Advances in passive fishing methods

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Fishing is a primitive practice dating back to pre-historic times. Initially humans caught fishes by bear hands, or by using pointed wooden poles or sharp bones. Slowly implements and tools were developed to catch fish in a better way. Later, as civilization advanced and with industrialization, sophisticated technologies and gadgets were developed and fishing changed from mere sustenance level to a commercial level. Besides giving food and livelihood, fishing is also carried out as a means of recreation in modern times.

Physical and mechanical tools and devices used to catch fish are collectively called as fishing gears. Fishing can also be carried out without using any device or implements. In fact, even now fish are caught using barefoot and hands. There are different mechanisms or processes of fish capture. It can be filtering, hooking, gilling and tangling, trapping, spearing or pumping. Depending on the mechanism of capture process, fishing gears differ in design, structure, mode of operation, target species and area of operation.

Fishing gears are classified into active and passive gears based on principle of capture, design and mode of operation. The basic difference between active and passive gears is that in active gears, the gear moves towards the fish and catch whereas in passive fishing gears, the gear stands stationary and the fish moves towards the gear and get caught. Trawls & dredges, surrounding nets & seines and actively operated hook & lines (Troll lines, Jiggs and Pole & line) are the main active gears. Of these, trawls and surrounding nets are the major gears used for industrial fishing.

Passive fishing gears

Passive gears are stationary or immobile gears which need not be moved viz., towed, dragged, pushed or pulled to catch fish. Passive gears are a distinct group of artisanal or traditional gears such as gill nets & entangling nets, hook and lines, traps & pots, wires, set bag nets etc.

Advantages: In the context of high cost of energy, passive gears are important as they are low-energy gears. Besides, these gears need low investment, are simple in design, construction and operation, and are relatively less detrimental to the ecosystem compared to active gears. Passive

fishing gears can be operated without special skills and they do not need sophisticated and rarely require sophisticated technology and/ equipment except a vessel and that can be a non-motorized one also. Fisherman can easily control the fishing effort in terms of size or number of gears, fishing time etc in passive gears than in active gears. Moreover, most passive gears can selectively catch specific size and/ species as they have species, size and/ sex selectivity.

Disadvantages: On a commercial point of view, passive gears are less economical as they are not bulk catching gears and are not as productive as active gears. Catch efficiency also is substantially lower than active gears as fish capture depends on movements of fish which itself is influenced by environmental factors. The fluctuation of environmental parameters and their influence on fish behaviour and/ movement are not well addressed by the scientific community till now and are less predictable. How fishes respond to various stimuli, is an area not well understood.

GILLNETTING

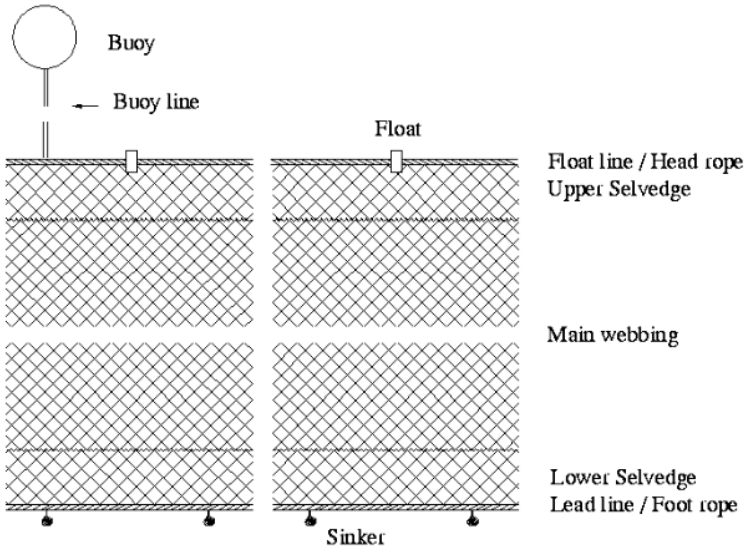
Gillnetting is an ancient fishing method and it withstood the technological and other transitional changes, the fishing sector passed through, such as introduction of bulk catching methods like purse seining and trawling. Gillnets have a number of advantages. It is a highly adaptable gear suitable for operation in the entire water column viz., in surface, column or bottom layers and can target very small fishes to large pelagics such as tuna and marlin. It can even be operated even without a vessel in small rivulets or reservoirs. But generally, a vessel is used which can be an unpowered one (non-motorized), or a motorized (small vessel powered with an outboard motor) or a mechanized one (relatively larger vessels powered with in-board engine). The gear is very simple in its design, construction and operation and requires very low energy for operation. Unlike energy intensive gears such as trawls, energy requirements are limited to commuting to the ground and back as gear setting and hauling are done manually using human power. Even in large-scale operation, when the size of the gear is very large, setting and hauling only are done using mechanical power but rest of the time the vessel is idle and simply drifts with the gear. It is a very suitable gear for catching scattered fish population. Thus, gillnetting is very popular gear across the world among all fishers particularly the traditional fishers.

From a conservation point of view, gillnet is a highly size selective gear. If optimum mesh size is selected for the net and is rigged at optimum hanging coefficient, the desired size class of fish can be caught. Compared to trawl or purse seine catch, gillnet catch is fresh, provided the soaking time

is not too long. Gillnets do very less harm to the environment and habitat as seldom the nets come into contact with the fishing ground.

However, gillnets also have certain disadvantages. Though the gear is highly size selective, species and sex selectivity are relatively poor. So, in multispecies fishery of tropical area, selective operation is at a limited scale. Loosely hung nets entangle and catch non-target species including endangered animals. Chances of accidental loss of net are very high which add to ALDFG (Abandoned, lost or otherwise discarded fishing gear) contributing to marine plastic debris and ghost fishing. Mostly set gillnets are soaked for long hours resulting in poor quality catch, catch depredation by predators and gear loss.

Gillnet: It is basically a long vertical wall of netting rectangular in shape, kept erect in water by means of floats at the upper end and sinkers at the lower end. Each unit of net consists of a main netting panel (of specific yarn thickness and mesh size, made mostly of nylon/polyamide), selvedge (top and bottom), float line, lead line, gavel line/ side ropes, floats, sinkers, buoys and buoy lines depending on the target fishery. Selvedge, generally of thicker material than the main netting is provided along the edges to give protection to the main webbing during handling and operation. Floats are attached either directly to the head rope or to a separate float line, which runs along with the head rope; and likewise sinkers are attached, either to the footrope or to a separate sinker line. Floatation of the net is adjusted by the required number of floats and sinkers. Rigged net is kept at the chosen position in the water column by adjusting the floatation using buoys attached to the head rope through buoy lines. According to the type and size of the fishery, required numbers of units are tied end to end to form a fleet of gillnet. Size of the fleet varies from 30 m x 0.5 m (length x height) to more than 100 km x 50 m



Structure of a typical simple gill net

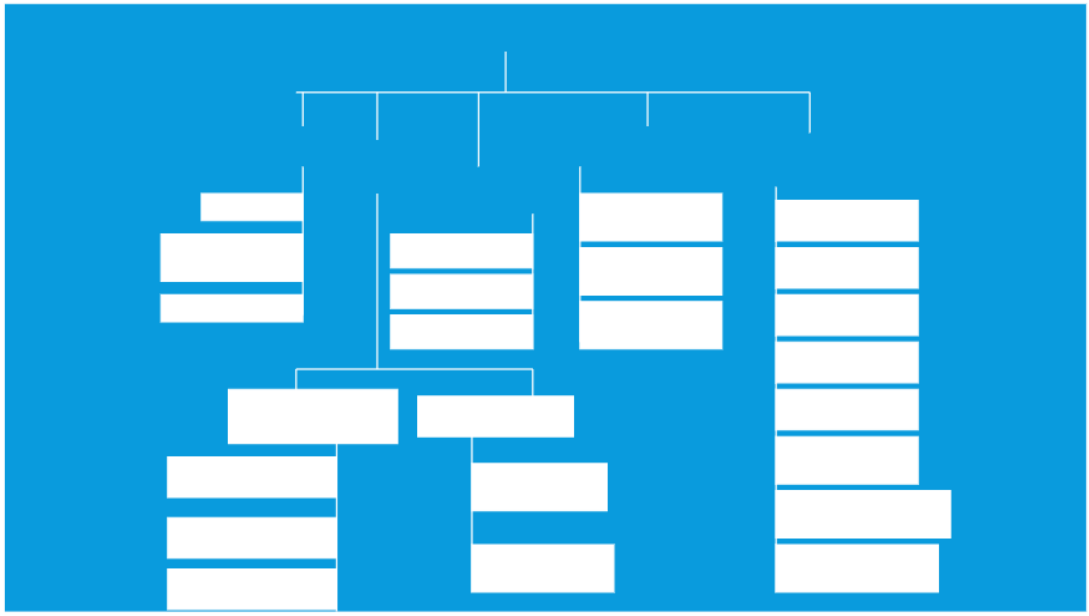
Gillnet is set across the current and in the path of fish migration. The nets shot either from the side or sometimes from the stern of the vessel are held in water for a certain period of time known as soaking time. The soaking time of the net varies from 0.5 to 1.5 h for coastal driftnets, 5-8 h for large drift nets and 12 to 24 h for set gillnets. Depending on the target fish and depth of operation, nets are held at the bottom, mid water or surface layer of the water column. In set gillnet, both ends of the gear are secured to the bottom by means of sinkers, anchors or stakes. In driftnets, one end of the net is secured to the vessel and the other end is free and the net drifts freely with the current and wind. Gillnets are deployed either during early morning or by late evening/ night. Nets operated during night have lamps attached to a flagpole at the extreme end of the fleet and in between to keep track of the net. In small-scale fisheries, nets deployed at shallow or at moderate depth are hauled by hand while for hauling large nets operated in deep waters, net hauler, power block or net drum are used.

Classification

The gillnet sector is classified into non-motorized, motorized and mechanized sub-sectors based on the vessel category and mode of propulsion. Gillnets are generally classified based on type of capture, structure, mesh size, area of operation, method of operation and targeted species. Simple gillnets, vertical line gillnets and frame nets are single walled gillnets while trammel (triple walled)

and semi trammel (double walled) nets come under multi walled nets. The vertical line nets - are simple gillnets, which are divided into different sections by passing vertical lines from the head rope to the footrope through the meshes of the webbing. Frame nets are single walled nets whose slackness is increased by attaching vertical and horizontal lines between the main lines dividing the main webbing to compartments of 1 to 1.5 sq. m. Trammel nets are triple walled nets having a loosely hung centre wall of small mesh netting which is bordered on each side by tightly hung walls of large open meshes.

Depending on the mode of operation, there are drift nets (which drift freely with both ends free or with one end attached to the vessel), set nets (anchored or stalked to the sea bed) and encircling nets (the fishes are surrounded and driven from the centre by noise or other means). Classification into surface, column and bottom gillnets is dependent on the depth of water column at which they are operated which itself is dependent on the target species. Based on target species also nets are classified.



Gillnet classification

Types of gillnets

Drift gill net: Drift gill net is used to catch fishes swimming in mid-water or near surface layer. In this type, the net is drifted according to the force of the wind or current freely. A marking buoy is tied to the net to indicate the location of the net. The depth of operation of net is adjusted in relation to the swimming layer of the fish.

Set gill net: Set gill nets are usually set to the bottom by using anchors, heavy weights or are tied to poles or sticks fixed to the ground. Surface set gill nets tar get fishes which swim near surface water and are commonly used in shallow coastal water where the current is negligible. Bottom set gillnets are used for catching bottom dwellers and demersal fishes. In bottom set gillnet, more weight is used and only a few floats are attached to keep the net without falling to the ground.

Encircling gillnet: A long gillnet set in a circular shape around a fish shoal is termed an encircling gillnet. Fishes driven to the net by making noise, by beating on the sides of the vessel are caught by gilling or entangling. This type of gear is mostly used in shallow waters with the footrope touching the ground.

Trammel nets: Trammel nets are triple walled nets having a loosely hung center wall of small mesh netting which is bordered on each side by tightly hung walls of large open meshes. The mesh size of the outer wall of webbing is usually 4 to 5 times than that of the inner wall. All the three layers of webbing are mounted on a single head and foot rope. Fish swimming through the outer meshes encounter the center netting and push their way through the opposite outer meshes. Fish become trapped in the resulting pockets that are formed. The outer meshes on one side of the net must be a mirror image of the outer meshes on the opposite side. Semi trammel nets are of same structure as that of trammel nets except that only one layer of outer webbing is present instead of two. Trammel nets are mostly used in fresh water fishing and also for coastal shrimp fishing.

Combined gillnet-trammel nets: Simple gillnet combined with trammel net is used in certain regions. This gear is generally bottom-set and has two horizontally divided parts viz., a simple gillnet on upper part which targets pelagic and column dwelling fishes; and a trammel net at the lower part in which bottom fishes are entangled.

Capture mechanism

Mode of fish capture in gill nets is influenced by the net construction, its dimensions, and the shape of the fish body. Fish gets caught in gillnets by gilling, wedging, snagging and entangling but the main capture mechanism is gilling. When a fish approaches a gill net, it tries to pass through the mesh the size of which is selected in such a way that it is large enough to allow the fish's head but not the rest of the body to pass through. When the fish tries to push through the mesh, beyond the head region, it senses obstruction and tries to pull back. By doing so, pressure exerted by the mesh at the opercular region of the fish opens the opercula and the twine of the mesh rolls and held behind the opercula. This characteristic capture mode is designated as `gilling'.

By snagging, the fish is held tight by the twine of the mesh around its head while by wedging, the fish is held tight around its body, and by entangling the fish is held in the net by the teeth, opercular spines or other protruding appendages of the body without actually entering the mesh. Looseness of the net and the body shape of the target fish determine the capture mode. Gill net is the only ` ' ` ' fish to be caught and catching it.

Advances in gillnetting

Changes in gear material and accessories, method of operation, use of resource specific gear, motorization and mechanization are the major advances happened in the gillnet sector.

Improved materials-Netting & accessories

Netting material has been changed from natural materials such as

cotton/hemp/sisal etc. to synthetic fibers. By late 1950s with the commercial production of synthetic fibres, natural gillnet material has been completely replaced by nylon multifilament initially and later by nylon monofilament. In large mesh gillnets targeted for tuna and other large pelagics polyethylene (PE) material also is used for gillnets. These improved materials have higher catching efficiency than natural materials. Nylon monofilament gillnet is 7.5 times more efficient than cotton gillnet and 3 times more efficient than nylon multifilament gillnet. Besides, synthetic fibres are durable and lasts for a long period and their maintenance cost is almost nil.

Likewise, rope material also has been changed from coir, manila, jute etc to PE, polypropylene (PP) etc which are strong and durable.

Floats used in gillnet for buoyancyalso have been changed from natural to synthetic materials. Wood/bamboo/cork /glass/aluminium etc have been replaced to plastic -styrofoam, polyvinyl chloride (PVC), thermocole etc. These synthetic floats are durable, highly buoyant, retain buoyancy, have high pressure withstanding capacity and are suitable for high sea operation.

Sinkers used as weights also have been replaced from stone, clay, brick etc to lead, iron, cement, concrete etc.

Resource specific gears

With the availability of a variety of machine-made netting in a wide range of mesh sizes, gillnetting has become more resource specific.

Method of operation:

Another advancement that has happened in gillnet sector is the switch over from encircling operation to drift gillnetting. With the introduction of smaller versions of efficient encircling nets and seine nets, encircling gillnets have become less popular.

Mechanization & motorization

Introduction of mechanized and motorized vessels was a major development in the sector. Bigger and highly powered fishing vessels led to use of bigger sized gear and helped for operation in deeper and distant waters. Vessels were altered to suit multi day operation by installing insulated/refrigerated fish holds, larger fuel tanks etc. Thus, a shift from single-day operation to multi-day operation extending to several days has taken place in mechanized sector and to a lesser extent in the motorized sector. Mechanized setting and hauling helped in handling large gear, ease of operation, reduced hauling time & trip time resulting in good quality catch.

Diversified deep sea gillnetting

To outlive the competition from large mechanized sector using active gears, traditional gillnet fishers adapted to deep sea fishing by acquiring larger vessels fitted with modern navigational, communication and gear handling equipment.

Baited gillnets

Another recent development in gillnetting is baiting the nets to increase fish density around the nets for better catch. Low value fish or damaged /discarded fish are placed in net pouches which are attached to head rope at every 10 m.

HOOK AND LINE FISHING

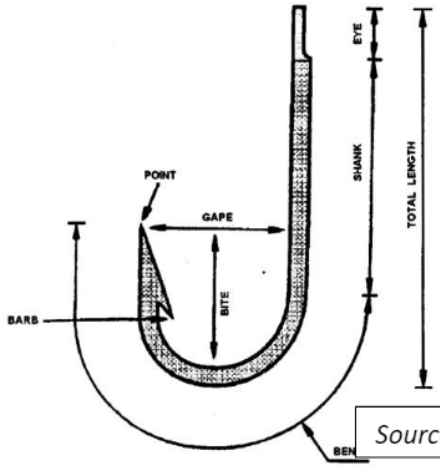
Hook and line fishing is among the simplest of fishing gear and considered as the most ancient type of fishing. In hook and line fishing, fish are enticed by edible natural bait or artificial baits or lures and are held by the hook concealed in the bait. It is a very popular fishing method as it is eenvironment- , q , ’ ,
to be operated in areas not accessible to trawlers viz., rocky and coral areas and in very deep grounds. It is relatively simple in design and need very low investment. The only disadvantages are that in long-line fishing, especially those operated in deeper areas, chances of incidental catch of seabirds, sea turtles and fishes other than target species are very high. Besides, bottom-set longlines snag and damage benthic epifauna causing habitat damage.

Handline, troll line, pole and line, squid jigging and long lines fall under hook and line fishing, among which handline and long line fall under passive fishing.

The Hook: Hook is the principal implement in line fishing. A typical hook has different parts namely eye, shank, bend, gape, bite, point and barb. The line is attached to the hook eye. The shank is the leg of a hook, which extends from the bend up to the eye, and could be short, regular or long depending upon the hook's design and usage.

Hook shanks are of different shapes such as straight, curved and barbed. Bend is the main distinguishing characteristic of a fishing hook while the gape is the

shortest distance between point and shank. The point, is the tip of the hook that penetrates the body of the fish. It occurs as straight, reversed or even curved. The barb helps in holding the bait and also prevents the escape of fish, once it is hooked. Usually, one barb is provided pointing to the inner side of the hook while hooks with one to three barbs pointing to the outside are also available. Barbless hooks also are used for fishing especially in recreational fishing.



Source: Thomas et al., 2007

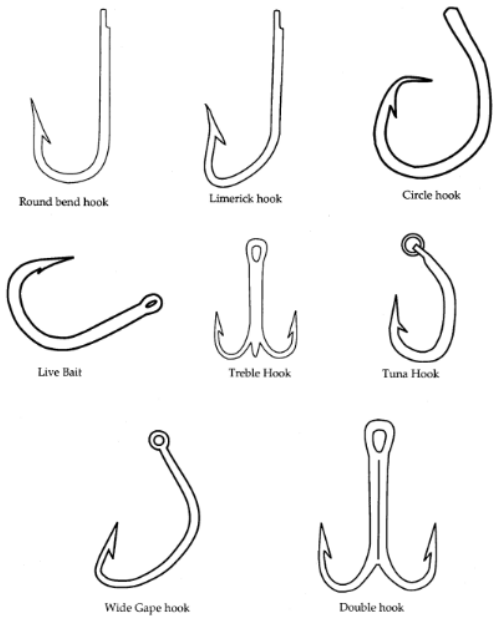
Parts of a typical hook

Handline: Handline is the simplest form of hook and line gear consisting of a hand-held single line, with rod, weight, and with one or more hooks spaced along the far end of the line. It consists of a single vertical line with single or several branched hooks. A weight is attached to the end of the line. Swivels are used to prevent excessive fouling and kinking of the line. It is operated by simply dropping the baited hook into the level of the sea. Hand liners generally use natural baits. Hand lines with or without pole are operated from boats, canoes and other small decked or undecked vessels or even from shore without even using a vessel. Lines are usually hauled manually and sometimes taken up using rollers fixed on the side of the vessel.

Long lining: Long lining is especially suited to catch scattered fish both pelagic and demersal fishes. Long line fishing is extensively used around the world on a large scale targeting mainly tuna and other large pelagics. It is one of the most effective fishing methods to harvest tunas.

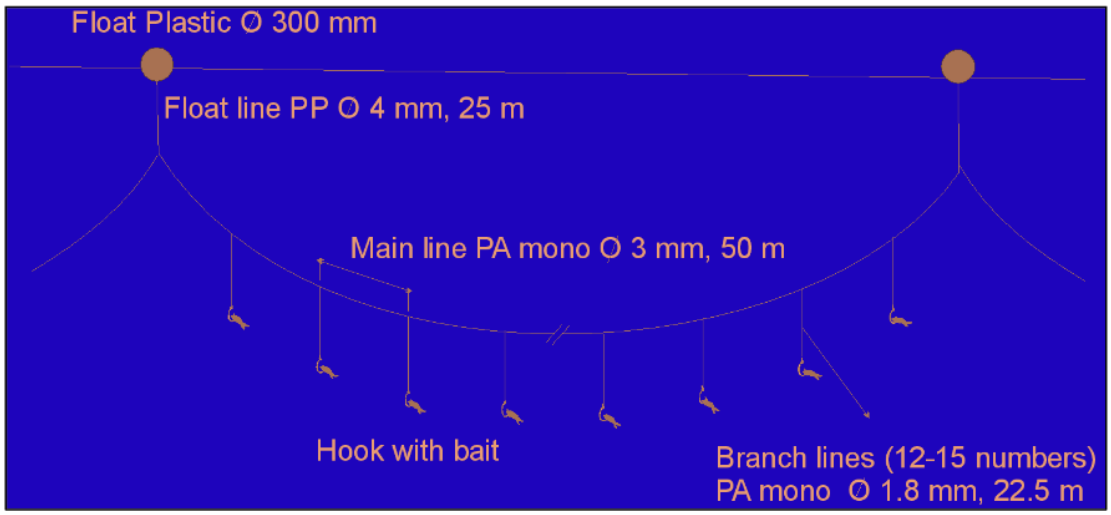
A typical long line consists of a mainline, branch lines/gangion/snood, hook and the bait. Hooks and branch lines can be attached to the mainline by using knots or mechanical crimps or clamps. Buoys, buoy lines, sinkers, swivels and connectors, flag poles, light buoys, radio buoys and radar reflectors are other accessories used in largescale longlining. In small-scale operations, sections of main line with required number of branch lines are kept coiled in units known as baskets. In the monofilament long lines (monolines), the main line is continuous and stored on powered reels.

The hooks are baited and cast after clipping to a long main line to which are connected number of branch lines by knots or through clips or crimps. Swivel is attached to each branch line to avoid kinking and twisting. Depending on the size of the fishery targeted, the number of branch lines vary. The total length of the gear especially in drift lines nowadays comes upto 80 to 100 km.



Source: Thomas et al., 2007

Fig. Common hook types



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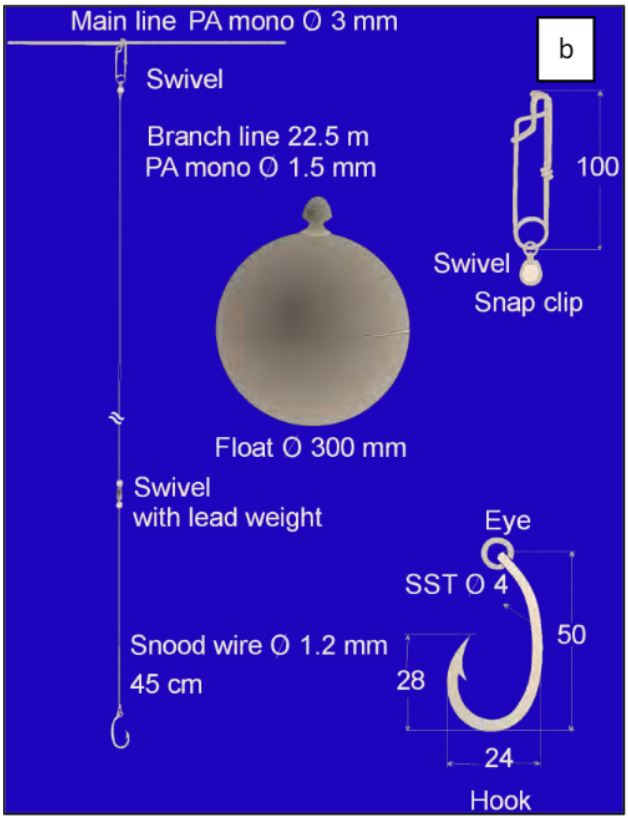


Typical structure of a long line (a) horizontal long line (b) Branch line

Depending on the mode of operation, two types of long lines are common, drift long line and set long line. Drift longlines are deployed with one end of the line attached to the vessel while to the free end, a buoy and flag pole are attached. The gear is soaked for a long period, about 5-6 hours and it drifts freely with current and wind.

In set long lines both ends of the gear are fixed to the ground using anchors or stakes or by any other means and are left unattended for hours. On either end, marker buoys are attached to trace the location. Drift longlines generally target pelagic fishes while set long lines target demersal species.

Long lines are set over stern and hauled over the bow or side forward. A baiting table and chute are generally located on the stern to facilitate shooting operation. Hauling is generally done manually if the number of hooks/length of the gear is small while large gear with large number of

hooks is hauled by using line hauler or powered drums. The baited branch lines are attached to the main line as it is released during setting operation. On hauling, the branch lines are removed from main line and stored separately. Long lines targeting fishes that feed during daylight are set early in the morning before sunrise and hauled by afternoon. For fishes that feed during night, long lines are operated at sunset and hauled before crack of dawn.

Advances in line fishing

Change of material

There has been a change in the material of fishing hooks, line and poles used.

Hook material: Earlier, hooks were made of sharp objects such as shells, animal bones, stone, wood, bamboo etc. Now there has been a change in the material from natural materials to high-carbon steel, metal alloys, stainless steel etc. most of which are covered with corrosion-resistant surface coatings. Latest innovation is to use non-reflective hooks which have low-visibility under water.

Fishing line: Material change has happened in fishing line also, from natural materials such as , , j PP, , " " , - high molecular weight polyethylene etc. Fluorocarbon line is a more recent one which is nearly invisible to fish. These fibres are thinner, stronger, shock resistant and durable. Fishing rod: Fishing rod also is changed from bamboo, wood etc to fibreglass or carbon fiber (graphite) which are very strong, light in weight and durable. Material changes from natural to synthetic/man-made have come in floats and sinkers also used for line fishing.

Hook technology: There are advances in hook technology in terms of hook shape and hook sharpness to maximize capture rates and minimize fish loss

Shape: Circle hook is used nowadays to minimize deep hooking and injuries for hooked fish. This has more relevance in recreational fisheries where catch and release is practiced for conservation of resources. In commercial lining also circle hook can be used for easy removal of catch from the hook so that appearance will not be affected and catch would fetch good price. Hooks with multiple barbs and outside barbs are innovations which minimize escape of hooked fish but removal of catch is relatively difficult in this case. Barbless hooks used specially in tuna pole and line enable fresh catch by reducing capture stress.

Sharpness: By increasing sharpness of hook, piercing or cutting ability can be increased. Mechanical sharpening, chemical (acid) sharpening and nano sSmooth coating facilitate fast penetration.

Bait technology:

Advances also have taken place in bait technology. Use of artificial soft baits from biodegradable materials avoid pollution due to the loss of plastic lures. Fish attractant compounds `fish scents are used to attract more fish towards the hook.

Motorization & Mechanization: With the advent of mechanization and motorization, fishing effort has been increased in terms of vessel size, engine power, larger gear and operation in distant and deeper waters targeting large pelagic species.

Automated long line system: is a new development in the sector which is widely adopted. Traditional long lining is a labour intensive and time consuming fishing method while automated long lines using mechanical and hydraulic line haulers are now widely used in operations which have reduced the manpower requirements and enabled working of large-scale long lines from relatively smaller vessels than before. Automated long line system consists of a line hauler with a mechanised method of cleaning the hooks and untangling branch lines from the main line. In some systems, the branch lines are separated and stored on racks or magazines and the mainline is wound and stored on a drum. In other systems, main line with branch lines are stored on drums. While setting, the hooks are baited by drawing through an automatic baiting machine.

TRAPS AND POTS

Trap fishing is an age-old fishing method extensively practiced across the world in both marine and inland waters. Trap is a traditional fishing gear made of structures with enclosures or chambers (one or more) to which the fish is lured or guided but escape is made difficult by means of labyrinths or retarding devices like funnels. As per FAO, traps are large structures fixed to the shore/ground while pots are smaller, movable traps, enclosed baskets or boxes which are deployed from a craft. Generally, both terms are used interchangeably. Traps are of different shapes, sizes and materials. Traps can be used to catch fishes, crabs, lobsters, shrimps or even molluscs. Trap fishing is advantageous as it is very easy to operate and require less attention during fishing. It is a low energy and less capital-intensive fishing method. The catch will be very fresh viz., it can be collected in live and undamaged condition. Trap fishing is economical as the capital investment is

relatively low. Traps show a high degree of species and size selectivity. Suitable in areas with uneven bottom, where other gears cannot be operated. Moreover, traps cause least impact to the habitant and to the biota. Traps offer high potential for survival of discarded non-targeted species which is important from the point of resource conservation. However, disadvantage of traps is that they are prone to gear loss and ghost fishing.

As per FAO classification, stationary uncovered pound nets, pots, fyke nets, stow nets and barriers, fences, weirs, etc. and aerial traps come under the category of traps of which all except aerial traps are passive gears.

Stationary uncovered pound net is a type of trap which is a large net divided into one or more chambers, anchored with a mooring system or fixed on stakes. Huge semi-permanent pounds are built up by poles and bamboo screens. Long leaders of converging screens lead the fish and prawns to the openings in the final chamber or pound, while others with in lead them towards smaller inner chambers. All except the final chamber are closed only at the bottom while open at the surface. These traps are used in places where considerable tidal influence is there and catch trapped in the pound is collected during low tide. Large-scale traps like the pontoon trap in Sweden are operated mechanically.

Fyke net is a fish trap which is a rectangular, cylindrical or semi-cylindrical net mounted on rings or hoops. It usually has wings or leader which guide the fish to the bag at the terminal end. The fish entering voluntarily find it difficult to come out. The fyke net is fixed to the bottom with any suitable means like stakes or anchors. It is generally operated by hand and small canoes are used for operations. The fyke nets are left in the same location for several days. Compared to pound nets, fyke nets are smaller in size.

Stow net/Set bag net is a type of trap set mostly in estuaries and coastal waters near to shore where tidal influx is there. It is a stationary filtering device set in a moving water, which filters out the catch which are swept more or less passively by the current, and is retained by the force of the current. It is a conical bag net with a rectangular or square mouth followed by a body comprised of different sections and with a codend or bag at the terminal end. The net is mostly anchored to the ground using staked fixed to the ground or by anchors or weights. A series of nets are set in a line.

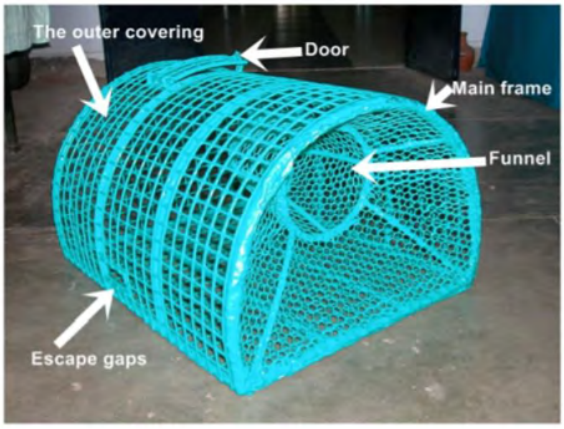
Barriers, fences, and weirs: These are a group of gears operated in tidal waters. Principle of operation is almost similar to pound nets. They have a narrow leader portion ending in a broad chamber in which fish is trapped. It is made of sticks, netting or poles. These are also operated in shallow coastal waters, estuaries etc where significant tidal action is there.

Traps/Pots: Pots and traps are rigid structures into which fish is enticed with bait or even without bait through funnels and once entered the exit is made is difficult. Designs and of traps vary as per the target organism. A variety of traps/pots are used in inland, coastal and marine waters to catch fish and shellfishes. In most of the traps, a cone-shaped entrance tunnel is provided.

Fish trap, lobster trap, crab pot etc are common. Fish trap is comparatively bigger than shellfish trap. All types of traps are made of a frame made of iron covered with netting. The trap is open on one side and is provided with two consecutive funnels or valves made of webbing inside the frame. At the end of the funnel the bait bag or bait is hung to attract the fish. In fish traps an opening is provided at the back side to collect the catch as fish trap is very large in size. Traps are set individually or sometimes in a series. A canoe is used to carry the traps to fishing ground in coastal waters and mechanized boats are used in deeper waters. Trap is set at the desired location with a marker float to identify the position. Nowadays, position is marked using GPS coordinates. Traps are deployed at the fishing ground either by fixing to the ground using anchors, weights etc or are placed among crevices in the rocks or corals. In some ' traps are laid and retrieved by fishermen by skin diving even in grounds as deep as 30 m which is prevalent in the south east coast of India. The trap is left at the ground for desired period and is hauled after desired soak time and the catch is retrieved.

Advances in trap fishery

Material change: In earlier days traps were made of natural materials such as bamboo, wood etc. Natural material has been changed to metal frame (plastic coated) covered with synthetic netting.



Traditional lobster trap

Modern lobster trap with escape gap

Collapsible trap: Conventional traps due to their huge size are difficult to handle and limited numbers only can be carried to the fishing ground at a time. Collapsible trap is a later development by which many traps s can be transported in place of traditional traps using a small canoe due to the foldability/stackability.

Escape window in traps: By providing escape gaps/windows and by the use of appropriate mesh sizes for the netting used for covering the frames, juveniles can escape which makes the trap very much size selective.

Timed release mechanism: Ghost fishing is a major problem with lost traps/pots. As a mitigation measure, timed release mechanism is developed in which the trap door is tied to the frame using easily corrodible metal or biodegradable natural fibre instead of the synthetic rope used at present. By this way, once lost after a short period of time the trap door will be opened due to the breaking away of the material used for tying the trap door so that the trapped organisms can escape.

Advances in passive fishing methods have brought out positive and negative impacts on the fishery.

Positive impacts: Introduction of improved materials have resulted in efficient gears, higher catch, durable gears and overall increased income to fishers. Mechanization and motorization enabled in use of modern and large gears, ease of operation, reduced physical strain, access to unexplored grounds etc.

Negative impacts: Drastic increase in the number and size of vessel and gear, overexploitation of resources, threat from widespread use of nylon monofilament due to higher chances of breakage and chances of gear loss, bycatch in lines and gillnets by loosely hung drift gillnets and drift long lines incidentally catching non-target species like marine mammals, sea turtles, sea birds etc including endangered species, ghost fishing by the lost gears as gillnets and traps are more prone to become ALDFG leading to ghost fishing etc.

Conclusion

Largely passive fishing gears are Low Impact and Fuel Efficient (LIFE) Fishing gears. In the context of rising fuel prices, fishing sector has to lower its fuel consumption, reduce carbon footprint and decrease ecosystem impacts. For this, passive fishing methods which generally are LIFE are to be encouraged. However, the negative impacts of these gears are to be addressed.