CONCLUSION

1. Masu Ami when set strictly according to the Japanese method could not stand firmly against the strong current of local waters.
2. When a few wooden poles were employed to support the framework and heavier anchors used the trap was strong enough to resist strong current.
3. By increasing the length of the wing more fish were intercepted and directed into the net.
4. Net treated with creosote—coal tar mixture did not show repelling effect on fish.
5. The capital cost and monthly operational expenditure of a Masu Ami are less than those of a Poh of corresponding size.

6. Masu Ami is easier to operate and requires less personnel than Poh.
7. It takes only two days to set up a Masu Ami, and less than one day is enough to dismantle it.
8. The catch of Masu Ami consisted of more species and larger quantity than the catch of a corresponding Poh operating under similar conditions, but some of the fish caught died inside the bag.
9. Masu Ami fishing requires very little or no wooden poles.
10. Masu Ami with certain minor modifications can be operated in Thai waters with good results and may be introduced to replace Poh with advantages.

INDIGENOUS MARINE FISHING GEAR OF THAILAND*

by

Swarn Charernphol**

Abstract

Fifty-four different types of fishing gear used in Thai waters are described. The construction, mode of operation, craft, catch, and localities in which used are given for each, with notes on preservation, cost and distribution of earnings where the latter information is available. The catalogue constitutes a representative assemblage of Thai fishing gear.

Introduction

Thailand, extending from 5° N to 21° N and from 97° E to 106° E, is a tropical country, with tropical fauna and flora. The Thailand part of the Gulf has a coast line of approximately 1,000 miles with approximately 65,000 square miles of fishable waters. The water of this area is rather shallow, roughly with an average depth of 20 meters for the inner Gulf and 35 meters for the outer Gulf. The bottom slope is gentle, being about 0.3 to 0.6 meters per mile. The bottom is predominantly muddy at the margin and changing gradually becomes sandy towards the deeper part, whilst rock and coral patches occur everywhere. The run-off of freshwater into the Gulf is tremendous, thus converting huge regions close to the coast into backwater areas and mangrove stands.

The Thai coast on the Indian Ocean side is about 300 miles long, a typical oceanic coastline, with exposed sandy beaches, rocky foreshore and sheltered bays.

The aquatic resources of the Thai waters are rich in quantity and variety. 'Pla thu' (Rastrelliger spp.) herrings (Clupea sp.), Dussumiera, Engraulis, mullets, threadfin, catfishes, rays, shrimps, Mytilus etc. are caught in large quantities in waters of low salinity. Barracudas, groupers, snappers, breams etc. are important species, of waters of deeper regions. Mackerels, Caranx, shark etc. occur also in large numbers in deep as well as onshore waters.

There is practically no cultural operation along the coast except in few localities where small amounts of mullets and sea-bass are cultivated. The main fishing industry depends on capture operations.

Because of the physiographic conditions of the coastal waters and the habit and tradition of the fishermen, fishing operations are generally confined to near-shore waters of less than 30 meters deep and less than 10 miles from shore.

There are great varieties of fishing gear in the various localities. Most of them are primitive and many of them have been in use for centuries without appreciable improvement. Among them the bamboo stake traps (Poh) are the most important being responsible for about 70% of the total catch of marine fish.

In many instances the gear used in Thailand, such as cast-net, gill-net, purse-seine, long-line etc. are not definitely of local origin; at least, there are exact counterparts in many other countries.

The following notes include information obtained by the writer personally as well as material accumulated by other fisheries officers of the Thai Fisheries Department in the course of several years.

The descriptions given below are by no means complete, and many remain to be added.

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** Fisheries Department, Bangkok, Thailand
In this report 54 kinds of marine fishing gear employed, some of the boats and accessory equipment used to operate the gear, the fishing operations, types of catch and distribution of gear are described and illustrated.

The fishing gear described in this paper are classified as follows:

(A) Nets

(1) Moving

(a) Trawl—none in use commercially; experimental work planned.

(b) Hank—many locality types.

1. Chinese Danish seine
   (Uan Ko chan)
2. Stolephorus seine
   (Uan tua bang)
3. Big Stolephorus seine
   (Uan pla hua on)
4. Beach seine
   (Uan koel)
5. Bagless seine
   (Uan play or Uan pla yai)
6. Simple seine
   (Pukard Mirung)
7. Hand seine
   (Chan nah)

(c) Cast—several locality types.

8. Cast net (Huay)
9. Shrimp Cash Net (Hae kung)

d) Thrust and Scoop—several locality types.
10. Shrimp Scoop Net
    (Rawa run kung)
11. Prawn Scoop Net
    (Rawa run koel)

(e) Dredge

12. Sea Cucumber Dredge
    (Chad ping or Sai pling)

(f) Encircling

13. Chinese Purse Seine
    (Uan tang keh)
14. Thai Purse Seine
    (Uan laloi or Uan dum)

(g) Encircling Gill Net—many locality types
15. Rastrelliger Gill Net
    (Uan pla lang or Kud pla lang)
16. Mullet Gill Net
    (Uan pla knubawk)
17. Sea Bass Net
    (Uan Pla kaphong)
18. Threadfin Net (Pukard rangin)
    (Pukard ba wai)
20. Drift Gill Net
    (Kad ta lang yai)

(h) Bag

21. Butterfish Bag Net
    (Uan ba wai or Uan chamamed dum)

(2) Stationary

(a) Set Gill—none in use

(b) Set Barrier
22. Barrier Net (Uan pid bang)

(c) Set Bag
23. Stone-fence set net (Lard hin)
24. Reversible set bag
   (Teusukung or Pongpang luk loi)
25. Set Bag (Pongpang luk)
26. Wing Set Bag (Pongpang peck)

(d) Lift—many locality types
27. Lift net (Yaw)
28. Four Boat Lift Net
    (Uan yaw chub pla-kratak)

(e) Crab Net
29. Crab Net (chan or yong)
30. Circular Crab Net (Rio)

(B) Lines

(1) Baited

(a) Hand line
31. One-hook (Bed deo)
32. Two-hook (Bed ku)

(b) Pole and line
33. Pole and line
    (Bed rao pla kapong)

(c) Long line
34. Baited long line
    (Bed rao pla kuhao)
35. Baited Shark long line
    (Bed rao pla chalarn)
36. Silk tassel set line
    (Rao pla tong)

(J) Troll
37. Sail-boat troll (Bed lark)
38. Sampan troll (Bed lark)

(2) Nonbaited

(a) Troll—similar to the baited troll.
(b) Figs—none in use.
(c) Long line.
39. Ray long line (Bed rao rawai)

(C) Traps

(1) Simple—many locality types.

(a) Galvanized wire
40. Hood-shaped trap
    (Lawb piathun or lawblud)
(b) Bamboo and nattu
41. Rectangular Bamboo Trap
    (Sai tang or Booboo puloh)
42. Cylindrical Bamboo Trap
    (Sainawn or luh)
43. Cone-shaped Bamboo Trap
    (Cheng leng)

(c) Bush
44. Bush trap (Krum)

(2) Multiple—many types
45. Poh—stake trap (Poh)
46. Small bamboo stake trap
    (Lamu or kleng or lad)
47. Netting trap
    (Uan pid aow or Uan rung)
48. Bamboo fence trap
    (Pueak karang karn or Fuenk rung)
49. Bamboo net trap (Chantho)

(D) Catch-boat—several types
50. Catch-boat (Rua kread)
51. White board catch-boat
    (Rua phee lawk)
52. Simple Catch-boat (Yaw ngat)

(E) Miscellaneous
53. Harpoon (Chanuak deo)
54. Crab hook (Kaw luangpoo)

(100)
1. **UAN KO CHAN** (Chinese-Danish Seine)

   The wing consists of four sections of which sections A, B, and C are made of cotton netting with 6 cm., 7 cm. and 5.7 cm. meshes respectively. Section D is of ramie netting, with 2 cm. mesh.

   The bag is made of ramie netting, with 2 cm. mesh. The circumference is 25 meters at the entrance and 3 meters near the cod end.

   Head line and ground line are of Manila rope, 0.4 cm. and 0.3 cm. in diameter respectively. The ground line is shorter than the head line.

   Wooden floats are 12 cm. in length and 8.5 cm. in diameter, spaced 85 cm. apart. Lead weights are spaced 20 cm. apart.

   Drag lines are made of 3 strands coir rope, 120-180 meters long 1.8 cm. in diameter, connected with the ends of the wings with wooden swivels. Each line is provided with a number of unmovable and movable white shells, alternatively arranged and spaced 0.7 meters apart.

   A cylindrical wooden buoy of about 35 cm. in length, 40 cm. in diameter at top and 30 cm. in diameter at base is provided at the end of one of the drag lines.

   An iron anchor of about 15 kg. in weight with an anchor line of 70-80 meters long is connected with the drag line close to the buoy.

   The seine is operated by a crew of 3-4 fishermen from a small sailing boat of 5-6 meters long; fishing is done in waters 8-15 meters deep, with sandy or muddy bottom.

   In encircling fish the anchor and buoy are laid down first, then followed by the rest of the net. During hauling, by shaking the drag lines, the movable shells are made to hit the unmovable shells repeatedly, producing round which helps to drive fish into the bag.

   Mostly bottom fish or fish living just off the bottom, shrimps and crabs.

   Used mostly on the coast of Puket Province. Employed all year round but September is the best season.

2. **UAN TUA BANG** (Stolephorus Seine Net)

   This gear is constructed on a small trawl principle, consisting of a pair of wings and a bag all made of cotton netting.

   Each wing is made up of 4 sections: section A (the outermost section) is 16 meters long and 6 meters high, with 6.3 cm. mesh; section B is 5.3 x 6.3 meters in size, with 5 cm. mesh; section C is 2.6 x 6.3 meters in size, with 3.5 cm. mesh; section D is 13.2 x 6.75 meters in size, with 3.5 cm. mesh. Total length of each wing is 60.7 meters.

   The bag is about 7.4 meters in length, made up of 3 sections of different mesh sizes, 1.8 cm. mesh near the entrance, followed by 1.55 cm. mesh and ends up with 1.5 cm. mesh at the cod end.

   The head and ground lines are made of coir ropes. The two hauling lines are both 120 meters long; one made of coir and the other made of rattan.

   Wooden floats, 12 x 5 x 6 cm., are fixed to the head line, spaced 43 cm. apart.

   About 65 lead weights are fixed to each wing, spaced 85 cm. apart.

   The trawl, operated from one medium size sailing boat with a 3 crew, is used in coastal waters of 8-10 meters in depth on sandy and muddy bottoms.

   As soon as a school of fish is detected, a long wooden pole is firmly set on the sea bottom, serving as anchorage. The end of the rattan hauling line is tied to the wooden pole and the net is laid from the boat to surround the fish. After completing the circle the boat is tied to the wooden pole and the net hauled up.

   Chiefly Stolephorus, sometimes Calmox & Cybium are also caught. During a good fishing season, the catch during one haul may be as high as 1,000 kg.

   Used mostly in Puket Province. Fishing is done whole year round, but January to February is the best fishing season.

3. **UAN PLA HUA ON** (Big Stolephorus Seine)

   Each wing consists of two sections: the end section is made of cotton netting 40 meters long and 7 meters high, with 0.5 cm. mesh; the inner section is made of ramie twine netting, 80 meters long and 7 meters high, with 0.2-0.3 cm. mesh.

   The bag is made with the same material as that for the inner section of the wing. It is 7 meters in length, with a circumference of about 23 meters at the entrance and 4.5 meters near the cod end.

   Head and ground lines are made of either coir or cotton, about 1-1.5 cm. in diameter.

   Wooden floats of three different sizes and shapes are used, spaced 25 cm. apart. Lead weights are spaced 8 cm. apart.

   Drag lines are made of coir, 2 cm. diameter, each is 100-150 meters long.

   (101)
Operation:

This gear is operated by a team of 13—15 fishermen, from a boat of 12—14 meters long, in shallow waters of 2—5 meters deep with sandy or muddy bottoms.

When a school is detected the end of one of the drag lines carrying a big buoy is laid down and one fisherman gets into the water to hold the line. When the fish are encircled two more fishermen get into the water to close up the bottom of the net by bringing the ground lines together.

Distribution of Gear:

Mostly in Rayong Province of the East Coast of the Gulf. August to April is the usual fishing season.

4. UAN KOEI (Beach Seine)

Construction:

The wings are 21 meters in length, 1.9 meters in depth at the free end and increase gradually up to 4.5 meters at the pocket end. Made of fine hemp twine, with 2 cm. mesh.

The pocket or cod-end is 18 meters long and about 1 meter in circumference near the end. Made of hemp twine, mesh 1.5 cm. at the edge and diminishes down to 1 cm. at the end.

Head lines and foot lines are all made of 4 strands coir, 1.5 cm. in diameter. Hauling lines two in number, both 90 meters long, one made of 4 strands coir, 2.5 cm. in diameter, the other made of rattan rope, 1.8 cm. in diameter.

Floats are 7 cm. in length and 5 cm. in diameter, made of wood and are spaced 15 cm. apart.

Weights, 2 cm. in length, 0.3 cm. in thickness, made of lead sheet, spaced 1 meter apart.

The complete net costs approximately 7,000 Baht.

Boat:

Sampan 6—9 meters long is used.

Fishing Operation:

Each seine is operated by a group of 18 fishermen (sometimes more). As soon as the net is set the leader of the group takes up a position in the boat behind the wing along side the cod-end, directing the hauling. About 2/3 of the crew work on the haul lines from the beach while the remaining 1/3 swim in water, driving fish into the net. On the Indian Ocean side December to April is the best fishing season.

Catch:

Prawns, anchovies and other shore fishes. The catch is divided into 2 halves, one half goes to the owner of boat and seine and the other half is equally divided by the fishermen.

Distribution of Gear:

Along the coast of Pangan Province on the Indian Ocean side as well as the East and West coasts of the Gulf of Thailand.

5. UAN PLAY or UAN PLA YAI (Bagless Seine)

Construction:

The net is not provided with a pocket. It measures 85 meters long, 5.5 meters high at the center and 3 meters high at both ends. The mesh of the net graduated from 7.5 to 2.5 cm.

The head and ground lines are of coir, 2 cm. in diameter. The hauling lines are 90 meters long two for each wing: the upper one is of rattan, 2.5 cm. in diameter; the lower one is of coir, 3 cm. in diameter.

Floats are made of wood, 8.5 cm. in length and 5 cm. in diameter. They are spaced 75 cm. apart.

Operation:

Operated from beach by a group of 18 fishermen. Sampan 9—10 meters long is used for laying the net.

Catch:

Cybium, Caranx, Rastrelliger. The catch is usually divided into two halves, the owner of the gear and boat gets one half and the other half is equally divided among the fishermen.

Distribution of Gear:

Along the West coast (Indian Ocean side) of Thailand. The best fishing season is from December to April.

6. PUKARD MIRUNG (Simple Beach Seine)

Construction:

The seine is a single piece net without pocket, made of 12 threads cotton twine, 75—80 meters long, 1.75 meters deep at both ends and 2.5 meters deep at the center, with 2.5 cm. mesh throughout.

Head line and foot line made of 3 strands coir rope about 0.5 cm. in diameter.

Floats are made of wood, 5—10 cm. in length and 5 cm. in diameter for the middle part and smaller ones about 3 cm. in diameter for the two ends of the net. 450—500 floats are used for one net.

Weights are 3 cm. in length and 0.3 cm. in thickness, made of lead sheet, fastened to the foot-line at a distance of about 50 cm. apart. About 15 meters of both ends of the net are not provided with weights.

Each end of the net is fastened to a strong wooden beam about 1.8 meter long.

Boat:

Ordinary small sailing boat about 6—7 meters long.

( 102 )
Three fishermen operate the net as a group. Fishing is done in shallow water about 2—3 meters deep. The gear is used mostly during low tide period. One fisherman takes care of the boat while the other two operate the net. As soon as fish are discovered one fisherman gets down into the water holding firmly one end of the net while a second fisherman proceeds to lay the net from the boat to encircle the fish. When the end of the net is reached the second fisherman also gets into the water, the net is then dragged and hauled gradually toward the shore.

Catfish, shrimps and crabs and other small shore fish. The catch is divided into 9 shares; the owner of boat and net gets 3 shares each fisherman gets 2 shares.

Mostly in the Province of Stul, which is situated on the Indian Ocean side, close to Malayan territory.

7. CHAN NAH (Hand Beach Seine)

Quite similar to that of a beach seine but smaller in size. Each wing is about 15.4 meters long, consisting of 2 sections both made of 2 strands hemp twine netting. The first section is 1.4 meters in length, with 4.7 cm. mesh. The second section is 14 meters long, mesh 2 cm.

The bag is about 35 meters long with a circumference of about 1.3 meters near the end, made with the same netting as for the second section of the wing.

Head lines and one of the two foot lines are made of hemp ropes, 4 cm. in diameter. The other foot line is made of coir rope of 2 cm. in diameter.

Floats are made of wood, 10 x 6 x 4.5 cm., tied to the head line approximately 55 cm. apart.

Weights are made of lead sheet, 2 cm. in length and 0.3 cm. thick. 10 weights are used for each wing.

Each end of the net is fastened to a strong wooden beam of 80 cm. in length. Each beam is provided with an upper and a lower beam line which are joined together to form a loop to which to tie the haul-line.

The type and size of boat used and method and locality of fishing are similar to that of the Pukad mirang. This gear is used all year round but the best season is June to July (rainy season) when the salinity of the shallow area water is low.

Shrimps, crabs, mullet and other small fish. The catch is divided into three shares; the owner of boat and gear gets one share and each of the two fishermen one share.

Mostly in Puket Province, on the Indian Ocean side.

8. HAE (Cast Net)

Made of cotton or ramie twine, conforming to the usual cast-net design, with build-in pockets at the margin. Various sizes are used. A typical one is about 5.2 meters high (from tip of cone to the margin) with 4.5 cm. mesh, provided with a chain of light lead rings at the edge as sinker. Cast line made of cotton, about 3.6 meters long.

Operated by one man mostly from a small sampan but sometimes from shore or standing in water. The net is cast in such a manner as to fall over a group of fish and entrap them in the marginal pockets.

All kinds of on shore fish.

Very popular throughout Thailand, used on all types of waters, throughout the whole year.

9. HAE KUNG (Shrimp Cast Net)

The constructional details and methods of operation of this gear are very similar to those of a typical Hae (Cast Net), but is small in size, measuring only 1.52 meters from tip of cone to the margin of net and there is no marginal pocket. The net is made entirely of cotton netting, with 2 cm. mesh. The number of mesh is 53 at the tip of the cone and increases gradually to 481 mesh at the margin.

Used all year round in shallow waters 0.9—1.5 meters deep with sandy or muddy bottom, along the sea shore, in mangrove swamps and estuarine areas. Catch consists mostly of shrimps. Gear popular throughout Thailand.

10. RAWA RUN KOONG (Shrimp Scoop Net)

Figure 1

Fine cotton netting of 2 cm. mesh, triangular in shape, about 4 meters long and 6 meters at the broad end, supported by two long bamboo poles which are fastened together to form a fulcrum point as figured. A wooden shoe is fitted at the end of each pole to facilitate easy
Boat: Fishing Operation: Catch: Preservation of Net: Distribution of Gear: gliding on the sea bottom. The net is fastened to the bamboo frame with cotton rope and carries small lead weights at its front edge. Small ordinary sampan is used.

One fisherman operates one gear, working in shallow waters 0.2—1.5 meters deep, along the coast and brackish water areas. Fishing is done all year round day and night, whenever the sea is calm and weather fair. The fisherman holds the fulcrum point of the bamboo frame, sets the front edge of the net down to the sea bottom and pushes the net forward while dragging the boat behind him. When sufficient shrimps are accumulated, the net is lifted and the catch emptied into containers kept in the boat, and the operation repeated.

An emulsion prepared from a mixture of egg white from 20 eggs and ¼ liter of Tung-oil is used as preservative. After being thoroughly soaked in the freshly prepared preservative the net is sun-dried, then steamed for 1—2 hours and finally sun-dried again. One treatment per month is required.

Along the entire coast of Thailand.

11. RAWA RUN KOEI (Prawn Scoop Net)

Quite similar to that of the shrimp scoop net, except that it is made of fine meshed hemp netting and the base of the net is provided with a cylindrical catch-bag.

Tannic acid solution obtained from soaking mangrove bark in fresh water is used for preserving the net.
12. CRAD PLING or SAI PLING (Sea Cucumber Dredge)

Frame of dredge made of heavy wood, about 6 meters in length, 40 cm. in height and 20 cm. in depth. Each of the two lateral bottom bars of the frame is provided with a split rattan cane, known to the fishermen as the “tail”. The tails project beyond the hind margin of the dredge for about 30 cm., providing a smooth surface for easy dredging and at the same time keeping the dredge closely applied to the sea bottom.

Fig. 2. Sea Cucumber Dredge

Stones of about 300—400 grams in weight are used as sinkers which are fastened one to each of the 3 bottom cross bars of the frame. The weight of the sinkers used depends upon the depth of water and speed of current under which the dredging is done.

The top, bottom and sides of the dredge are covered with netting made of 0.15 cm. hemp twine, with 6.5 cm. mesh.

The dredge line is about 250—300 meters in length, 3 cm. in diameter length and made of either cotton or fibre of tree bark.

Small Malayan type sail-boats about 6—7 meters long 1.2—1.5 meters wide are used. Each boat carries a 6-men crew.

Fishing is done mostly along the West coast of Thailand (Indian Ocean side) in a depth of 10—30 meters. Fishing season starts in November and ends in May, but February and March are the best months. Upon reaching the fishing ground the dredge is lowered down to the bottom of the sea, the crew then row the boat forward until the entire dredge line is released, the boat is then anchored and the dredge hauled to the boat dragging it slowly along the sea bottom. Each dredging operation requires about 1 hour to complete.

Sea cucumbers. The catch is washed, cleaned, boiled in sea water and sun-dried.

When the boat and gear is not operator owned the total catch is divided into 8 shares; 2 portions for the boat and gear and one for each of the crew.

Confined to the West coast (Indian Ocean coast) of Thailand, mostly in Puket Province.

13. UAN TANG KEH (Chinese Purse Seine)

Figure 3.

Net made of 5 sections of cotton netting, total length about 220—250 meters, 50 meters high at the middle and 6—10 meters high at the ends, with 1.5—3 cm. mesh.

Head and foot ropes are made of cotton, 0.75 cm. in diameter.

Wooden floats are spaced 10—15 cm. at the end sections and 8—10 cm. for the rest. Lead weights are cylindrical shaped, each weighing about 1/4 kg., a total of 250—300 weights are used in one net.

Purse rings are made of brass, 5 cm. in diameter. Each net uses about 100 rings.

Purse lines are made of cotton, 2.2 cm. in diameter, each is 130 meters in length. Two lines are used, connected together with a swivel at the central part of the net.

One powered boat 15—19 meters long, 2.8—3.2 meters wide and 1.5—2 meters deep, with 30—60 H.P. engine, and two small sampans are needed for operating this gear. Insulated holes are provided in the powered boat for storage of catch.

17 fishermen are required in the fishing operation. Fishing is done in waters 10—30 meters deep with sandy or muddy bottoms; from February to December. The two sampans each carrying half of the net are towed by the powered boat to the fishing ground. Each sampan carries 7 fishermen who are responsible for laying the net to surround the fish and to drag the purse lines. The final step of hauling and removing catch is done by the fishermen on the powered boat.

Mostly Rastulliger. The total income from each fishing voyage after deducting expenditures on food, ice and fuel, is divided as follows:—the boat-owner gets 32%, net-owner 32%, leading fisherman 3.5% and the rest is divided into 20 to 22 parts of which the head fisherman gets 2 parts, assistant fishermen 1 1/2 parts and each fisherman 1 part.

There are about 80 sets of net now in operation, distributed in Samuth Pakran, Samuth Sakhorn, Samuth Songkram, Phichit, Cholburi and Petchburi.
14. UAN LARD or UAN DUM (Thai Purse Seine)

Made principally from cotton netting with 1—2 cm. mesh. Each set of net consists of two separate unconnected halves. Total length 500 meters, depth 17 meters. Nets of smaller dimension are also used.

Head and foot lines are made of cotton ropes, 0.75 cm. in diameter.
Purse rings are made of brass, 8—10 cm. in diameter, spaced 1 meter apart.
Purse line are made of cotton ropes, 330—560 meters in length and 2.5 cm. in diameter. 2—4 small sailing boats of 5—6.5 meters long with a crew of 20—24 fishermen are needed to operate one set of net. Fishing is done in waters 6—14 meters deep with sandy or muddy bottom.

A wooden pole, 10—15 meters long and 10—20 cm. in diameter is used for hauling the purse line. One end of the pole is tied to the boat while the other carries a pulley. As soon as the fish are encircled the pole is put into water and with the help of a diver the purse line is inserted through the pulley, to facilitate easy closing of the purse net.

Mostly Rastrelliger. Various kinds of Clupeoids are also caught.

After taking out expenses for food the remaining income from each fishing trip is divided into 30 portions; gear owner gets 9 portions, each of two chief fishermen 1½ portions, each experienced fisherman 1 portion and each apprentice fisherman ½ portion.

Along the coast of Samut Prakan, Samut Sakorn, Samuth Songkram, Prachuap and Chumphon. Bigger nets are used 9 months of the year, March to December, while smaller nets in are operation all year round.

15. UAN PLA LANG or KUD PLA LANG (Rastrelliger Gill Net)

Net made of hemp twine netting, with 5.7 cm. mesh. Each unit is 24 meters in length and 7.5 meters high. 4 units connected end to end to make a complete set.

Head and ground lines are made of manila ropes of about 1.5 cm. in diameter.

Floats are made of wood, 25 x 7 x 3 cm. fixed to the head line 45 cm. apart.

Weights are made of lead rods about 1.5 cm. in diameter and are attached to the ground line 90 cm. apart.

Small sailing boats about 6—7 meters in length are used, carrying a crew of 4 fishermen.

This net may be used in waters of 8—50 meters deep. Fishing operations can be carried out both day and night. When a school of fish is discovered the net is laid to surround them and by beating the water with sticks the fish are frightened and while trying to escape will be gilled to the meshes.

Mostly Rastrelliger. The catch is usually divided into 7 shares; the boat and gear owner takes 3 shares while the rest is equally divided among the fishermen.

Along the West Coast (Indian Ocean side) of Thailand.

16. UAN PLA KABAWK (Mullet Gill Net)

Net made of ramie twine, with 6 cm. mesh. Each unit is 30 meters long and 4 meters high. 5 units joined end to end to make one complete net.

Head and ground lines are of manila rope, 0.4 cm. in diameter.

Wooden floats are 25 x 10 x 3 cm., spaced 65 cm. apart.

4-man crew operates the gear, from a boat of 8—10 meters long, in shallow shore waters of 2—4 meters deep with sandy or muddy bottom. Fishing is done both day and night. After the fish is encircled by the net the fishermen beat the water with their oars to drive the fish towards the net.

Mullets and Thread-fins.

In the Southern Provinces along the Indian Ocean coast and the coasts of the Gulf. The best fishing season for the Indian Ocean side coast is from November to April.

17. UAN PLA KAPHONG (Sea Bass Net)

Net made of ramie twine, with 12—15 cm. mesh. Each unit is 22 meters long and 2.1 meters high. 9 units are needed to make up one complete net.

Head and ground lines are made of manila rope, about 0.3 cm. in diameter.

Wooden floats are 25 x 10 x 3 cm., spaced 65 cm. apart.

Operated by a 4-man crew from a kampan about 8—10 meters long, in shallow shore or brackish water areas, in a depth of 1—2.5 meters, on sandy or muddy bottom. The method of catching is similar to that of mullet gill net.

Mostly sea-bass.

Along the coast of Ranong Province on the Indian Ocean side and also along the East and west coast of the Gulf.
18. **PUKARD RANGIN** (Thread-fin Net)

**Construction:**
Quite similar to that of the mullet gill net but with the following differences:
1. each unit is about 21.5 meters long and 1.75 meters deep, with 7 cm. mesh;
2. both head line and foot lines are used, made of 4 strands manila rope of 0.5 cm. in diameter;
3. wooden floats 10 cm. in length and 5 cm. in diameter are used at both ends of the net, while 8 cm. long floats are used in between the two ends, the floats are spaced 17 cm. apart.

**Fishing Operation:**
A small sailing boat about 6.5 meters long with a five-man crew operates as a unit. Fishing is done in very shallow waters, about 0.5—1.5 meters deep, from December to April, while February is the best fishing month. This gear is used only in daytime. Four units of net are employed to form one set. When a school of fish is detected one of the crew gets into the water holding one end of the net while the rest of the net is laid from the boat to encircle the fish. The net is then drawn closer and closer thus narrowing the circle and concentrating the catch.

**Catch:**
Mostly thread-fins. The catch is divided into 6.5 portions; 1 for boat, 0.5 for net, and 1 for each of the 5 fishermen.

**Distribution of Gear:**
Along the coasts of Trang Province and Gulf of Thailand.

19. **PUKARD BA WAI** (Butter-fish Net)

**Construction:**
Quite similar to that of the mullet gill net except that each unit is 28—30 meters long and 4.7 meters deep, made of 2 strands hemp twine of 0.2 cm. in diameter, with 14 cm. mesh.

The wooden floats are 16 x 3 x 2 cm., spaced 47 cm. apart.

**Fishing Operation:**
Small sailing boat about 5—6 meters long is employed. A two-man crew takes care of the entire operation. Fishing is done almost exclusively on dark nights, about 12 days in a month, during October to May. The nets are set across the current in waters of about 3—8 meters deep. Five units of net are joined end to end to form one set which has a total length of 140—150 meters. One end of the net is free while the other is tied to the boat with one or two buoys fixed between them.

The net is left drifting for the whole night and is hauled up at dawn.

**Catch:**
Mostly flat-fish and sardines. The catch is divided into 3 equal portions; one for the boat and gear and one for each of the two fishermen.

**Distribution of Gear:**
Along the coast of Trang Province on the Indian Ocean side of Thailand.

20. **KAD TA LUNG YAI** (Drift Gill Net)

**Construction:**
Made of units 24 meters long and 8—9 meters deep. The netting is made of 2-stand hemp twine of 0.2 cm. diameter. The mesh is 18 centimeters.

The head line is made of 4-stands manila rope, 0.5 cm. diameter. No ground line is necessary.

Flots are made of wood, each is about 21 x 4 x 2.2 cm. They are tied on the head line, spaced about 65 cm. apart.

Buoys are made mostly of bamboo, each measures about 45 cm. in length and 11 cm. in diameter. 16 buoys are used for one complete set of net.

**Boat:**
Ordinary small sailing boats, about 6—8 meters in length and 1.7 meters in breadth are used.

**Fishing Operation:**
4—6 fishermen work as one team. In fishing operation 6 units of nets are fastened together end to end to form one set. Fishing is done at night all year round but mostly in calm seas, in shallow waters, 10—30 meters deep, along the coast or around islands.

The net is used as a ring gill net when fish occur in school. As soon as a school of fish is detected judging from the characteristic glow of water caused by the movement of the fish, the net is set to encircle them. When the fish are surrounded, light or sound are used to frighten them and drive them into the net.

When used as a drift net it is set across the current with one end tied to the boat.

**Catch:**
Mostly Scomberoides, and Cybium.

**Distribution of Gear:**
Along the coast of Krabi Province, Indian Ocean side of Thailand.

21. **UAN BA WAI** or **UAN CHARAMED DUM** (Butterfish Bag Net)

**Figure 4, 4a**

**Construction:**
The essential items of this gear are a cone-shaped bag net, a series of fish lures and a small sailing boat.

The net is cone-scoop shaped, made up of 3 parts of cotton netting as shown in figure.
Part A is 30 meters long and 20 meters wide, mesh 9 cm. Part B is 11.5 meters long and 20 meters wide, with 6.5 cm. mesh. Part C (the bag) is 20 meters long, and about 1 meter
Fig. 4. Butterfish Bag Net

Fig. 4a. A Fish-lure

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in diameter near the cod end, mesh 6 cm. Both head and ground lines are made of cotton ropes. Coir ropes are used as lift lines and buoy lines. The guide line is made of manila rope. 22 wooden floats are fixed on the head rope, each measuring 15 cm. long, 5 cm. in diameter at the middle.

Two stone weights are used; one is about 5 kg. attached to the lower fore angle of the net, the other is attached to the middle part of the net, and weights about 2 kg.

The fish lures consist of a series of vertically set lines. Each line consists of a piece of coir rope about 45 meters in length and 2.2 cm. diameter, a wooden anchor at the lower end, a bamboo float on the upper end and with coconut leaves or palm leaves tied into 4 or 5 small bushes between the two ends of the line.

One fishing team consists of 6 fishermen. Fishing is done only in day time, in waters 16—45 meters deep. Upon reaching the fishing ground by a small sailing boat, the lure lines are set in a long row across the current, spaced about 50—100 meters apart. When sufficient number of butterfish, Strepturus cinereus are caught, the catch is divided into 7 shares; 1 share for boat and gear, and the rest divided equally among the crew.

Catch:

Cat-fish, sea bass, mullets and shrimps. The catch is divided into 3 portions; 1 for the owner of the gear and the rest for the fishermen.

DISTRIBUTION OF GEAR

On the East and West coast of the Gulf and on Krabi Province on the Indian Ocean coast. Fishing season starts from March and ends through November, but September is the best time for using this gear.

22. UAN PID BANG (Barrier Net)

CONSTRUCTION:

The trap consists of a cotton or hemp netting set on wooden poles across small brooks in estuarine areas. The netting is about 15 meters long and 2 meters in height, with 5 cm. mesh. The ground rope of the net is provided with 50—60 small wooden pikes about 50 cm. in length and 1.5 cm. in diameter each for fixing the ground edge of the net firmly to the bottom.

FISHING OPERATION:

During low tide 15—20 wooden poles are set across the brook. The ground line of the net is then fixed firmly to the bottom by pushing the attached wooden pikes into the mud. The head line of the net remains free at this stage. When the maximum water level is reached, the head line of the net is then raised and fastened as high up the wooden poles as possible without freeing the bottom line, thus forming a semicircular barrier across the brooks. The fish and shrimps accumulated in the trap during the recession of tide are removed with scoop net at low tide. Small sampan or mud sledge are used for visiting the trap.

CATCH:

Small littoral fish, shrimps and crabs. The catch is divided into 3 portions; 1 for the owner of the gear and the rest for the fishermen.

DISTRIBUTION OF GEAR:

Mostly used in Ranong Province on the Indian Ocean coast.

23. LARD HIN (Stone barrier trap)

CONSTRUCTION:

This gear consists of two wings and a catch-bag. The “V” shaped wings are constructed by piling small stones about 0.5 meter high on the shore during low tide. The wings lead into a cotton netting catch bag set on a wooden frame.

OPERATION:

During high water fishermen work with small scoop nets along the inner edge of the stone wings, starting from the shore towards the catch-bag. By so doing he catches some of the fish or shrimp present along the wings and at the same time drives the rest gradually into the catch-bag which is emptied during low water.

CATCH:

Small littoral fish, shrimps and crabs.

DISTRIBUTION OF GEAR:

Very popular in Krabi Province, on the Indian Ocean coast. This gear can be operated all year round but low water season gives the best catch.

24. TEESUKUNG or PONGPANG LUKLOI (Reversible Set Bag)

CONSTRUCTION:

The bag is made of 5 sections of hemp twine netting as shown in the figure. The total length of the bag is about 7.7 meters long and when set in position the open end is almost square, measuring about 3 meters on each side; the body of the bag is cone-shaped and is about 27 cm. in diameter at the cod-end. The net is supported by 5 metal rings one at the junction of two major sections as shown.

FISHING OPERATION:

Fishing is done the whole year round when the sea is calm. The net is set in shallow waters, in the direction of the current, when the tide is low. No floats or sinkers are used. The net is fixed firmly to two long wooden poles set about 3 meters apart.

In hauling, the haul-line fastened to the last metal ring is lifted. The catch is removed through the end of the bag. On average, 30 minutes is required for one hauling. When the

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catch at one place is poor, the net and poles are removed and re-set at another place. The whole process of setting the net takes about 20 minutes. This net is reversible to fish and once set in a favourable position may be used for both ebb and flow.

Shrimps and small fishes.
Net treated once a month with egg-white Tung-oil emulsion, sun-dried, steamed and sun-dried.
All along the coast of Thailand, especially popular in brackish water areas.

25. PONGPANG LUK (Set Bag)

Quite similar in shape, construction, operation and distribution to that of Pong pang Lukloi, but is larger and the frame for fixing the net is stronger and is held firmly by anchors.

26. PONGPANG PEEK (Wing Set Bag)

The shape, construction, method of operation, distribution and preservation of the net are quite similar to those of Pong pang Lukloi, but in this gear two wings are used; each consists of 300—500 wooden poles set 30—40 cm. apart in a long row diagonal to the opening of the bag.

The two bottom angles of the mouth of the bag are each provided with 2 rattan rings which are fastened to the arms of the horse-shoe shaped end piece of the depth controlling pole. In setting the net the horse-shoe shaped end piece is slipped around the frame pole and the pole lowered down until the desired depth is reached then tied on to the frame pole.

This gear is used for about fifteen days in a month when the tidal current is strong. The net is set during low tide and the cod-end is hauled for discharging catch at intervals of about 20 minutes.

27. YAW (Lift Net)

Figure 6

Net square, made of cotton netting, 2—4.5 meters to one side, margin fringed with cotton rope.
4 bamboo rods, 2—3 meters long each, are used as net spreaders which are joined together, to form a big cross at the center by inserting the big ends of the rods into the ends of a bamboo cross-frame.
A single bamboo pole is used as lever, 5—8 meters long and carrying a cotton lift line 10—12 meters long.
The net is operated by one man either from a small sampan or from shore. Catch is removed from the net with a long handled dip-net. Used in shallow waters of all types of bottom, along the coast, brackish and fresh water regions.
The net is detachable, the bamboo spreaders, cross frame and lever may be rolled with the net into a small roll for easy carrying.
All kinds of shore fish, shrimps and crabs.
Used throughout entire Thailand, all year round.
Fishing Boat:

Construction:

Net made of both cotton and zanie twine netting. The centre piece is of zanie, 10 meters square with very fine mesh. The outer portion of the net is made up with 4 side pieces of cotton netting, each measuring 15 meters long and 5 meters wide, with 1.25 cm. mesh. The side pieces and the central piece are joined together to form a large net of 20 square meters.

The margin of the net are strengthened with 2 coir ropes of 1 cm. diameter.

Each corner of the net is provided with a stone sinker 8—10 kg. in weight, and is connected with a coir lift line 6 meters long.

Boats:

5 small sampans, 7—8 meters long.

Operation:

10—15 fishermen are required for operating a set of gear. Fishing is done only in dark nights, in all types of shallow waters of 4—6 meters.

Four of the five boats of the team, will anchor each near a corner of the net and holding one of the life lines. The net is lowered by releasing the four lift lines simultaneously from the four boats. The fifth boat carries a bright light (from burning oil or wood) and moves around slowly. When sufficient fish are attracted to the light the boat then proceeds slowly, leading the fish to the centre of the net. Net hauling is then done by lifting the 4 lift lines at the same time by the four boats.

Catch:

Mostly Stolephorus.

Distribution of Gear:

Used in the Province of Cholluri (Goh Si Shang) on the East coast of the Gulf. June to September is the fishing season.

29. CHANG or YONG (Crab Net)

Construction:

The net consists of a frame and a piece of cotton net and is controlled by floats and sinkers. The frame is made of 2 pieces of bamboo each about 60—70 cm. in length which are tied together at their middle to form a cross.

The net is made of 10 threads, 2 strands cotton twine, mesh 4—6 cm. Small stones of about 200 grams are used as sinkers, one tied near the tip of each net frame. A wooden float is connected to the centre of the frame by a cotton float line of from 1—8 meters in length.

Bait:

Small fish are used as baits and are tied beneath the centre of the frame.

Boat:

Small sampen or small sail-boat, with one man crew.

Fishing Operation:

Fishing is done whole year round, day and night, along the coast, especially in well protected areas, lagoons and mangrove region. The nets are set by adjusting the length of the float line so that the bottom of the net is barely touching the sea bottom. One fisherman sets
15—50 nets in a long row and works continuously from one end to the other in removing the catch, rebaiting and re-setting.

Mainly shore crabs (Scylla serrata) and some blue crab (Fortunus pelagicus).

Along the entire coast of Thailand.

30. RAEW (Circular Crab Net)

A circular cotton netting, 40—50 cm. in diameter, with 5—8 cm. mesh, fixed on a rattan ring. The net is tied to a small wooden pole by four strings, with one end of the pole passing through the centre of the net.

Baits, usually fish flesh, are tied near the centre of the net.

Two fishermen work as a team from a small sampan; one rows the boat and the other operates the gear.

The nets are set with their bottoms barely touching the sea bottom in shallow brackish waters, mangroves and estuarine areas. 20—70 nets are set about 8—15 meters apart in a long row. 10 to 15 minutes are allowed for crabs to come to take the bait. The fishermen work from one end of the row to the other, removing the catch, rebaiting and re-setting the net.

Catch consists mainly of crabs, Scylla serrata, while shrimps are also occasionally caught.

The net is popular along the East and West coasts of the Gulf and fishing is done during daytime all through the year.

31. BED DEO (One Hook Hand-line)

Line made of 75 threads of No. 20 cotton yarn, about 20—30 meters long. Hooks used are of various sizes and shape depending upon the kind of fish to catch.

Sinkers are of lead, about 4 cm. in length, weighing approximately 150 grams.

Shrimps, worms or cut up pieces of clupeods.

Ordinary small sampan carrying one or two-man crew.

Fishing is done all year round, in shallow sea, brackish waters, estuarine areas, rivers and lakes.

All kinds of fish.

32. BED KU (Two Hooks Hand-line)

Similar to that of the one hook type except that the line is 80 meters long and 2 hooks are used instead of one. The lead sinker is 7 cm. in length and about 600-800 grams in weight.

Ordinary small sampan or sail-boat, with either two-man or three-man crew.

Fishing is done all year round in shallow water, 10—30 meters in depth, along the coast.

During fishing operation the boat is anchored and all the crew work on the lines.

Mainly of bottom forms.

Popular throughout entire coast of Thailand.

33. BED-RAO PLA KAPONG (Pole and line—for sea-bass fishing)

The pole is made of bamboo, about 4.1 meters in length, 2 cm. in diameter at the tip and 5 cm. in diameter at the base.

The main portion of the line is about 3.85 meters, made of No. 4 galvanized wire. A double piece of 75-thread cotton line about 30 cm. long is used for connecting the galvanized wire to the pole. A ring-like swivel is provided at the distal part of the line about 30 cm. from the hook.

Hooks are hand made by fishermen from iron wire of about 0.3 cm. in diameter, each measures about 10 cm. in length and 4 cm. in breadth. Barbed.

The cost for a pole and line is about 5 Baht.

Shrimps of various species are used.

Fish is done mostly in daytime in brackish water and estuarine areas. One of the 2-man crew rows the boat while the other does the fighting.

Sea bass, Lates calcarifer.

In all the brackish water and estuarine area of Thailand.

34. BED RAO PLA KULAO (Baited long line)

The main line is cotton, 0.5 cm. in diameter and 370 meters in length. Each piece carries 200 hooks. Snoods or pigungs are of Manila twine 1 meter in length and spaced 1.8 meters apart. Aluminium coated iron hooks of No. 4 size, about 5 cm. in length and 2.8 cm. in breadth. Each set costs about 500 Baht.

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Boat: Small sampans 5 meters long and 1.2 meters wide are used with two fishermen crew.

Baits: Shrimps, prawns and small chupeoids are used as baits.

Fishing Operation: In laying out the line a wooden weight with stone anchor and a bamboo buoy are set at each end of the gang. A third bamboo buoy is placed at the middle. Each buoy is about 40 cm. in length and 12 cm. in diameter. These lines are set in shallow water perpendicular to the direction of current. After the line is set the fishing or seeking time requires only 10—20 minutes. With a 2-man crew the fishermen work continuously in setting, lifting and ecbaiting.

Catch: The catch consists mainly of rays, sharks, cat-fish and thread-fish.

Distribution of Gear All along the coast.

Preservation of Line: The lines are soaked in Rhizophora bark solution twice a month. The Rhizophora bark solution is prepared by soaking finely cut Rhizophora bark in water for 2 weeks.

35. BED RAO PLA-CHALAR (Baited Shark Long-line)

Construction: Main line made of 3-strand coir rope, 1 cm. diameter. Each unit measures 230-300 meters in length. It usually takes two units tied end to end to form one set, making the total length about 460-600 meters.

Snoods are 3-strand coir rope, 0.7 cm. in diameter and 1 meter in length, spaced 2 meters apart. Two pieces of No. 14 galvanized wire, 20 cm. long are used to join the hook to the end of the branch line thus making the total length of snood 1.2 meter.

Hooks are 10 cm. long and 2 cm. broad, hand made by the fishermen from iron wire. Each set of line carries 250—300 hooks. When not in use all hooks of each units are kept in a hook sheet and line coiled in a basket.

Anchors are made of either iron or stone, weigh about 10 kg. each. Each anchor line is about 0.5 meter long.

Buoy and floats are of the same size and material, each is made of a piece of bamboo about 10 cm. in diameter and 50 cm. in length. 2 buoys one at each end of the line and 6 floats spaced about 80 meters apart are used.

The cost of one complete set of line is 300—600 Baht.

Boat: Small sampans 6—8 meters in length and 1.2 meters in breadth carrying 2—3 men crew is used.

Fishing Operation: Lines are set across the current in shallow on-shore or estuarine areas about 6—20 meters in depth, at about 2/3 the depth under surface of water. Best season for fishing is when water salinity is high.

Baits: Small chupeoids and catfish are used.

Catch: Mainly sharks.

Distribution of Gear Along the entire coast.

36. RAO PLA TONG (Silk tassel set line)

Construction: The main line is 20—40 meters long, made of cotton or ramie. Snoods are made of 10-thread cotton twine, 50 cm. in length and spaced 60 cm. apart.

Instead of using hooks, tufts of silk threads about 8 cm. long are tied to the end of the snoods. Small pieces of fish flesh are used as bait which are tied just above the silk tassel.

Fishing Operation: The line is set across current in backish waters or river mouth. Wooden poles are set first then the line is tied on to them. The main line is set just touching the surface of water. Fishes trying to take the baits will be caught at their teeth by the silk thread.

Catch: Needle fish.

Distribution of Gear Fishing is done from January to March in the Province of Surat along the West coast of the Gulf.

37. BED LARK (Sail-boat Troll)

Construction: Made of No. 14—15 galvanized wire, 40—100 meters in length. 3—6 lines are operated by one boat.

Bait: Foreign made iron 6—8 cm. in length and 3—4 cm. in breadth. Hook barbed. Two swivels are provided between the line and the hook.

Cost of Line: Sardine or small chupeoids are used. Bait is fastened around hook with fine copper wire.

Boat: Each set of line and hook costs about 500 Baht.

Fishing Operation: Fishing is done mostly in day time along on-shore areas about 10—25 meters deep. Each boat has a one-man crew who operates 3—4 lines. Since the boat is wind propelled the fisher-
man can operate, without stopping the boat, more lines continuously and get larger catch than fishermen in sampan trolleys.

Cybium, Baracuda and other Scomberoides.

From August to May, Fishing starts at the southern part of the East coast of the Gulf and moves up north gradually as the season changes.

Used mostly along the East Coast of the Gulf of Thailand.

38. BED LARK (Sampan Troll)

Made of 3 cotton strands right hand twisted, 30 threads of No. 20 cotton yarn to each strand. Length of line 36—40 meters.

Fibres made, iron, 9 cm. in length, 4 cm. in breadth, end of shank either knobbed or ringed; hook barbed.

Various species of small clupeoids are used. Bait usually fastened around hook with fine copper wire.

The cost of line and hook is approximately 10 Baht per set.

Lines are rubbed with juice of Rhizophora bark 2—3 times every month.

Small sampans approximately 6—8 meters in length and 1 to 1.2 meters in breadth are commonly used. Each boat is provided with a pair of oars.

The boat is manned by only a single fisherman who operates 1 or 2 lines. Fishing is done only in shallow waters about 6—10 meters deep along the shore. Upon reaching a favourable spot the fisherman casts out the lines and allows them to run for about 18—20 meters, then stops it with his feet while he continues to row the boat forward. By the nature of jerk of the line under his feet the fisherman knows when fish is hooked. He stops rowing, hauls up the line, removes the fish, rebait the hook and repeats the operation. Fishing is done mostly at night or at dawn when the sea is calm and breeze gentle. Catch is collected in the hold or put into bamboo basket without ice.

The catch consists mostly of Scomberoides, Cybium, Baracudas and Lates.

All year round.

Throughout the entire coast of Thailand but especially popular along the East and West Coasts of the Gulf.

39. BED RAO PLA KABEN or BED RAO RAWAI (Non-baited Long-line for Ray Fishing)

Main line made of 4-strand manila twine, 0.5 cm. in diameter and 56 meters in length. 12—20 units form one set with a total length of 672—1120 meters.

Snoods are made of 2-strand hemp rope, left handed twisted, 0.3 cm. in diameter and 30 cm. in length, spaced 35 cm. apart.

Hooks are hand made by fishermen, iron, 5.5 cm. in length and 2 cm. in breadth, shank knobbed and hook barbed. Each unit carries 144 hooks.

Flots are made of wood, 5 x 2.5 x 2.5 cm. spaced 2.45 meters apart, attached to the main line by float line 3—5 cm. long.

Buoy lines are made of bamboo, 10 cm. in diameter and 45 cm. in length. Buoy lines made of same material as main line, each measures 50 meters in length. 13 buoys are used for one set of line.

Small sail boat about 8—10 meters in length and 2 meters in breadth, carrying 2—3 fishermen most commonly used.

13 wooden anchors are used for fixing the line. Each anchor is attached to the main line with a short anchor line at the points where the buoy lines are fastened.

The lines are set across the current in shallow waters about 10—15 meters depth. Each “Soaking” (Fishing) time is about 2 hours. Fishing with this gear is done all year round, night time as well as day time. Fishermen work only during 1 tide a day.

Rays and sharks month. In cases where the fishermen do not own the boat and gear, the total catch is divided into 5 equal portions; 2 portions for the owner of boat and gear and 3 portions divided equally among the crew.

Throughout the entire coast of Thailand.

40. LAWB PRATHUN or LAWBLUAD (Hood Shaped Trap)

Figure 7

The shape of the trap resembles the hood of a sampan, about 2.8 x 1.4 x 3.3 meters. The frame of the trap is made of wood and rattan and is covered with 2.3 cm. mesh galvanized wire netting. The chamber of the trap is provided with 2 sets of trapping device one at the entrance and the other near the center of the trap.
Fig. 7. Hood Shaped Trap

Fig. 8. Rectangular Bamboo Trap
A piece of bamboo about 4—5 meters long with a small stone tied to the big end is used as marker. The bamboo marker is connected with the frame of the trap by 40—50 meters of galvanized wire rope about 1 cm. in diameter. This line serves also as a lift net.

The size of crew and boat used depends on the number of traps to be handled.

The traps may be set on any type of sea bottom of 3—6 meters of water. The traps are hauled up at 7—10 day intervals to remove the catch. For larger traps simple winches are used for hauling.

Mostly bottom fish.

Along the entire coast of the Gulf but especially popular in Smutsakorn, Prachinburi-khan, Rayong, Chantaburi and Chumphorn regions.

41. SAI TANG or BOOBOO PULOH (Rectangular Bamboo Trap)

        Figure 8

        The trap is more or less rectangular, 1—3 meters long, 1—15 meters broad and 0.7—1 meter high, made of bamboo strips and fixed on a wooden base frame. A bamboo float marker is connected with the trap by a long rattan line.

        Traps are set mostly on coral or rocky beaches, in a depth of 10—20 meters. The traps are hauled up to remove the catch once a day. Sometimes fishermen purposely discard the float marker to avoid traps being stolen. In such a case the traps are set at spots with clear land marks for easy recovery.

        All types of coral reef fish.

        Fishing is done from November to June in Puket Province and the coast adjacent to Malaya.

42. SAINAWN OR LAUB (Cylindrical Bamboo Trap)

        Figure 9

        Trap cylindrical, 1—1.5 meters in length and 20—60 cm. in diameter at the entrance. The framework of the trap consists of 3 strong rings made of twigs of trees and 5—6 rattan or bamboo rings, on which small bamboo sticks are tied. Two sets of trapping devices are provided; one at the entrance and the other at the middle of the trap. The hind end of the trap is provided with a door for removing catch. Stone weight, bamboo float marker and float line are provided as usual.

        Fig. 9. Cylindrical Bamboo Trap

        Fishing is done all year round. Traps are laid in shallow waters near shore as well as in backish and estuarine areas. Fish flesh is used as bait.

        All kinds of bottom fish and crab.

        This is considered the most popular trap in Thailand, and is used by fishermen along the entire coast.

43. CHENG LENG (Cone-shaped Bamboo Trap)

        Figure 10

        The trap is cone-shaped, 1—5 to 2 meters long, made of closely woven bamboo strips.

        The entrance of the trap is 33—40 cm. in diameter and is provided with a wooden cross bar to which a long rattan line is attached. At the end of the rattan line a bamboo float marker is tied.

        Traps are set on the bottom near to some old Poh or in shallow waters about 1—6 meters deep. Traps are hauled up for removing catch once in every 2—3 days.

        Coals and Plotrous.

        Fishing is done all year round along the entire coast of Thailand.

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44. KRUM (Bush Trap)

**Construction:**
Twigs and branches of mangrove trees or shrubs are set in shallow area during low tide into bushes. Fish will be attracted to hide or play around and among the branches. It takes seven days (5—7) to attract sufficient fish to the bushes to warrant a harvest.

**Fishing Operation:**
Both long bamboo screen or cotton netting may be employed for catching the fish. The screen is laid down gently around each bush before the tide begins to ebb. The ring is then gradually narrowed down. The bush temporarily removed and the fish inside the screen or net are taken out with scoop nets. The operation may be repeated the whole year round. This type of fishing is quite popular in brackish waters and shallow shore water along both coasts the Gulf.

**Catch:**
The catch consists of a great variety of fishes such as sea bass, plotosus, caranx, groupers etc.

45. POH (Bamboo Stake Trap)

Figure 11, 11a

**Construction:**
There are many variations in size and designs of Poh but fundamentally they follow the same generally pattern and use the same material for construction and similar method of operation.

The principal material used for the trap are wooden poles, bamboo, rattan and galvanized wire.

The trap consists of one long central wing, one or two pairs of side wings which are directed toward the entrance of a series of one to three compartments.

The framework of the wings and compartments is made of long wooden poles, bamboo poles, bamboo sticks and rattan. The poles used for the wings are about 3—4 meters longer than the depth of water, while those used for the compartments are 4—6 meters longer than the depth of water. For each Poh 1,000 to 20,000 bamboo poles are required, depending on the size of compartments and length of wings.
The wings and compartments are completely lined with units of bamboo screens. Each unit measures about 4—7 meters in breadth and 1—2 meters higher than the depth of water. The screens are made of split bamboo, woven and fastened to a bamboo frame with rattan and galvanized wire.

For catching the fish trapped in the last compartment a cotton net somewhat similar to a small purse seine is used. The net is about 30 meters in length and 13—22 meters in height with 1—3 cm. mesh. The head line, ground line, purse line, floats and sinkers are similar to those used for a purse seine net.

Fig. 11a. Interior View of Catch Chamber of Poh

Either medium sized sailing boat or motor boats are used.
Traps are set in a depth of 6—20 meters, along the shore where the bottom is either mud or mud-sand. Bottoms with stones, and coral formations are not suitable for Poh. The frame work for the trap is laid down during low tide and followed by fixing the bamboo screens to the framework with rattan and galvanized wire.

It takes a long time and much labour to make the screens, and to fix the framework and screening. Once a Poh is constructed its position is fixed and is never changed. During a good fishing seasons the trapped fish are removed during each ebb tide, but during poor fishing seasons the trap is cleared once in every 2 or 3 days.
In removing the trapped fish the net is laid down closely along the inner edge of the last compartment and operated from one strong and long wooden pole set at the corner of the entrance of the compartment.

Rastrelliger, Cybium, Caranx, all kinds of littoral fish and shrimp.
Fishing Season: Though fishing is done all year round good fishing seasons differ from locality to locality—July to March for the East coast of the Gulf, April to October for the West coast of the Gulf, and all year round for the Indian Ocean coast of Thailand.

Distribution of Gear: Along the entire coast of the Gulf as well as many places on the Indian Ocean coast of Thailand.

46. LAMU, KLENG or LAD (Small Bamboo Stake Trap)

Construction: The framework of the trap is made of a bamboo fence fastened to and strengthened by wooden poles with rattan. It consists of one central wing which is constructed at right angle to the coast and two shorter wings, at 40°—50° to the central wing, leading into two circular shaped compartments.

The bamboo fence is made of units of bamboo screen, each 8—10 meters in length and 5—10 meters in height. 50—200 units of bamboo screens are required for making a complete trap. The poles used for the trap are 5—12 meters in length and 10—15 cm. in diameter, mostly from mangrove trees.

The catch net is similar to a small purse net, about 4—8 meters in length and 3—5 meters in height, made of 2 strands hemp twine with 4.5 cm. mesh. Head and ground ropes are made of 4 strands manila rope 1.5 cm. in diameter. Purse rings are made of lead, 4—5 cm. in diameter and spaced 18 cm. apart. The purse line is made of 4-strand coir rope, 1 cm. in diameter, 10 meters in length. The net is fixed on 6 poles, each 5—6 meters in length.

Fishing Operation: The trap is used in shallow waters up to 7.5 meters deep. It is set at right angles to the shore line with the central wing starting from shallow water and ending with the last compartment in deeper water, which is called the “Heart”. The poles are firmly driven into the bottom, and bamboo screens are fastened to them with rattan. The screens of the compartments are further strengthened by trap and side poles as shown in the figure. The purse net is introduced each time when the the trap is to be cleared.

Catch: All kinds of littoral fish, especially threadfin and sea bass.

Distribution of Gear: Popular along the coast on Indian Ocean side, but are also used occasionally along the coasts of the Gulf.

47. UAN PID AOW or UAN RUNG (Net Trap)

Construction: The trap consists of two wings and a catch compartment. Instead of using bamboo screens, netting is used for the trap. Each unit of netting is 24 meters in length and 1.5 to 2 meters in height, of either cotton or hemp twine with 1—2.5 cm. mesh. For a small trap 8 units of netting are sufficient but for a big trap as many as 20 units are required.

The poles are bamboo 2—2.5 meters in length and 3—4 cm. in diameter. 100—400 poles are used, depending on the size of the trap.

Fishing Operation: The trap is set during low tide in shallow waters close to the shore. The wings are set from the low tide mark and converge into the catch compartment which is set in deeper water. The bamboo poles are firmly set first then the netting fastened to them to the desired height. The fishermen then push the ground edge of the netting into the bottom mud with their feet. The trap is set for 12 hours and when the water is low again the trapped fish is scooped up from the catch compartment with dip net or scoop net.

Catch: Catch consists of various kinds of littoral fish and shrimps, and sharks are occasionally taken.

Distribution of Gear: Along the entire coast.

48. FUEAK KARNG KARN or FUEAK RUNG (Bamboo fence trap)

Construction: The bamboo fence trap is constructed on the Polh principle but on a much smaller scale and without using any wooden poles. The trap consists of a pair of long wings which is “V” shaped and directed to 2 successive compartments, the latter of which stands away from the coast in deep water. 50—100 units of screens are required to make one trap. Each unit is 1—2 meters high and 3—7 meters long, made of small bamboo stick, woven and fastened together with rattan. The screens used for the compartments are about 0.5 meter higher than those of the wings.

Fishing Operation: The trap is set during low tide in shallow waters about 1 to 1.5 meters deep, perpendicular to the shore with mud or sand bottom. During low tide the wings are exposed completely and the fish trapped concentrate in the last compartment. The catch is removed by fishermen, employing the locally made “Wooden Horse” (sledge) as means of transport and support when working on muddy shore.

Catch: Small littoral fish and shrimps.

Distribution of Gear: Distributed along the entire coast of Thailand and are operated all year round especially during low water season which varies according to locality.
49. CHUNTHA (Bamboo Screen Net Trap)

This gear consists of two long wings and a rectangular catch chamber enclosing a bamboo screen net.

The wings are about 80-100 meters in length each, made of long wooden poles spaced about 70-80 cm. apart. The wings are set against current, "V" shaped (with an angle of 75—90 degrees) leading into the catch chamber. The catch chamber is rectangular shaped and constructed of long wooden poles as a frame work and provided with beams and cross-bars, about 25 meters long, 8.5 meters broad and 2—2.5 meters high (depending on the depth of water). Instead of the usual cotton netting a fine bamboo screen netting is used. The bamboo net is made of fine bamboo sticks and rattan woven together, 30—35 meters long and 8.5 meters wide, provided with rattan lift lines and two net setting poles. The cost of constructing one trap ranges from 1500 to 2500 Baht.

![Fig. 12. Bamboo Screen Net Trap](image)

The trap is erected in channels between islands where current is usually strong. The wings and catch chambers are constructed during low tide. The hind edge of the bamboo screen net is firmly fastened to the upper hind margin of the catch chamber. When lowered the net covers up the hind wall and floor of the chamber. The rattan lift lines attached to the front angles of the net are operated by a pair of hand winches fixed on the two front upper angles of the chamber.

During low tide fishermen (4 for shallow water trap and 6 for deeper water trap) go to the trap by sampan or sailing boat. Upon their arrival the bamboo screen is lowered by the help of two wooden net setters. The leading fisherman stations himself on the front edge of the chamber and keeps watch. As soon as he sees fish entering the chamber he signals the two fishermen sitting behind the winch to start hauling the net. The fourth fisherman removes the catch with a long handled dip net. The bamboo screen net is lowered again and the operation repeated until the current stops or water becomes too low.

Consists of sharks, butter-fish, Dosab, and many other kinds of littoral fishes. The catch is usually divided into 5 portions; the gear owner gets one portion and the rest to the fishermen.

Mostly used in Sull Province along the Indian Ocean coast. Best fishing season for this gear is from February to July.

50. RUA KREAD (Catch-Boat)

Gear constructed on the principle that while the boat moves along, the fish are frightened and caused to jump into the boat.
The principal parts of the gear consists of a long but narrow sampan, 9—10 meters long and 1 meter wide, provided with a bamboo screen, a coconut-leaf fence and a "krai" (comb-shaped scare sweeper).

The bamboo screen is 7.2 meters long and 55 cm. high.

The coconut-leaf fence consists of a bamboo framework, 7—2 meters long and 40 cm. high, with a single layer of coconut leaves knitted between the cross bars.

The scare sweeper consists of a bamboo pole about 8 meters long provided with a row of rattan rods set 10 cm. apart. The length of the rattan rods near the base of the sweeper is 1 meter long, diminishing gradually to ½ meter at the tip of the sweeper.

![Fig 13. Catch-Boat](image)

**Fishing Operation:** Operated by one fisherman during dark night only, in shallow waters about 0.2—1 meter deep, close to the sea shore or bank of brackish water areas.

The bamboo screen is erected from one side of the boat while the coconut leaf fence is hung on the other side of the boat down into the water. The scare sweeper is set at an angle of about 80° degrees to the side of the boat, with the tips of rattan rods barely touching the bottom.

While the boat moves slowly along the bank, many of the fish and shrimps present nearby will be frightened so that they will try to get away by jumping out of the water, resulting in many of them landing themselves inside the catch-boat.

**Catch:**
Many kinds of small shore fish and shrimp.

**Distribution of Gear:**
Krabi Province on the Indian Ocean side and Nakonshritamarasch district on the West coast of the Gulf. Fishing is all year round but August to September is the best season.

**51. RUA PHEELAWK (White Board Catch-boat)**

**Construction:**
A white painted wooden board 4—6 meters long and 60 cm. high is used in place of the coconut leaves fence, and ramie or cotton netting is used for the screen. No scare sweeper is employed.

**Fishing Operation:**
This gear is operated only in daytime. The fisherman rocks the boat violently while he rows it along the shore or bank of shallow brackish water areas. The motion and sight of the white shiny board are effective in causing fish and shrimp to jump.

**Catch:**
Mullet, sea bass, shrimps etc.

**Distribution of Gear:**
Throughout entire Thailand. Used all year round.

**52. YAW NGAT (Simple Catch-boat)**

**Construction:**
A very simple type of Catch-boat. Only a cotton or ramie screen is used, erected on one side of the boat.

**Fishing Operation:**
Operated by two fishermen. Fishing is done at night in very shallow waters along the banks. The fishermen while rowing the boat slowly repeatedly beat the water with their oars to frighten the fish.
Fig. 14. Simple Catch-Boat

All kinds of shore fish and shrimps.
Used all year round in Krabi Province on the Indian Ocean side.

53. CHAMUAK (Harpoons)

Many kinds of harpoons are used by coastal fishermen. A typical one consists of a spear head, a handle and a harpoon line.
The spear head is made of iron, about 16 cm. in length, with a sharp prong and a sharp barb.
The base of the spear head is provided with a metal ring to which a long harpoon line is attached. The handle is made of bamboo, about 2 meters in length.
Two fishermen operate as a team from a small sampan; one rows the boat and the other manages the harpoon. Fishing is done in day time in clear shallow waters all year round throughout the entire coast of Thailand.

54. KAW LUANGPOO (Crab hook)

The hook is made of small iron rod or coarse galvanized wire, about 60 cm. in length and 0.5 cm. in diameter. The basal position of the hook is firmly fastened to a wooden handle of about 80 cm. long.
This gear is especially handy for catching crabs (Scylla serrata) in mangroves and among rocks. The hook is inserted into the crab hole and the crab is pulled out gradually.

AN EXPERIMENT IN FISH SALTING
by
J. Westenberg*

ABSTRACT.

As a result of improvements in the production system of the Kalianget Saltworks (East Madura), the fish preserving home industry of East Java and Madura had to deal with several changes in the properties of the salt, e.g. its chemical composition. In this experiment the influence of the more important natural mixtures on the quality of salted and dried fish was tested by their component ions separately, viz. Mg++, Ca++ and SO₄²⁻. For this purpose MgCl₂, CaCl₂, and Na SO₄ were added in various quantities to the salt. Pure sodium chloride yielded the best product.
During the last few years prior to the war, several details of the production system of the Kalianget saltworks (East Madura) underwent improvement by introduction of a more careful control of the process of crystallization, and by adoption of the so-called Portuguese method of gathering the salt.

* In charge of the Service of Sea Fisheries, Poatere, Makassar, Indonesia.