STRINGED CAST-NET (*Vichu vala*).—The Stringed Cast-net is the type in ordinary use. It rejoices in a multitude of names for it has very many varieties, differing from one another in the size of the meshes, the diameter of its circle and the leading of its periphery as well as in other and minor details. The confusion thus caused is intensified by variability in the terms used on different parts of the coast for similar nets and by the use of three languages in the area now being dealt with.

All varieties agree in general construction. All have a served ring opening at the centre (or apex); through this the hauling line passes to subdivide at once into numerous secondary strings. Each of those in turn subdivides into three short branches at about three feet from the periphery to which their distal ends are attached. As in the simple *kattum* type the peripheral cord is leaded at short intervals.

This net is adapted specifically for use from a small dugout. The crew number either three or four. The net thrower stands statuesque at the bow of the canoe, balancing himself gracefully, eyes intent upon the water ahead; one man steers with a broad, triangularly-bladed paddle (Pl. VIII) and another, or may be two, paddle as directed, following indications given by the movements of the man standing. When at last the net flies out, the canoe's progress is

arrested and all wait in silence till it is judged that the leaded margin has sunk far enough (Text-fig. 16). Then the net-man begins to haul in his line slowly and cautiously. As this proceeds the leaded

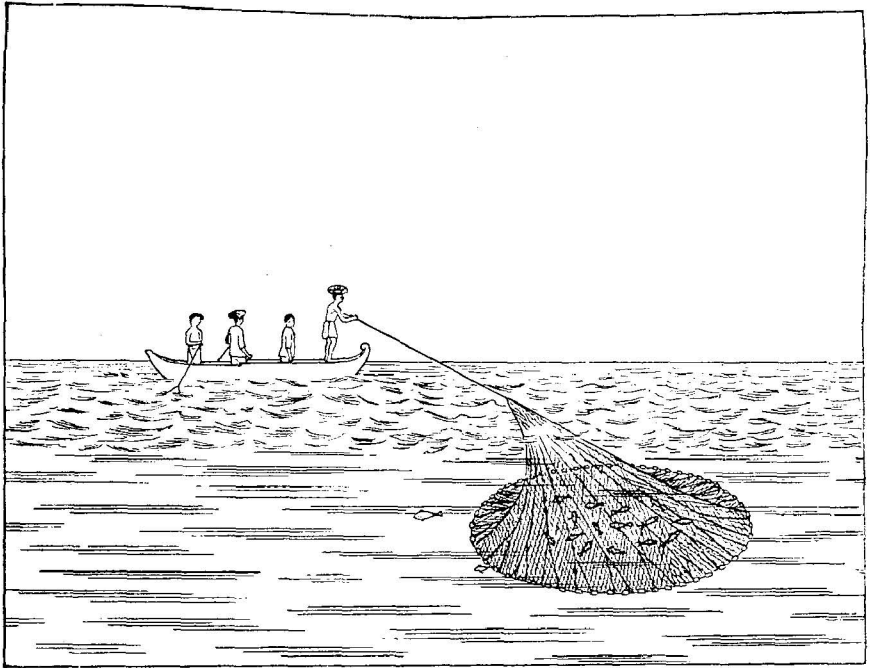


FIG. 16. FISHING FOR SARDINES WITH THE STRINGED CAST-NET, MALABAR.
DIAGRAMMATIC.

margin is drawn inwards and upwards, till at last all the leads come to be bunched together at the apex of a secondary and smaller cone within the upper part of the primary cone. This effects the imprisonment of any fishes within, in a circular, ring-shaped marginal pouch. Once closed in this way the net is quickly hauled aboard the canoe. By slackening the hauling cord the bunched-up net is loosened and the catch liberated.

Some of the nets are of surprisingly large size, requiring great dexterity and strength to throw them properly. Diameters range up to 38 feet ; the average is rather more than half of this. Sardines are the chief catch ; *aila* (mackerel), *adavu* (*Lactarius delicatulus*), catfishes and other shoaling fishes are also caught, a net of appropriate mesh being used for each species.

In Malabar the most common varieties are *churuku vala*, *muttukanni vala*, *pakku vala* and *thiruda vala*. Of these the first three have meshes about $\frac{3}{8}$ to $\frac{3}{4}$ inch bar, while those of the *thiruda vala* are $1\frac{1}{4}$ inch bar. These nets also vary in diameter from ten to thirty feet.

In South Kanara cast nets are used almost exclusively for mackerel and sardines and have meshes varying from $\frac{3}{8}$ to $\frac{5}{8}$ inch bar. They include nets known as *nanju balai*, *parla balai*, *tikkala balai* and *tikkanda balai*. The largest of all is the *deb balai* with a mesh of $\frac{3}{4}$ inch bar and a spread of nearly 40 feet in diameter. Taken as a class they are termed *vichu balai*.

In Malabar the lead sinkers are made of strips rolled around the marginal cord ; in South Kanara they are usually discs strung upon it.

Material : Cotton thread ; unlike the stringless cast nets, these are usually barked and become reddish brown in consequence.

The cost varies between Rs. 5 and 25 according to the dimensions and size of mesh.

SEINES.—As employed on the coasts of Malabar and South Kanara, this class of drag-nets is divisible into three groups :—(a) Hand-seines, (b) Shore-seines and (c) Boat-seines. The first and second groups may also be classed together as “ Bagless seines ” with the third group representing the “ Bag-seine ” division ; the former are without any proper cod-end or bag-shaped tail at the centre, whereas the bag-seines have this feature well developed.

HAND-SEINES.—The only examples of this group are the large and the small forms of a net approximating to the *Konda valai* of the Coromandel Coast and to the *Vadi vala* of the Malabar backwaters. In North Malabar both kinds are termed *Koru vala*, while in South Kanara they go by the related name of *Goru balai*. They are worked by two men wading in shallow water in the usual *vadi vala* manner, except when of specially large size ; in this case a couple of extra hands are employed to support the vertical mouth-distending sticks towards the centre of the mouth's length. The *koru vala* has little economic importance.

The larger form is identical in general design with the *vadi vala* described on page 28. The dimensions are variable : the length of the mouth varies from 15 to 60 feet and the mouth-sticks from 2 to 4 feet. According to the kind of fish to be caught, so the sizes of the meshes vary—they range from one-quarter to one inch, knot to knot.

The smaller form ranges from 10 to 15 feet in length of the mouth opening. Only two vertical sticks are used, one at each end. Besides keeping the mouth open they serve as grips for the two men who haul the net to shore after shooting it in as deep water as they are able to reach by wading. As these sticks are from 6 to 8 feet in length, it follows that the depth of the mouth is greater in these nets than in those of the larger (longer) type. The meshes vary from one-eighth to one quarter inch.

SHORE-SEINES.—A shore-seine may be defined as a long length of netting shot from a boat as it is paddled or rowed from the beach and back again in a semicircle having the shore as the chord of its arc, in the endeavour to enclose any fishes that may be in the area within the semicircular course taken by the boat. A long rope, the warp, is attached to each end of the net ; one end is left in charge of a shore party when the boat, loaded with the net, leaves shore ; the other is brought ashore the moment the boat returns to land after shooting the net. The two warps are then hauled in evenly and as quickly as possible until the two ends of the net are brought to land. After that the hauling continues more excitedly, for all fishes within the diminishing semicircle of the net are now trapped and if the net be hauled in properly few should escape. As hauling progresses the enclosed area decreases in size and the horns of the lessening semicircle gradually approach one another. When at last they are brought together, the catch of fish is concentrated in a more or less definite pocket at the centre of the net. This is carried ashore and the catch emptied on the beach for sorting.

Apart from the small *Koru vala* no indigenous shore-seine was in use until the introduction of the great Rampani seine now to be described, and even at the present day its employment is confined to South Kanara.

THE RAMPANI SEINE.—This fine shore-seine is currently believed to have been introduced from Goa some 40 to 45 years ago. The

Portuguese Parish Priests who wield great influence over the Roman Catholic fisherfolk between Goa and Mangalore, in many instances evince much interest in the improvement of fishing methods in use by their parishoners and it is said that the introduction of the shore-seine into South Kanara was due to the initiative of a priest called Father Rampani or Rampini.

The net itself is a typical long-haul shore-seine of splendid catching power in the conditions prevailing in the places where it has become established. Apart from its length it has no special feature of construction. The material of which it is made is Sunn or San hemp (*Crotalaria juncea*) grown for the purpose in the Konkan districts. An ordinary Rampani net measures on an average about 300 fathoms in length; the depth increases gradually from the outer end of each wing, where it is about 6 feet, to 15, 20, and 24 feet progressively toward the centre. The mesh, conversely, decreases from $1\frac{1}{4}$ inch bar at the wings to $\frac{1}{2}$ inch bar in the central region. The increased depth at the centre is given to compensate for the lack of a deep bunt or cod-end; in practice, the depth of the net in this region causes it to become baggy as it is hauled ashore and thus forms an effective substitute.

The cost of a net varies according to length from Rs. 3,000 to Rs. 4,500. To fishermen without capital resources this is an expenditure which can be met only by collective and co-operative action whereby a complete net is the property of a considerable number of fishermen, each of whom contributes from one to four sections or lengths of net. These sections number from 200 to 300 according to the size of the net, and are assembled and laced together every time the net is prepared for operation. A net examined at Malpe was owned by 45 shareholders in varying amounts.

So long and heavy is the net that it requires from 50 to 60 men to haul it ashore and to man the boat which shoots it. Half the proceeds of the catches goes to the owners of the boat and the net, and the other half is divided among the men who do the actual work. Usually these men, the boat's crew and the shore helpers, have each contributed one or more pieces of net; in such instances the system is an ideal one. Co-operative working is, however, not universal. In some instances a capitalist provides both the boat and the net

and requires not only his due share of half the catch or its proceeds but also stipulates that the fishermen's share be sold to him and he takes good care that the price paid is a low one on which he may reckon to obtain additional profit.

The Rampani net is shot only when a shoal of fish is noticed coming close enough to the shore to warrant an attempt to surround it with the net. For this purpose watchmen are stationed on suitable points of vantage in the same way as the "huers" of the Cornish pilchard fishery. As the shoals (sardines and mackerel) are often of enormous size, a successful haul may prove exceedingly profitable. On one occasion I saw a haul of sardines made at Malpe which totalled just over four tons in weight and I heard of another haul made the same day that yielded the almost unbelievable amount of 10 tons! Again, on 20th November 1908, when I visited the fish-curing yard at the same place (Malpe), the officer in charge informed me that nearly 3,000 maunds or 110 tons of mackerel had been delivered in the yard for curing on the day previous—all caught in Rampani seines.

To shoot the Rampani net, a boat of a design wholly foreign to the Malabar and Canarese coasts is employed. It is a small single outrigger called *akada hodi* in the Konkan and *padavu* in Malabar; it hails from the Ratnagiri district of the Bombay Presidency. In size these boats range between 16 and 20 feet in length. The basal part of the hull may consist either of a dugout region with low vertical sides about 3 inches high, or of three planks—a bottom plank and two narrow vertical side planks rabbeted to the edges of the basal one. In both models, sides flaring sharply outwards are added, erected upon the low vertical lateral additions to the flat bottom, in order to give the necessary freeboard. Each side is usually formed of two wide strakes, joined by rabbeted edges. (Pl. XI).

The outrigger is formed of two bamboo booms (*bowkar*), and a float (*uldi*). Proximally the booms cross the hull several feet apart; distally they extend outboard 5 to 5½ feet and to these distal ends is directly attached a light wooden float made of the timber called *muruka* in Malayalam (*Erythrina indica*).

The Spanish windlass (*tangri*) is employed to secure the inner ends of the booms to the gunwales and also to the float, using a

double grommet for the former and a single one for the latter. The grommets or rope rings are made of coir and are tightened, tourniquet fashion, by a rod as twisting lever (Pl. XI).

BOAT-SEINES.—The seine nets which will be described in the following pages are those which are shot and hauled with the help of two canoes operated some distance from the shore. Their operation and design in several characteristics are comparable to those of the Scottish ring-net and the Italian *lampara*, but have their own distinguishing peculiarities.

It is certain that this type of seine has long been indigenous on the Malabar Coast whereas, as we have seen, the large shore-seine, of which the Rampani seine is the conspicuous example, is of comparatively recent introduction. The Malabar boat-seines, of which the *Odam vala* or *Painthu vala* is the most characteristic example, are certainly of very ancient origin. There can also be little doubt that they are developments of the *madi valai* and *thuri valai* used in primitive fashion by the catamaran fishermen of the East Coast of the Madras Presidency. With the greater carrying capacity provided by the large and fine dugout canoes in use on the Malabar Coast, the *madi valai*, after adoption by the fishermen there, has progressed marvellously as well in general dimensions as in complexity; special modifications have also been introduced as experience has dictated, fitting it for particular needs, thereby creating varieties of the central type.

As we follow the variations in the type northwards from the Travancore coast, we find that the dimensions and consequent catching power increase progressively until in South Kanara it attains its maximum size, a fact due to the enterprise and wealth of the capitalist section of the fishing community in that district. Its introduction into South Kanara indeed did not occur until nearly the end of last century. Till then the inshore fishery was all but monopolized by cast-net fishermen, working in fleets of canoes within a range of about three miles from the shore. To-day the use of the coast seine has become so prevalent that the numbers and well-being of the cast-net men have greatly declined; their individual hauls are trivial compared with the wholesale catches made by the *odam vaia*, here called *vai balai*.

The progressive increase in the size of these boat-seines is best assessed by comparison of their cost as we travel from south to north along the coast. In Cochin and South Malabar the pre-war cost as given by Govindan¹ ranged from Rs. 40 to 70 per net; in Central Malabar it ranged from Rs. 50 to 150; in Northern Malabar it rose to Rs. 75 to 175; in South Kanara it varied from Rs. 100 to 200 at Kasargod to Rs. 150 to 270 at Malpe. To-day these rates must be raised by 50 per cent and even more. The price of the large *Kolli vala* is still greater as this net is often made entirely of cotton.

THE ODAM VALA, PERU VALA OR PAINTHU VALA.—The *Odam vala* is the species of boat-seine in most general use and the most typical of its class. The name varies with the locality. In Cochin and Malabar it is known also as the *painthu vala* or *peru vala*; in South Kanara it goes by the names of *vai balai*, *nulu balai*, *mari balai* and *painthu balai*. The name I shall use here for convenience will be *odam vala* as this signifies "canoe-net," a very appropriate term seeing that its operation requires the use of two large-sized canoes (*odam*).

In essentials the net consists of three parts, (a) a rather short, wide-mouthed bag called the *vala*, made of cotton, (b) a coir net-platform, *keezh-vala*, in front of the mouth and forming a continuation of the floor of the bag region, and (c) two long wings, one on either side of the mouth. A short distal section of each wing forms one side to the mouth platform whilst the proximal section of each is much longer and being free constitutes a true wing as in the European otter trawl. The whole net resembles an otter trawl fairly closely if we were to suppose the trawl to be used upside down and the otter boards replaced by a pair of canoes to keep the wings spread. The "platform" of the *odam vala* would then correspond to the "square" or "square lint" in front of the opening into the bag part of the trawl and which in the normal position of a trawl forms a projecting shelf or roof in front of and above the mouth. In the trawl this "square" prevents fish from escaping upwards when disturbed upon or near the bottom over which the trawl is being towed, whereas in the *odam vala* which is used near the surface to catch shoaling pelagic fish, its counterpart slips *below* the shoal and

¹ *Madras Fisheries Bull.*, Vol. IX, 1916.

prevents their escape by swimming downwards. A stout rope, the warp (*kamba*) is attached to the free end of each wing; the other end is aboard one of the canoes.

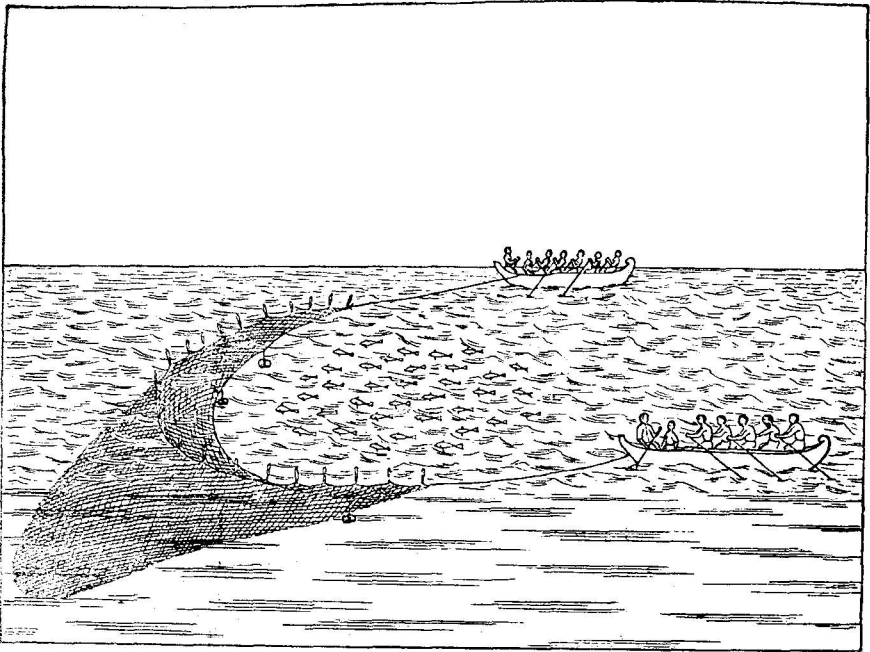


FIG. 17. TWO CANOES HAVING SHOT AN *Odan vala*, ARE ABOUT TO CONVERGE IN THEIR COURSES AND SO TO COMPLETE THE FISHING CIRCLE. DIAGRAMMATIC.

Operation.—Two large canoes are necessary, each manned by a crew of five to seven men. After half the net has been loaded into the stern of each, the two canoes paddle side by side to the fishing ground. If a shoal of sardines or other shoaling fish be seen the boats try to get into position ahead of them; if they succeed in this the boats separate and take a course away from one another and across the course of the shoal; as they do this a man in the stern of each begins to shoot his portion of the net as quietly as possible. Simultaneously the canoes begin to alter their course, so that eventually each completes a semicircle which brings the two together again after the last of the net has been shot. If the manœuvre be successful the shoal is encompassed by the wings which shepherd the fishes into the bag as soon as the “platform” passes below them. (Text-fig. 17). When the canoes come together, the crews begin to haul in the warps and to repile the wings as they come to hand. Eventually the bag is brought up between them

and the catch dipped out into one of the canoes (Text-fig. 18). A few minutes see the whole of the net repiled, half in each canoe, and the men ready to shoot the net again.

Details of the parts.—For many of the following particulars I have to thank Dr. M. Ramaswami Nayudu, who has been kind enough to take measurements of the parts of a typical net at Calicut.

The bag part (*vala*) of the *painthu vala* is made up of three funnel-shaped sections laced end to end. The first and widest of these, forming the mouth section, is termed the *neria vala*; the next is the *anja vala* and the third, the *arakkattu*. To the distal end of the *arakkattu* is laced a blind terminal section, the *vattam*. All these are formed of cylindrical bands (*chutru*), made up of squares of netting (*kandam*) sewn together. Each *kandam* measures 50 meshes each way but the size of the mesh varies with its position in the bag. The length of the bag itself is usually from seven to eight fathoms with a circumference at the mouth of about twenty-five fathoms.

From the *vattam* to the mouth of the bag the rounds (*chutru*) of netting increase gradually in circumference in order to give the

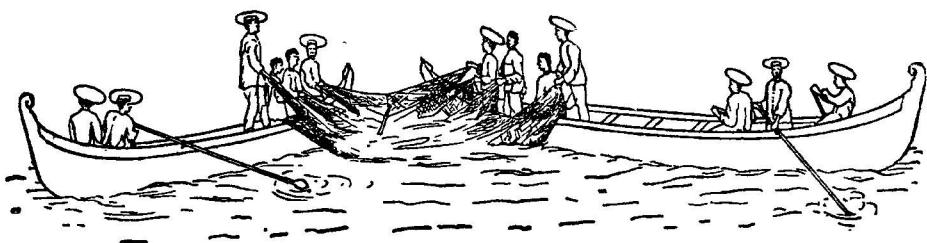


FIG. 18. EMPTYING AN *Odam vala*, AFTER HAULING.

necessary increase in the width of the bag. Each successive *chutru* progressing towards the mouth, contains typically four more *kandam* squares than the one distal to it, but deviations from this rule may occur. In all, the number of *chutru* rounds varies between 16 and 19. To allow for the necessary taper, triangular gussets or gores (*thelu*) are inserted where necessary.

1. *Vattam*.—The terminal blind end, the *vattam*, consists of (a) a rectangle (*modu* or *modu vattam*) of nine squares or *kandams*, three by three; this which is considered the first *chutru* is encompassed by (b) the second *chutru* made up of twelve *kandams* formed

into a slightly funnel-shaped cylinder by the insertion of a gore or *thelu* between each set of three *kandams*. Each *thelu* is actually half of a *kandam* and is of triangular shape. Lastly, (c) a wider oral circle or round composed of 24 *kandams*, forming the third *chutru*. The mesh throughout the *vattam* is 15 inch bar, made either of 10-ply No. 10 cotton thread, or of 10 to 20 ply of No. 20 thread.

2. *The Arakkatti section* is formed of the fourth and fifth rounds, containing respectively 32 and 40 *kandams*. The former has meshes of 18 inch bar, of 8-ply No. 20 cotton, the latter's mesh is 2 inch bar, of 6-ply cotton of the same number.

3. *Anja vala* is made up of four rounds of netting containing respectively 52, 64, 72 and 72 squares of net. The mesh of the sixth round is 2 inch bar; that of the other three rounds is 25 inch. All are of 4-ply No. 20 cotton.

4. *The Neria vala or mouth section* forms the widest and longest region of the bag; it consists of ten rounds or *chutru*. The two distal ones are composed of 72 *kandams* each, the four median ones of 76 each and the two proximal of 80 each. Of the outermost or 19th. *chutru*, 20 *kandams* go to form the *mevala* or roof of the mouth, while the remaining 60 *kandams* go to the *keezhvala* forming its floor and sides. The mesh throughout is 25 inch made of 4-ply, No. 20 cotton.

The mouth is finished off and strengthened by an inner selvage (*madangu*) of three full meshes cotton cord, 12 to 16-ply, No. 10 gauge, and by an outer one (*allu*) one full mesh wide of coir yarn. The *madangu* mesh is 75 inch bar where joined to the *mevala* and 5 inch where it margins the *keezhvala*. The *mevala allu* is of 6 inches bar, the *keezhvala allu*, 12 inches bar. Three meshes of the inner selvage go to one of the outer coir selvage in the *mevala* region, while eight of the inner are netted to one outer in the *keezhvala* region.

The *neria vala* section of the bag is finished off by the reeving of a strong coir rope, the *puram*, through the meshes of the *allu selvage*.

The rest of the net forms the *thattu* and is made of coir. It is divided into the platform section and the free wings.

The platform section consists of a wide floor, the *thattu keezhvala*, bordered on each side by a curved vertical wall, the *kachuvala*. The coir keezhvala is approximately 60 feet long, the kachuvala, 68 feet, so some 8 feet of the latter form a free prolongation on each side ; to these are laced the outer ends of the wings.

Mesh of the kachuvala, 8 inches bar ; of the keezhvala, 9 inches but this is compensated for somewhat by the coir twine in the latter being slightly thicker than in the former. The keezhvala is made of two longitudinal strips of netting laced together down the centre of the floor at the time the parts of the net are assembled for fishing.

The wings, *kadangani*, are each about 27 fathoms in length. Each is made up of three pieces, *madakku*, respectively 35, 30 and 25 meshes deep, the size of mesh increasing as we progress from the mouth of the bag towards the free ends of the wings, where the meshes are about 3 feet bar. The reason for this great size of mesh is that these wings are mere guides or leaders, the equivalent of the scare lines used in primitive types of nets, intended to direct fish towards the mouth of the bag which forms the net proper. Along both the head and the foot of the wing netting runs a stout coir rope, again called the *puram* ; the foot-rope is continuous throughout for it is reeved through the selvage of the *thattu keezhvala* and *kachuvala* so connecting the lower margins of the wings across the lower border of the bag-mouth.

A stout warp, the *kamba*, is made fast to the *puram* at the free end of each wing.

Floats and Sinkers.—Two large wooden floats, *valia ovu*, are attached to the head rope at each corner of the mouth of the bag. Between these are a number of smaller ones, the median one the largest. Eleven or twelve small floats, *cheria ovu*, are tied on along the free edge of the side walls (*kachuvala*) of the platform, and two more large wooden floats at a wide interval on the headrope of each wing.

On the foot-rope a big stone is tied at each corner of the platform. Two others are attached directly below the position of the large floats on each wing head-rope.

When the net is not in use the bag part is detached from the platform and wings. The *thattu* sections, made of coir, may also be

divided into sections along the longitudinal suture of the platform. The various parts usually belong to different fishermen who contribute their portion whenever the net has to be assembled.

Usually the cotton part of the net is tanned at intervals of a fortnight or one month according to the owners' discretion and the amount of usage.

VAKKU VALA.—This is a coarser edition of the *painthu vala*. So closely related is it that, as it requires two of the largest size canoes for its operation, it is also sometimes termed an *odam vala*. Each canoe requires a crew of seven or eight men.

Its conspicuous differences from the *painthu vala* are (a) the substitution of hemp (*vakku*) for cotton as the material for the bag, and (b) an increase in the size of the meshes in the corresponding parts. It is used to capture large fishes such as *kora* (*Sciaena aquila*), big catfishes and the like, and for this purpose a specially strong twine is requisite, while larger meshes are an advantage in lightening the weight and thereby enabling a larger net to be handled with the same ease as the smaller *painthu vala* (See Text-fig. 19).

The details of the various parts may be tabulated as follow for comparison with those of the *painthu vala* :—

The bag consists of three parts, *vattam*, *anjamalu* (or *arakattu*) and *murru vala*.

The *Vattam* has a terminal modu (= 1st chutru) consisting of a central area made up of two ordinary kandams and one double-sized one. This square is encircled by two ordinary tapered cylindrical chutru (2nd and 3rd) having 8 and 16 kandams respectively, with the necessary gores at the corners to give taper.

The *Anjamalu* is in turn made up of the third and fourth chutru of 20 and 24 kandams respectively.

The *Murru vala* consists of four chutru made up of 28, 32, 36 and 40 kandams each.

A one-mesh selvage (allu) of coir borders the proximal end of the *murru vala* ; mesh, 4-inch bar.

The mesh of the *vattam* is 5-inch bar, made of 6 to 8-ply coarse hemp. The *anjamalu* is of 5-ply hemp, 7-inch bar, while the *murru vala* is of 4-ply hemp, of 8 or 9-inch bar.

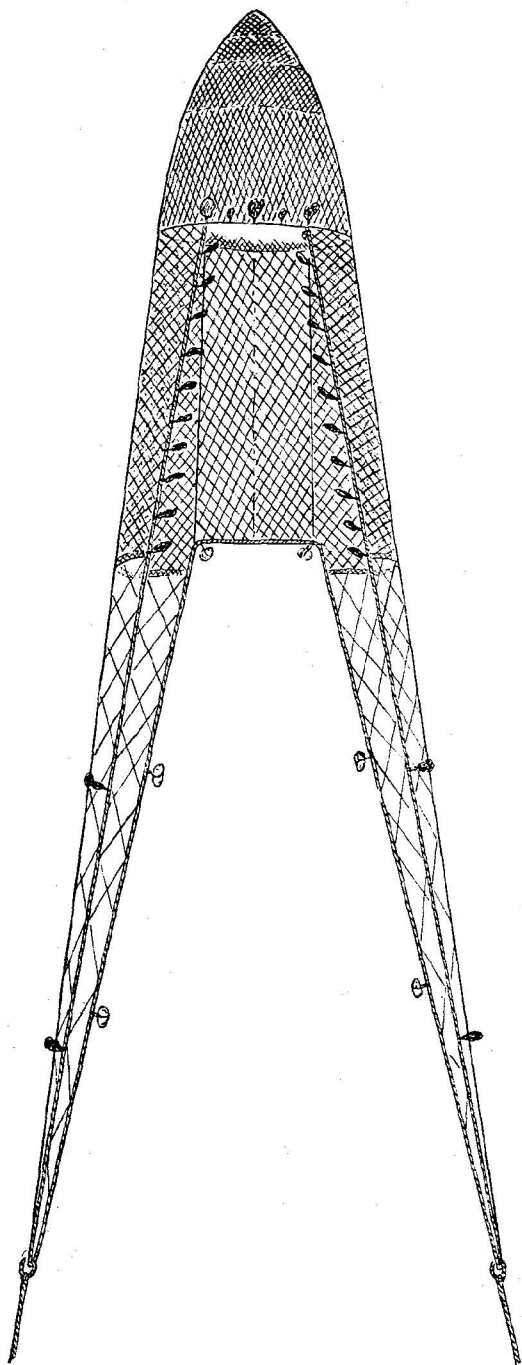


FIG. 19. DIAGRAM OF A *Vakku vala*.

The lengths of the bag, platform and wings are the same as in the *odam vala*.

The head and foot ropes and the number and arrangement of the floats and sinkers are identical with those of the true *odam vala* except that they are larger. The float at the middle of the mouth is particularly large—about 1·5 ft. long by 6 or 7 inches in diameter. It is made of the light *kurrukan* wood; the smaller floats are rod shaped, 1·5 ft. long with a diameter of 1·25 to 1·5 inch, cut from branches of *kamutti*.

When not in use the net is divided longitudinally into two halves, which usually belong to different individuals.

KOLLI VALA the "*Killer-net*".—This net found in two varieties, the *mathikolli vala* and the *ailakolli vala*, is employed solely for the capture of small shoaling fishes, particularly for sardines (*mathi*) and the small mackerel (*Aila microlepidotus*), as is indicated in the names of the two varieties. Both have the same general design as the *odam vala* but differ therefrom in two important particulars: (a) the platform and its sides are of small-mesh of cotton in place of coir while (b), the wide-meshed wings are quite short—less than one-third the length they have in the *odam vala*.

Mathikolli vala.—The parts of the bag are almost identical in form and arrangement with those of the *odam* or *painthu vala* except for variation in the mesh sizes. The relative proportions, etc., of average examples of the two kinds of net are as under but it must be remembered that there are wide local variations in all dimensions even in the same locality due to the personal predilection of different fishermen (See Text-fig. 20).

	Odam or painthu vala	Mathikolli vala.
Length of bag	8 fathoms.	6 fathoms.
„ of platform	11 „	12 „
„ of wings	25 to 27 fathoms.	8 „
Meshes of bag (bar)	15 to 25 inch.	2 to 3 inch.
„ of platform (bar)	7 to 9 inches.	3 inch.
„ of wings (bar)	1 to 3 feet.	1 to 2½ feet.

The net is operated in nearly the same way as the *painthu vala*; two large canoes with crews of 7 or 8 men are needed. Owing to the shortness of the wings the net can be shot more rapidly than the *painthu vala*; this in turn requires all the manoeuvres to be effected more expeditiously if the haul is to be successful. Any slowness

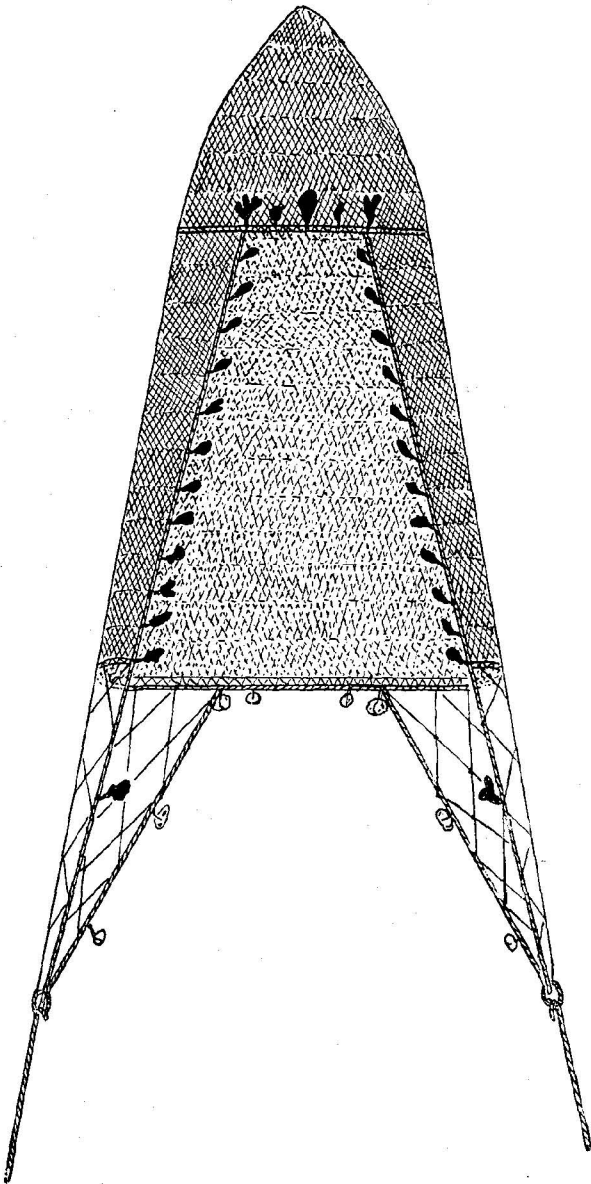


FIG. 20. DIAGRAM OF A *Kollivala*.

or miscalculation of distance or premature scaring of the shoal, spells failure. To avoid this mischance it has long been customary to employ a number of accessory small canoes, each manned by two or three men, to head the fishes towards the mouth of the net by frightening them by making use of every imaginable means for producing noise and disturbance. The most favoured devices are to beat on the sides of the canoes with sticks and to hurl stones tied to the ends of ropes, bolas-fashion, into the water near the fishes. The noise and splashing thus made are extremely effective and this net, when so used, well deserves its name of "killer" (*kolli*). Complaints on the part of other classes of fishermen against this procedure are bitter and many have been the petitions to Government praying for its prohibition.

Local statements are to the effect that it was introduced from the Bombay coast at the end of last century but this is uncertain. That it is of local invention is equally likely.

Aila kolli vala is similar in general design, but as it is used to catch larger and stronger fishes the netting is made of rather larger meshes and the whole of the bag, with the exception of the mouth section, is made of hemp twine. The meshes vary from .3 to .5 inch-bar. The peripheral section of the mouth, consisting of a cylindrical band about a fathom broad, is usually of cotton; mesh, half inch bar.

The *kolli* which is the term given to the platform and its sides is of cotton as in the *mathi kolli vala*, with meshes of about half inch bar, but differs in the way the margins are finished off. In both there are two bands of strengthening selvedges as is general in all these bag-nets, the inner or *madangu* of cotton, the outer or *allu*, of coir, but in the *aila kolli* the *allu* is two full meshes wide or double the width of that in the *mathi kolli*.

Unlike the *mathi kolli vala*, no small accessory canoes are employed to drive fishes toward the mouth of this net.

SULTAN VALA.—This is a small bag-net combining the features of the *Painthu vala* and the *Kolli vala*. The bag region is of cotton as in the former and of similar shape, whereas the platform region is in two sections, a distal one, the *kolli*, and a proximal, the *kachu vala*, made respectively of cotton and coir. The *kolli* is

approximately double the length of the kachu vala. The wings are of coir and in length relatively longer than those of the kolli vala, but shorter than in the painthu vala.

Approximate dimensions are—

	Length in cubits.	Mesh (bar) in inches.
Bag (vazhikkattu or vaikkattu).	9	1/5 to 1/4
Cotton platform (kolli) ...	7½	1/4
Coir platform (keezh vala) ...	4½	8
Wings (kadangani)	18	12 and upwards.
Warp (kamba)	40

The width of the mouth of the bag between the points where the side walls of the platform meet it, is about 8 cubits.

Floats.—A large float is attached at each corner of the mouth with another midway between. Another is attached on each side at the junction of the kolli with the kachu vala.

Sinkers.—Stone sinkers are hung from each footrope at the point where the lower corner of each wing meets the coir platform and one (or two) at intervals along the lower margin of each wing.

To operate the Sultan vala two medium-sized canoes, each manned by three or four men, are used, generally quite close to the shore. Prawns and small fishes form the bulk of the catches.

Numerous other varieties of boat seines occur, characterized by some difference in the relative sizes of the several parts and as the same nets often go by different names in different localities, it is impossible, without extending this account to inordinate length, to attempt an exhaustive description. Similarly it must be remembered that the measurements of the nets as described, are taken from individual nets and that the dimensions of certain of the parts of others of the same kind may differ considerably.

DRIFT-NETS.

This class of nets is in general and extensive use on the coasts of Malabar and South Kanara. Except the two kinds used by Ratnagiri fishermen in their fine sailing machwas, all the

others are shot from quite small craft—dugout canoes and flat-bottomed, plank-built boats developed from the dugout (See Text-fig. 21).

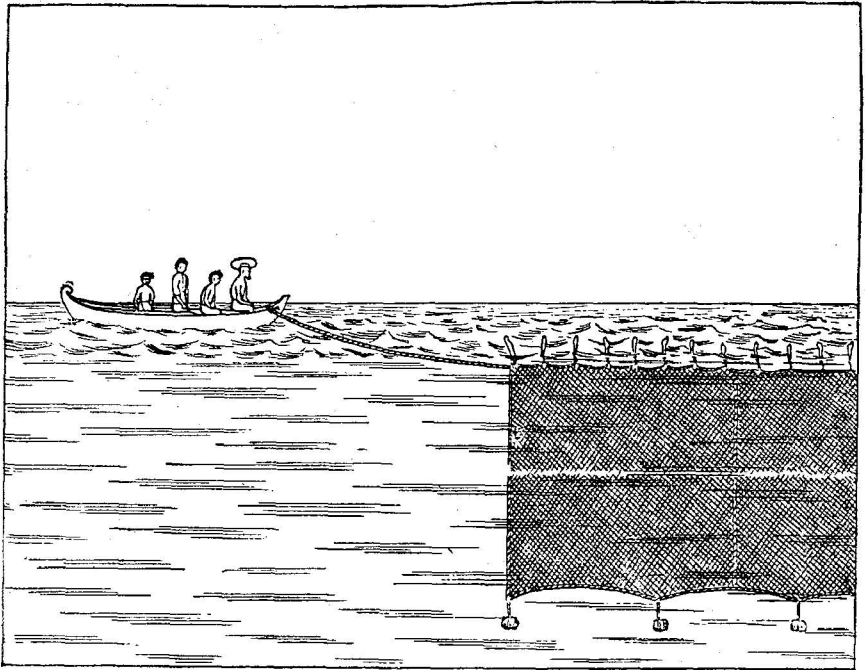


FIG. 21. DIAGRAM TO SHOW HOW A DRIFT-NET HANGS IN CURTAIN FASHION AFTER BEING SHOT. NOTE THE LONG WOODEN FLOATS ALONG THE HEAD ROPE AND THE STONE SINKERS SUSPENDED FROM THE FOOT-ROPE.

Compared with those employed in Europe and America, the dimensions of these nets are small. The following are representative of those used in Malabar :—

Name of net.		Mesh (bar).	INCHES.	A fleet of these nets usually runs to 8 to 10 pieces.
Kandadi vala	2 to 2½		
Odu vala	2½ to 3		
Nariyan vala	4		
Sravu vala	5 to 8		
Thirandi vala	6 to 9		

Other local names and varieties are *Kai vala* (4" bar), *Kora vala* (4" bar) and *Muppiri vala* (2½" bar). *Ozhuku vala* appears to be a generic term in some parts of Malabar for certain kinds of drift nets, while in others it applies to one special kind having a mesh of 5-6 inch bar.

In South Kanara the same varieties of drift-nets are generally in use. In the southern section of the district, the Malayali terms are in use with "*vala*" giving place to *balai*; in the north, where Malayali influence is weak, drift netting is less important, apart from that practised by the Ratnagiri men. It would seem, therefore, that the old types of drift nets in use in S. Kanara are due to borrowing from Malabar.

The chief drift nets in use in South Kanara are—

Name.	Mesh (bar). inches.
Kandadi balai	2 to 3
Acha balai	2½ to 4
Aiburla balai	2½
Kai balai	4
Shoraku balai	6

Offsetting the relatively small use made of local drift-nets in South Kanara except in the southern villages where Malayali influence dominates fishing methods, is the use of long fleets of large-meshed drift-nets by seasonal visitors from Ratnagiri and Rajapur, who come to Mangalore and Malpe in the fair weather period from October to March. Two fisheries are prosecuted by them; the more important lasts from October to the end of November for medium-sized fishes, principally seer, bonito, palamin, catfishes, etc., by means of the small *vavurijala* (usually corrupted into *vowuri*), having a mesh of 4½ inch-bar, shot from small, open sailing boats. The other is prosecuted with larger boats for sharks and rays and for this the season lasts from January until March, inclusive.

For a detailed description of the indigenous types of drift-nets and also of the Ratnagiri *vavurijala*, see my "Report on the Results of a Fishery Cruise along the Malabar Coast and to the Laccadive Islands in 1908," in the *Madras Fisheries Bulletin*, Vol. IV, 1910, pp. 63-64 and 80-86.

All the abovementioned drift-nets are made of hemp and are tanned at such intervals as are considered necessary.

GILLING NETS.

Although drift nets are usually gilling nets, there are certain gill-nets which are not drift-nets. Those in use on the Malabar and Kanarese Coast comprise two varieties of a floating gill-net, the *Chala vala*, and one anchored gill, the *Kantha* or *Kanda balai*.

CHALA VALA.—The two varieties of this net, known respectively as *aila chala vala* and *mathi chala vala* in Malabar, are used as the names indicate for the capture respectively of mackerel (*aila*) and sardines (*mathi*). Unlike drift-nets, these are operated only when shoals come into inshore waters for the canoes used are of small size, manned by two to four men. The mesh of the *aila chala vala* varies from $7/8$ to 1-inch bar; a net section usually measures 8 to 10 fathoms long by 5 to 6 fathoms in depth in Malabar, increasing in South Kanara (where it is called *patti balai*) to a length of 12 fathoms and with a depth of 5 to 6 fathoms.

The *mathi chala vala*, with a mesh of $3/8$ to $5/8$ -inch bar, ranges in length from 6 to 15 fathoms, with a depth of 2 to 3 fathoms.

Both are made of cotton thread, No. 10 gauge.

The ordinary method of operation which is the same for both nets, is as follows:—Two canoes are the minimum required but a larger number may combine. In the case of two canoes, each takes aboard from 6 to 9 pieces of net, laced end to end; to these wooden floats are attached at intervals along the head-rope, while small stone sinkers are tied on similarly along the foot-rope.

Leaving shore, the head fishermen watch for indications of a shoal; as soon as one is seen, the two crews lace together their two sets of nets and manœuvre for position. On a concerted signal they separate and, rowing rapidly on opposed semi-circular courses, endeavour to enclose the shoal or part of it within a ring fence of netting. If this be accomplished satisfactorily, the fishermen let loose a pandemonium of noise; they hammer on the sides of the canoes with hands and sticks, yelling like demons possessed; wherever the frightened shoal may rush the men pursue them with showers of stones, often tied bolas-like to the ends of cords, making the water boil under the fusillade and splashing. Terrified, the fish scatter in flight in every direction, only to gill themselves in the surrounding wall of net.

When more than two canoes are employed, they operate in a similar manner, joining all their nets into one great length. Sometimes boys are in attendance in small dugouts, charged to add their quota of noise once the shoal be encircled, a duty they perform with immense enthusiasm.

Owing to the noise made by beating and splashing during the fishing operations, these nets are also called *Thattu vala*. From time to time fishermen who employ other methods of fishing, petition for their prohibition, alleging that the terrific din scares all manner of fish away from the coast to the grave detriment of what they call the legitimate methods of fishing. In some instances as at Cannanore, Tellicherry and Tanur, the fishermen's panchayats have themselves forbidden the use of these nets.

Originally the two kinds of *chala vala* were used as ordinary drift-nets ; the encircling device, combined with the *thattu* procedure, are said to have been introduced by fishermen from the Bombay coast about 1890. Of this I am doubtful as I believe this method of fishing is not practised there. The noise and the disturbance common to the operation of both the *chala vala* and the bag-seine called *kolli vala* are due, more probably, to local invention.

KANDA BALAI.—This is an anchored gill-net used on the South Kanara coast, chiefly between Malpe and Hosabettu. The usual length when set is about 300 feet, made up of a number of net lengths each from 45 to 75 feet long, with a depth of 6 to 9 feet ; the mesh varies between $1\frac{1}{2}$ to 3 inches bar.

It is set in comparatively shallow water being anchored in position by heavy stones on the foot-rope ; it is also said that a pair of pole struts are sometimes attached at their upper ends to the head-rope at the ends to assist in holding the net from displacement. Coconut husks and bamboo joints are used to float the head-rope.

The fishermen go out a little before sunset to set it ; it is left all night and raised only at sunrise, when the owners haul it and remove any fish that may be gilled.

Material : hemp.

INDEX

	PAGE		PAGE
Acha balai	63	Hand dip-nets	33
Aiburla balai	63	Hand-lines	17
Ailakolli vala	60	Hand-seines	46
Ampalli	4	Harpoons	4, 39
Angling	17, 40	Hunting bows	5
Arippu vala	25	Intercepting barriers	22
Ayiram chundu	40		
		Kai balai	62, 63
Backwater fishing	4	Kai chunda	17
Barriers	22, 23	Kola vala	38
Basket traps	18	Kolli vala	58, 65
Beppu	40	Kambu vala	33
Blowguns	10	Kanda balai	63, 65
Boat seines	46, 50	Kandadi vala	39, 62
Bow, The fishing	5	Kannillatha kurithi	20, 21
Bush fishing	23	Kannitta kurithi	21
		Kantha balai	63
Catamarans	1, 2, 3	Kattum vala	43
Cast-nets	26, 43	Konda valai	28, 29, 46
Chala vala	63, 64	Kora vala	62
Changadam	26	Koru vala	28, 46
Changalapayikkal	26	Kudu	18
Chattuli	4, 39	Kuzhi valai	29
Chavittu vala	25	Kurukkumadi	2
Cheena vala	33		
Cheria beppu	40	Lampara	50
Chinese dip-net	33	Long-lining	40
Crocodiles, Baiting for	18		
Crossbows	6	Madi valai	2, 50
		Mari balai	51
Deb balai	46	Mathi chala vala	64
Dip-nets	33	Mathi kolli vala	58
Drag-nets	28	Mupalli	4
Drift-nets	38, 61, 63	Muppiri vala	62
Earthen barriers	22	Nakulla kurithi	21
Endi balai	25	Nariyan vala	62
		Net-fishing	24, 42
Filter traps	20, 30	Nulu balai	51
Fishing bows	5		
Fish-spears	4	Odam vala	42, 50, 56
		Odu vala	42, 62
Gilling nets	63	Ola vala	29
Gorati balai	29	Ottal	19
Goru balai	28, 46	Ozhuku vala	62

	PAGE		PAGE
Painthu vala	50, 56	Tangle-nets	42
Parangi pathi	6	Tellikanni vala [†]	28
Pari	21	Thattu vala	23, 42, 65
Patti balai	64	Thettal	5
Pattu kanni vala	28, 29	Thirandi vala	62
Peru vala	43, 51	Thumbitan	10
Plunge-basket	19	Thuri valai	50
Rampani seine	42, 47	Trammels	42
Rod-and-line fishing	17	Trapped bunds	22
Scare lines	24	Traps	18
Screen barriers	22	Trawls	2, 42
Seines	46	Uli	39
Shoraku balai	63	Vadi vala	28, 46
Shore-seines	46, 47	Vai balai	43, 56
Sieve-nets	25	Vakku vala	56
Sickle	17	Valia beppu	41
Sravu beppu	41	Valu vala	30
Sravu vala	62	Vattu vala	25
Stake-nets	30	Vavurijala	63
Stringed cast-net	44	Vella vala	24
Stringless cast-net	43	Vichu vala	26, 42, 44
Sultan vala	60	Vowri	63
Surf-casting	40	Whiffing	40
		Yenda balai	25

LIST OF ILLUSTRATIONS.

TEXT-FIGURES.

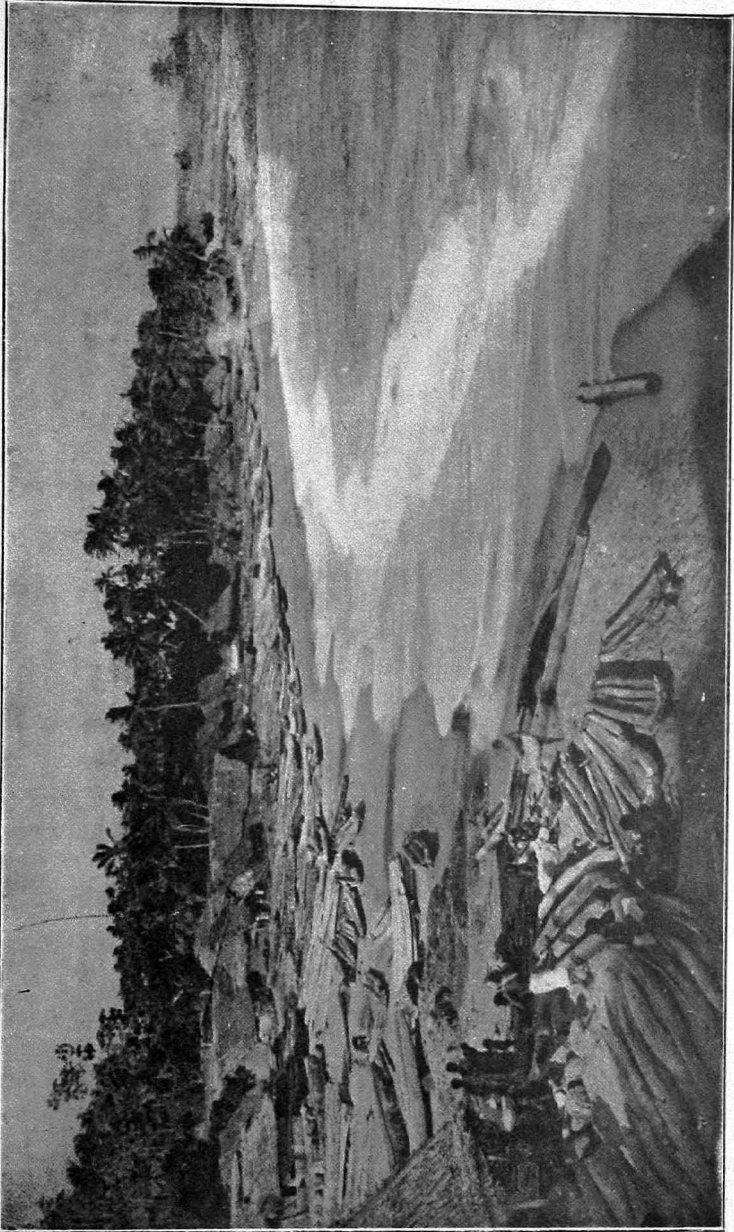
- Fig. 1. Diagram of a Kurukku madi, Southern Travancore.
- „ 2. A pellet-bow (Thettal) adapted for shooting fish with a barbed arrow, Malabar.
- „ 3. Outer ends of three varieties of the compound bow of the Malayali crossbow. In A two leaves are employed ; in B and C four. In B the two middle leaves are tapered and shorter than the outer ones.
- „ 4. Details of the trigger (B and B¹) and wheel-nut (A and A¹) of a Malayali crossbow. A and B are seen in perspective ; A¹ and B¹ in section.
- „ 5. Two types of the Malayali crossbow. 5 A is from Arathinkal, Travancore and for the sake of clearness the arrow groove and line-holder are omitted. 5 B is from Valapad, South Malabar ; the bow is coarsely made and the stock longer than in the other.
- „ 6. Varieties of crossbow arrows used in South India. A is a bird bolt, B and E the forms of fish arrow in general use, C and D being rarer varieties of the same.
- „ 7 to 11. Varieties of the mouth-piece of the Malayali blow-gun. Fig. 7 is a plain reed tube without any added parts. In Fig. 8 the mouth-piece is a disc of coconut shell ; in Fig. 9 it is turned out of wood. In Figs. 10 and 11 it is built up of several layers of gummed cloth painted over. The butt end of Fig. 11 is ornamented with bands of yellow and red on black. The barrels of all are made from the stems of the *ita* reed.
- „ 12 to 14. Fig. 12 is a very massive blow-gun in the Trichur Museum, Cochin. The butt end is encased in a turned brass mouth-piece cap. The barrel is spirally wound with strips of fibre, painted black. Fig. 13 is the end of an old blow-gun from Valapad, South Malabar, made of wood and spirally wound with animal membrane. Fig. 14 is the retrieving hook on the muzzle of the Trichur blow-gun.
- „ 15. The Malayali blow-gun harpoon dart. Fig. 1, shows it ready for use, with the line neatly wrapped around the shaft ; Figs. 2 and 3 give details—(b) the barbed steel head ; (c) the mop-like wad, its base not yet pulled down into the cavity within the head of the shaft. Fig. 3 shows the head in longitudinal section with the oblique perforation through which the cord is passed.

- Fig. 16. Fishing for sardines with the stringed cast-net, Malabar. Diagrammatic.
- „ 17. Two canoes having shot an *Odam vala*, are about to converge in their courses and so to complete the fishing circle. Diagrammatic.
- „ 18. Emptying an *Odam vala*, after hauling.
- „ 19. Diagram of a *Vakku vala*.
- „ 20. Diagram of a *Kolli vala*.
- „ 21. Diagram to show how a drift-net hangs in curtain fashion after being shot. Note the long wooden floats along the head rope and the stone sinkers suspended from the foot-rope.

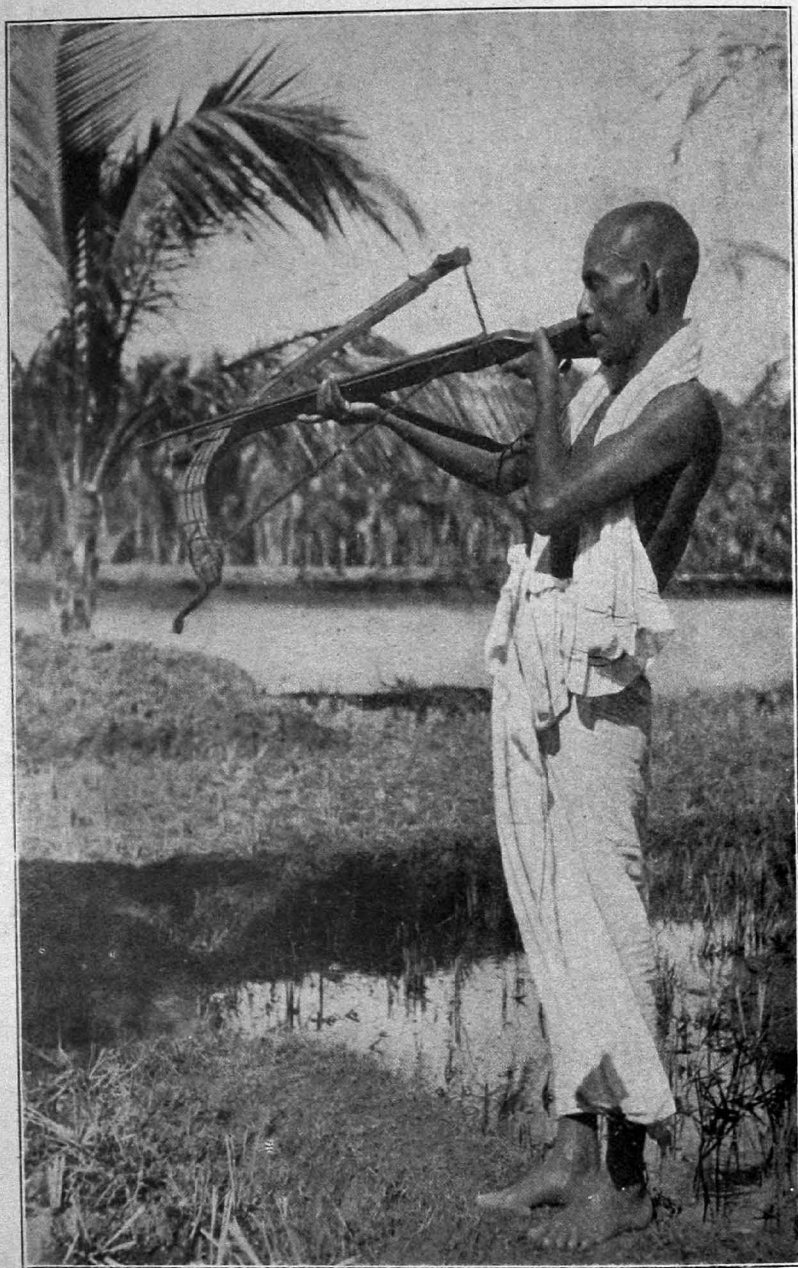
PLATES.

- Plate I. A Travancore fishing village near Cape Comorin.
- „ II. A Malayali aiming at a fish with his crossbow.
- „ III. Basket traps, Malabar. In the centre is a Palghat *ottal* or plunge basket ; on the left is a *Kannillatha kurithi* and on the right a *Nakulla kurithi*—these two are usually used in conjunction.
- „ IV. A screen barrier or *Thattu vala*, Cochin backwater.
- „ V. A half hoop net or *Chavittu vala*, Cochin backwater.
- „ VI. The *Changalapayikkal* or *Changadam* method of fishing, Chetway.
- „ VII. Two Chinese balanced Dip-nets, Cochin.
- „ VIII. A Malayali fisherman at the stern of a fishing dugout. Note peculiar steering paddle.
- „ IX. Throwing a Cast-net, Malabar.
- „ X. Malayali fishing canoes and fishermen, Beypore river.
- „ XI. A Rampani outrigger canoe (*padavu*).

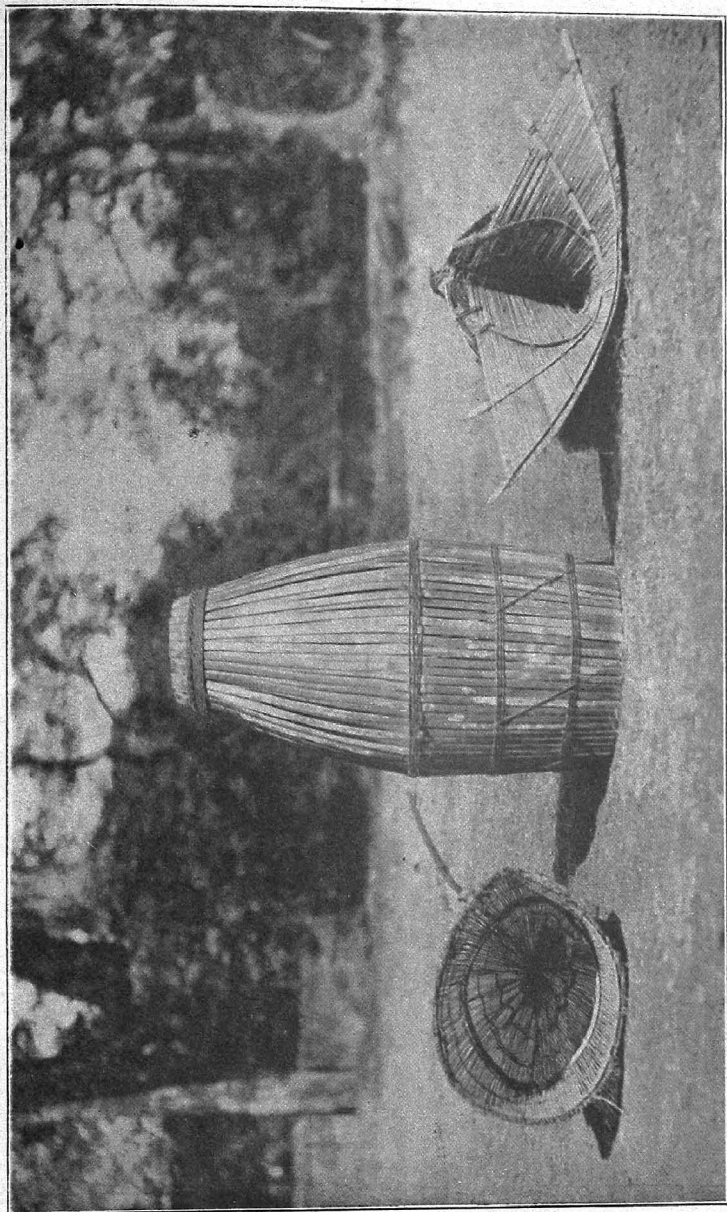
(Photographs by J. Hornell.)



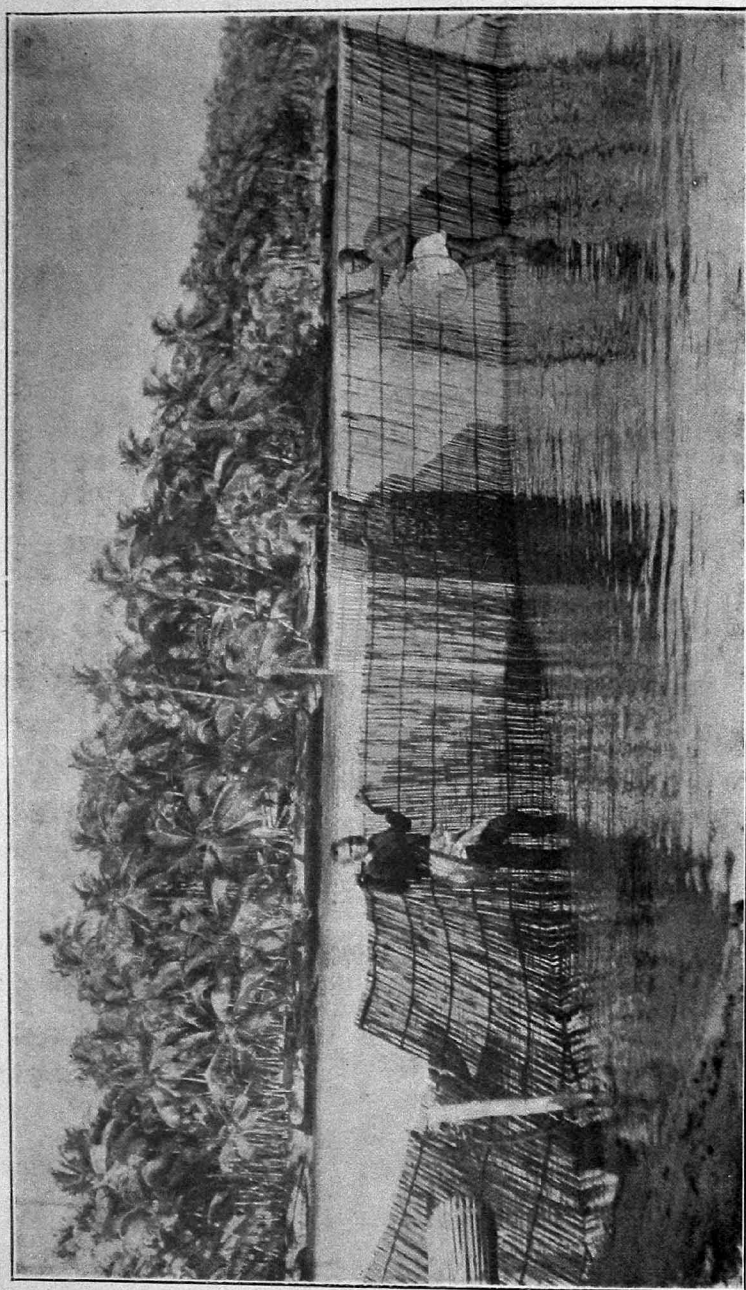
A TRAVANCORE FISHING VILLAGE NEAR CAPE COMORIN.



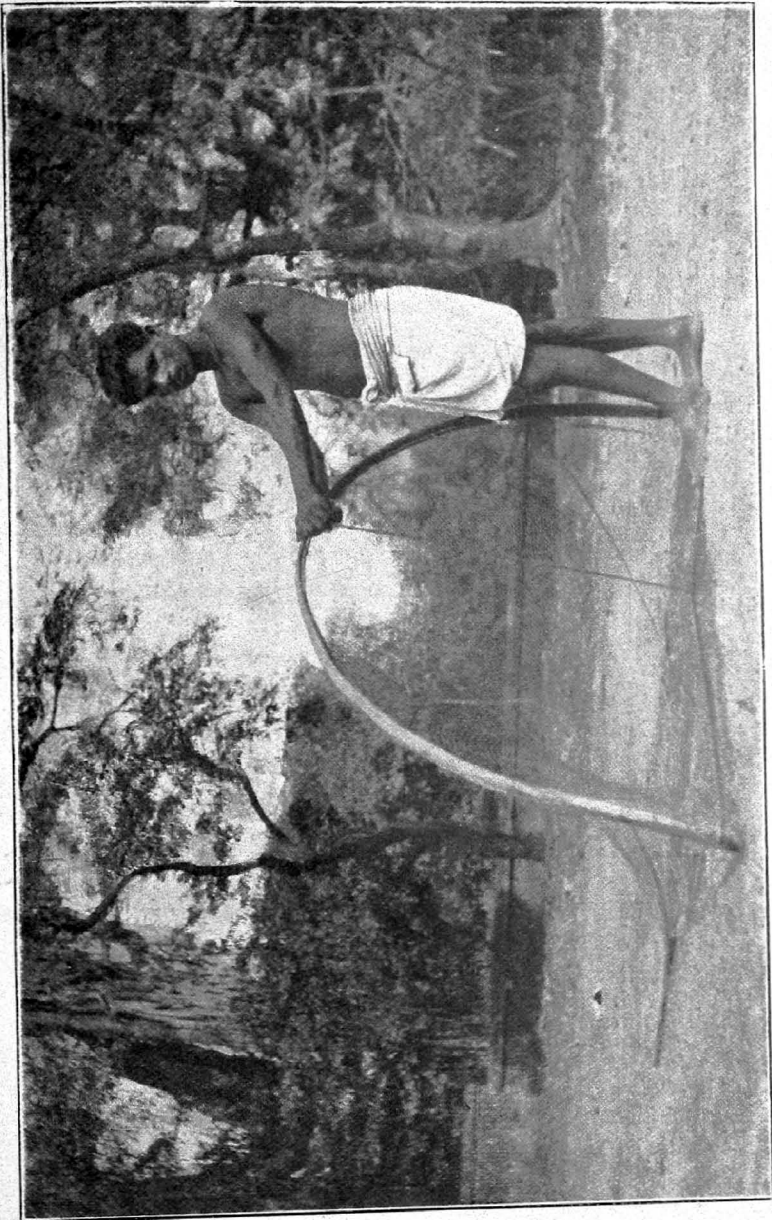
A MALAYALI AIMING AT A FISH WITH HIS CROSSBOW.



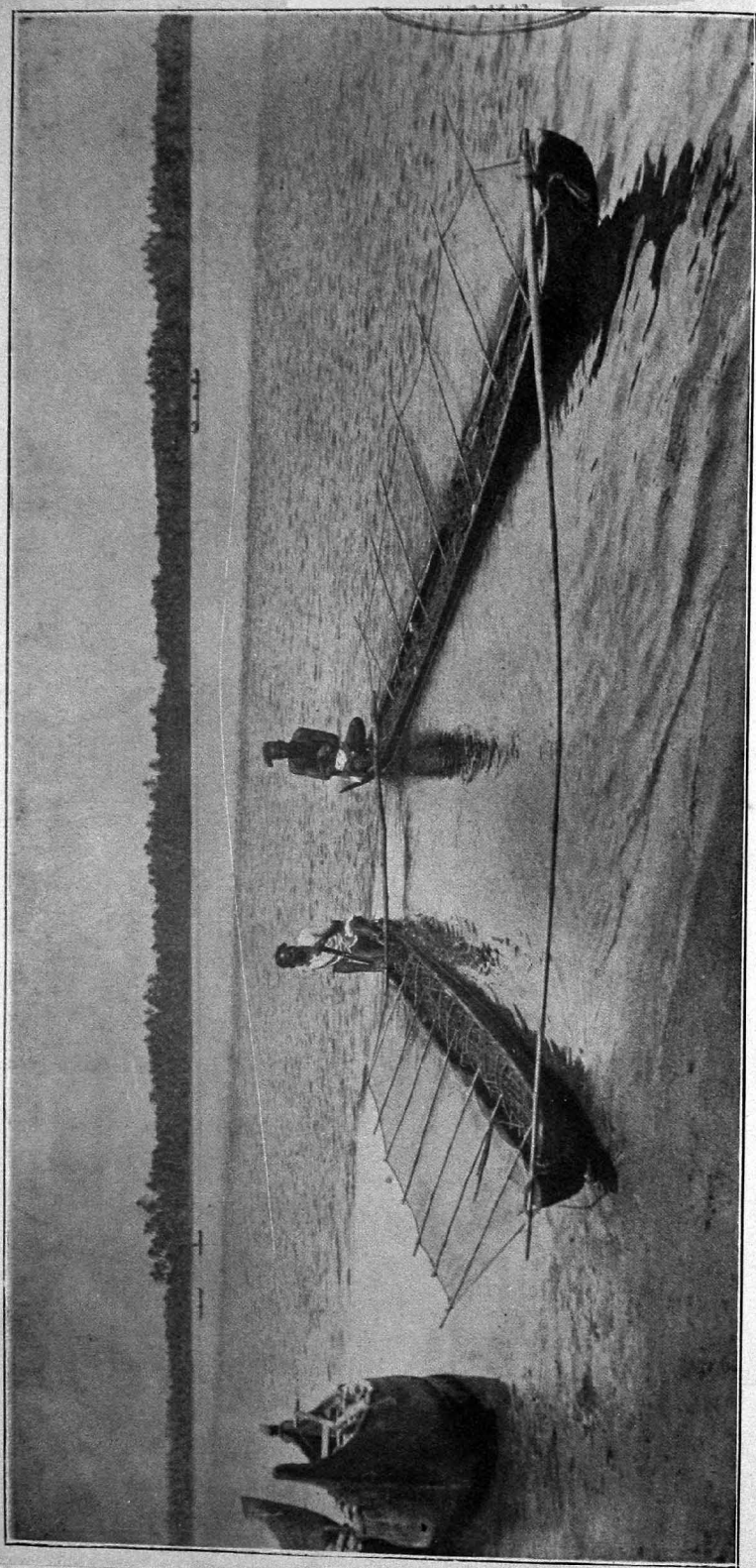
BASKET TRAPS, MALABAR. IN THE CENTRE IS A PALGHAT *ottal* OR PLUNGE BASKET; ON THE LEFT IS A *Kannillatha kurithi* AND ON THE RIGHT A *Nakulla kurithi*—
THESE TWO ARE USUALLY USED IN CONJUNCTION.



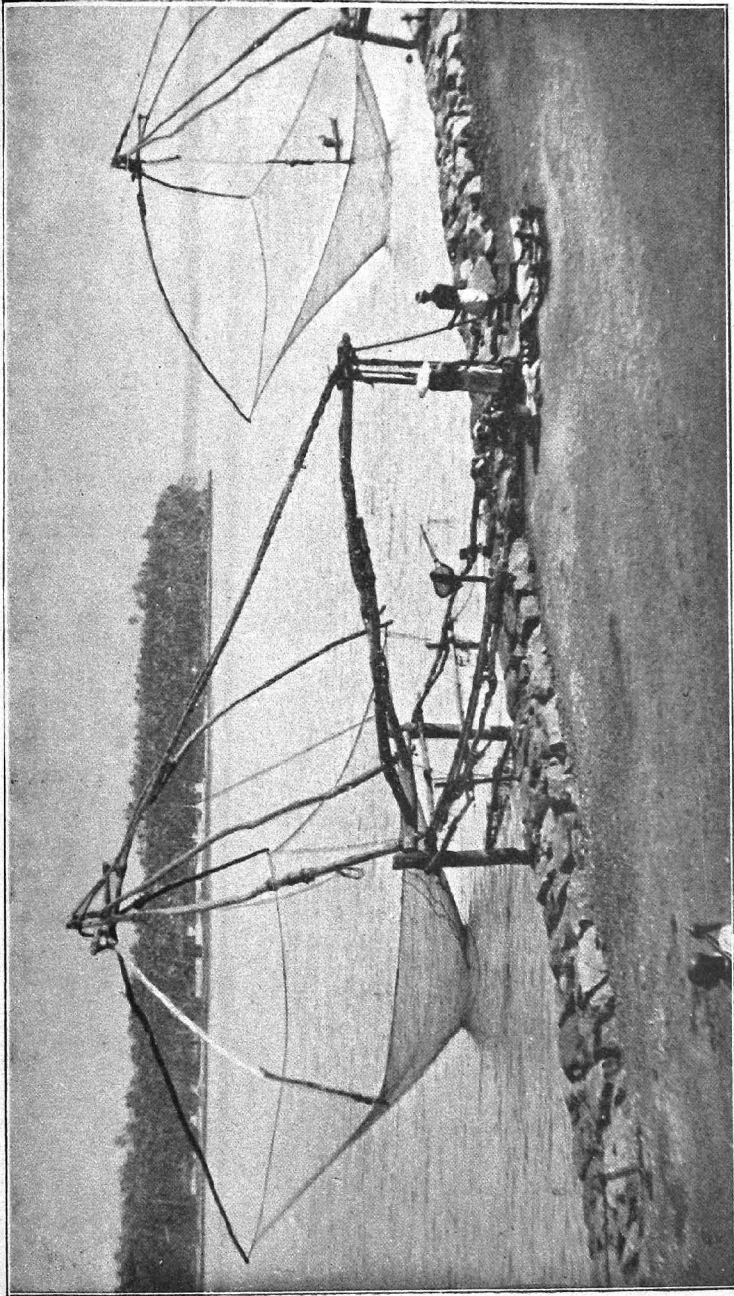
A SCREEN BARRIER OR *Thattu vala*, COCHIN BACKWATER.



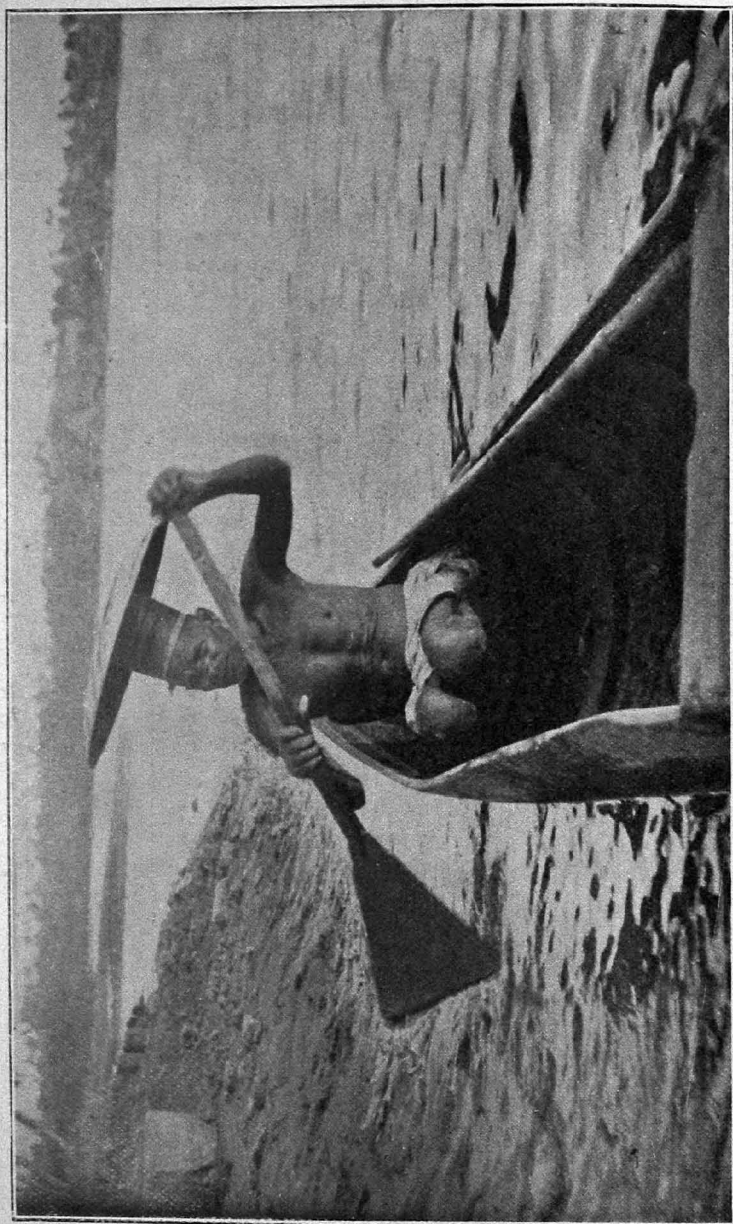
A HALF HOOP NET OR *Chavittu vala*, COCHIN BACKWATER.



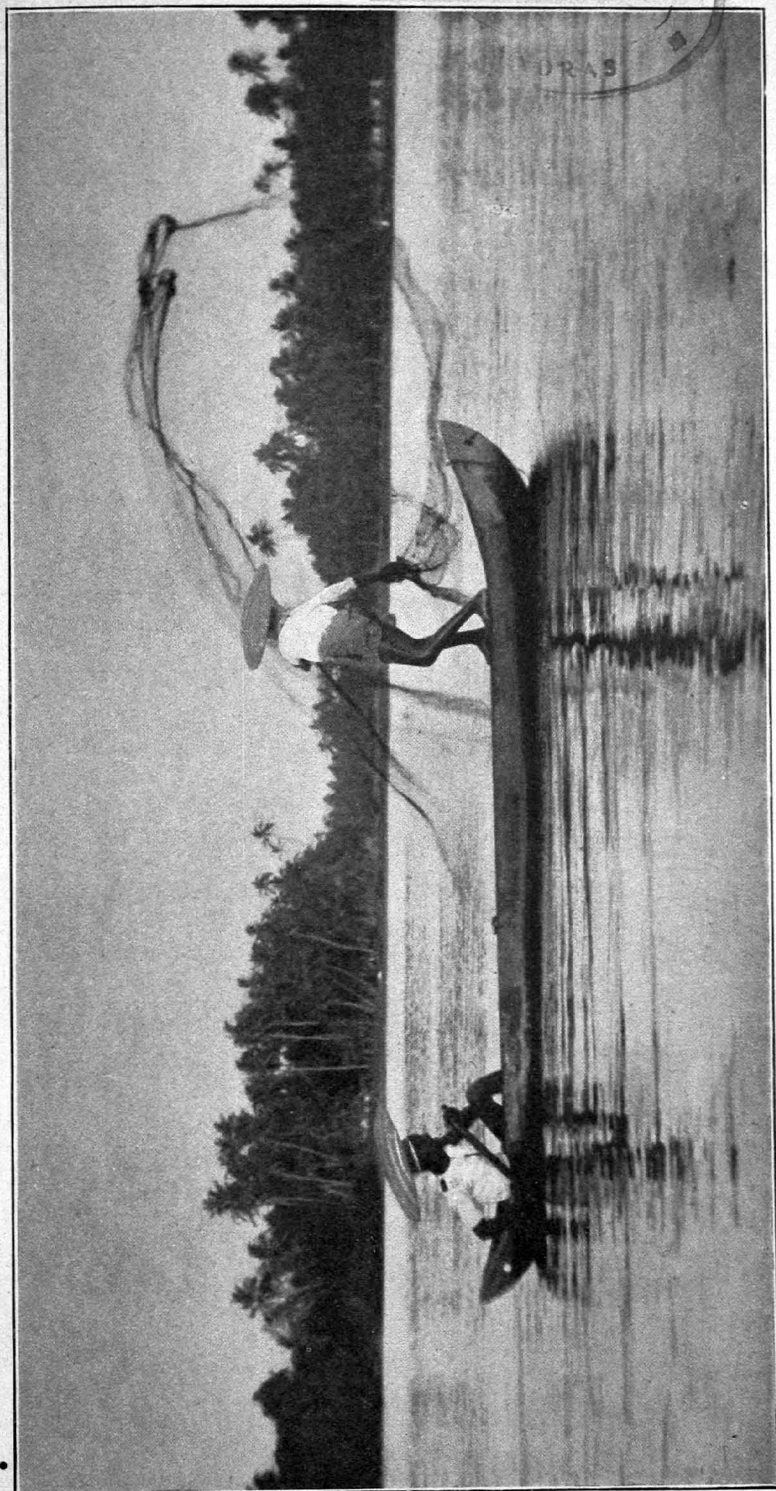
THE *Changalappayikkal* OR *Changadam* METHOD OF FISHING, CHETWAY.



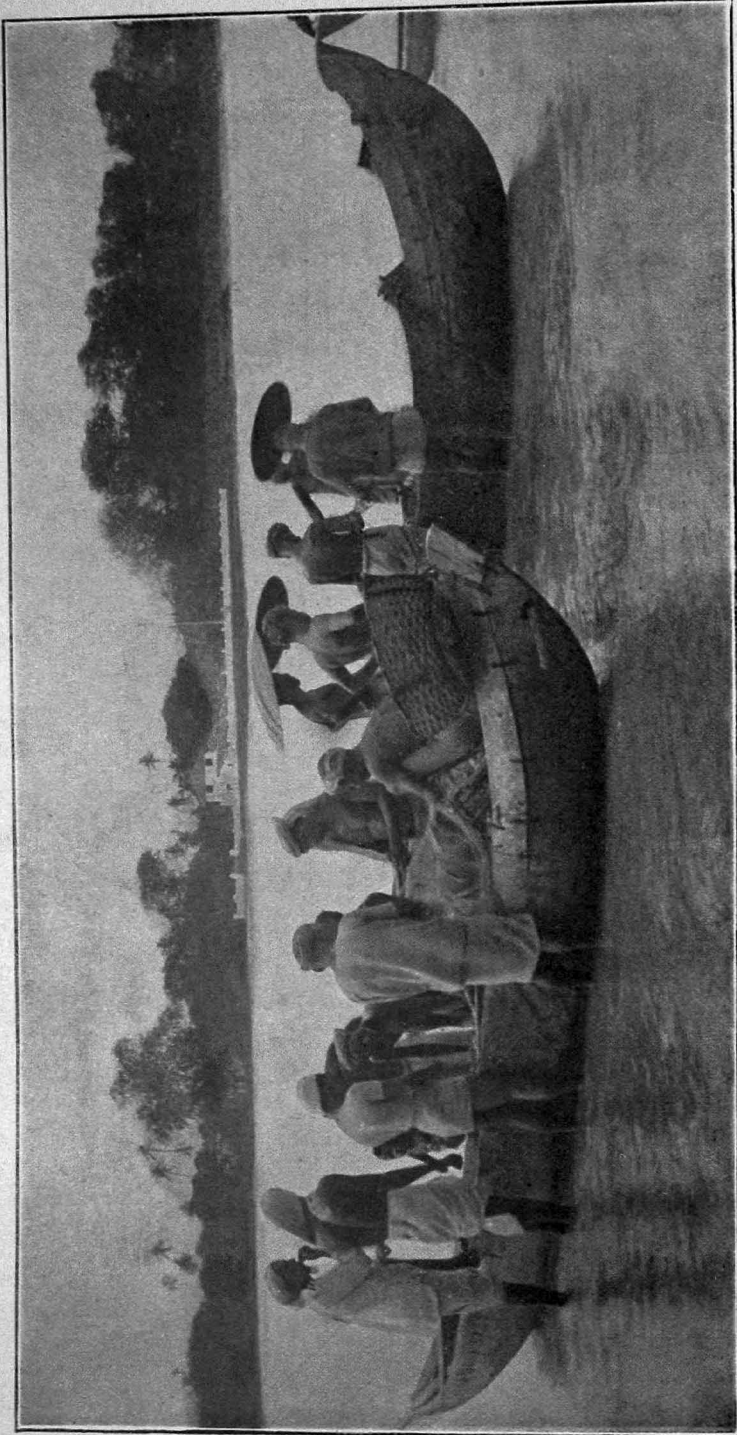
TWO CHINESE BALANCED DIP-NETS, COCHIN.



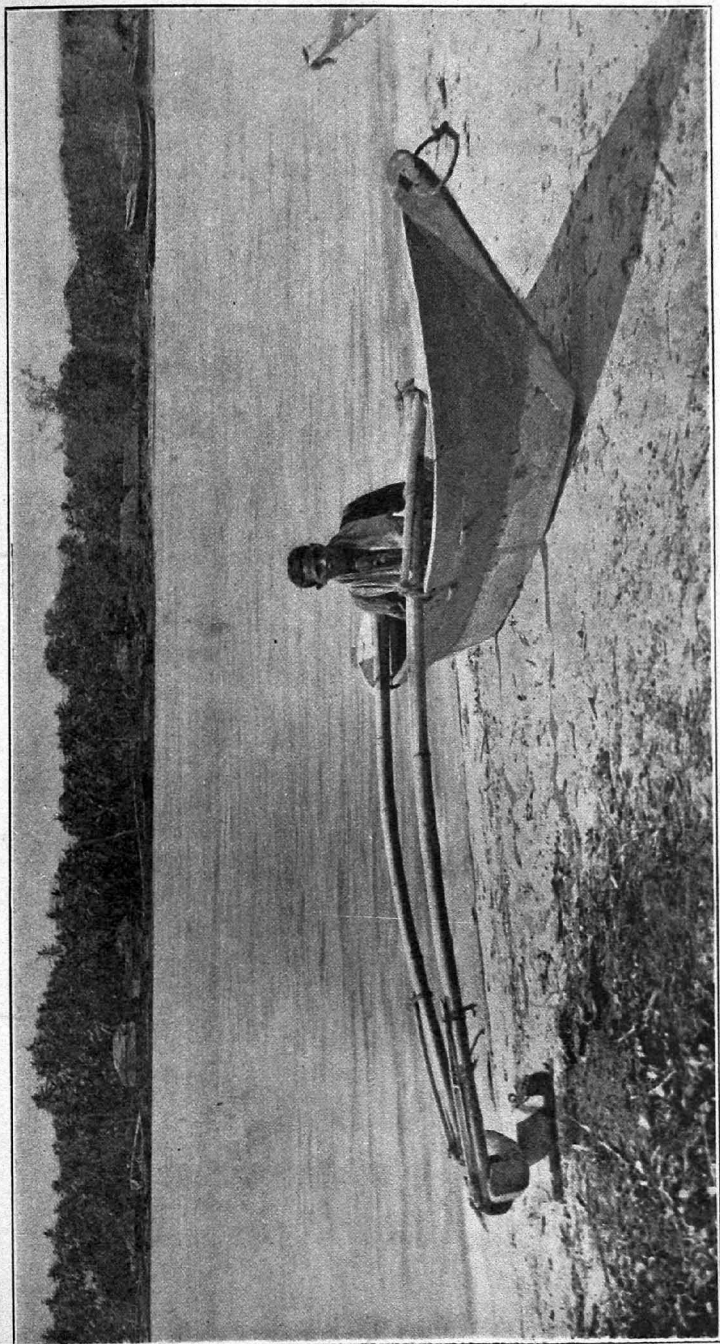
A MALAYALI FISHERMAN AT THE STERN OF A FISHING DUGOUT. NOTE THE PECULIAR STEERING PADDLE.



THROWING A CAST-NET, MALABAR.



MALAYALI FISHING CANOES, AND FISHERMEN, BEYPORE RIVER.



A RAMPANI OUTRIGGER CANOE (PADAVU).