

Design, construction and operation of fishing pots and traps

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Introduction

Trap fishing is one of the age-old fishing methods and it has been widely practised throughout the world in both tropical and temperate seas (Hawkins, et al., 2007). Pots and traps are gears which make the entry of the aquatic species easy and make the escapement difficult due to special designs. The parts of traps which prevent the escapement may be chambers, flaps, narrow paths, funnels etc. Enormous designs of pots and traps exist throughout the world. Based on the abiotic and biotic factors, pots and traps differ regionally in size, design, operation etc. According to FAO, traps are large structures fixed to the shore. Pots are smaller, movable traps, enclosed baskets or boxes which are deployed from any craft. In India, the usage "Pot" is not much common and the fish trapping devices are generally termed as "Traps". Traps are generally operated in the area where other types of fishing gears cannot be operated due to uneven bottom or submerged obstacles. The advantages of trap fishing includes the following

- Trap fishing is economic and low energy is required when compared to active fishing method. They are highly fuel efficient both in terms of f returns and biomass per unit of fuel consumed (Wilimovsky and Alverson, 1971, Mohan Rajan, 1993).
- Organisms caught in the trap can be retrieved alive in an undamaged condition
- Traps can fish continuously day and night and required only periodical tending (Pravin et al., 2011)
- They can be left in the sea during unfavorable weather conditions and can be collected when favorable conditions set-in.
- Capital investment is relatively low and many traps show a high degree of selectivity.

Mechanism & Type of fish trapping

In India, based on the area of operation, pots and traps are classified mainly into pots and traps of marine and inland sector. The inland traps and pots are very common and popular throughout the country. Even though various marine fish traps are operated for livelihood subsistence, organized marine trap fishing exists only in the Southern coast of the country especially in Tamil Nadu. Depends on the level of modernisation, traps are also classified into traditional traps and modern traps. Plunge baskets, box traps, filter traps, aproned filter traps screen barrier, bamboo screen barrier, net barrier, *Chemballi koodu*, *chevu*, Kalava traps, lobster traps, crab traps etc are some of the example for the traditional trapping systems (Remesan, 2006, Remesan and Ramachandran, 2008). Details of some of the important traditional traps (Marine sector) are described below.

Marine Fish traps

The traditional fish traps operated along Gulf of Mannar, Palk bay and south coast are known as *koodu*. These traps are mainly used for catching perches and perch like fishes. Fishers from Rameswaram evolved extremely elaborate stellate form of this traps with a roomy side chamber in each of the arm and even with 5 entrance of the interior. These traps are made of splinters of babul tree or with thin bamboo reepers or palmyrah leaf stalk fibers (Meenakumari, 2009). The meshes are hexagonal in shape with each side of the mesh having a length of 3-4cm. The length of the trap varies from 60-150cm, breadth from 60 to 120cm and height from 15 to 45 cm.

Kalava traps

Kalava traps are operated for kalava and perches. They are used in rocky sea bottom and submerged reefs in depth ranging 60-150m along the west and east coast of India. Traditional Kalava traps are known as Rameswaram type traps. Modified modern kalava traps are also operational in the various part of the country. These rectangular traps made of 10mm dia MS rods with strengthening ribs. These rods are joined together with coil hinges so as to facilitate collapse of the trap when not in use.

Lobster traps

Spiny lobsters are traditionally caught from the south coast of India with traditional lobster traps. These traditional traps are called as Colachal traps. They are heart shaped/ arrow headed trap locally fabricated with biodegradable materials. By understanding the shortcomings and operational difficulties of the traditional traps, ICAR-CIFT has developed and popularized modern lobster trap for this region (Meenakumari et al., 2009). These traps were accepted by fishermen (Fig.1) due to special deign and durability.

Gargoor fish traps, Caribbean traps (arrowhead, "Z", "S", etc.); round traps, rectangular traps;"D"-shaped traps, collapsible traps, pelagic fish traps, North Atlantic cod pots, plastic multipurpose traps are some of the common designs used throughout the world.

In trap fishing, fishes are caught by attracting (using bait or any other attractant) or forcefully directing to specially designed traps or trapping area by utilising the behaviour of the targeted species. The diversity of fish traps designs ranges from natural structures like rocks and corals to specially designed species specific traps (Slack-Smit, 2001). . Based on the nature of catching mechanism, material of constriction and design, tarps are classified in to various categories.

Table 1: Details of various types of fish traps and trapping mechanisms

SL No	Trapping mechanism/ trap type	Details
1	Barrier type	As the name indicates these traps acts as an obstacle for fish movement. Physical constructions like dams, fences, nets etc act as barrier that may or may not be closed by the fisher after the entry of fishes.
2	Habitat traps	In habitat traps, the fishes which have the hiding

		behaviour are mainly targeted. The brush traps and octopus pots are example for this
3	Tubular traps	Tubular traps are slender funnel shaped traps with a bell shaped mouth and a narrow neck in the hinder region. The narrow funnel stops the fishes from getting out backwards. Eel tubes are good example for a tubular trap.
4	Mechanically operated traps	Gravity traps (box traps) and Bent-rod traps that are examples for mechanically operated traps. The traps are mechanically closed by the fishers
5	Basket traps	Most of the advanced trap designs are the modification of basket traps. These traps have special designs which make easy entry but the escapement or backward movement difficult or impossible. These types of traps are fabricated with wood, bamboo, plant leaves, plastics, metals, synthetic yarn etc.
6	Large open traps	Large panel of nets or mended bamboo panels or similar constructions are used in large open traps. Usually there will be a mechanism to stop fish from escaping, which can be fixed on sticks or anchors, set or floating.
7	Aerial traps	Aerial traps are normally set out of the water. Some fishes when in danger, excited or under physical pressure jump out of water. Any suitable horizontal nets, rafts or boats or boxes can be used to collect the fishes as they fall back. Pitfall traps used for catching crabs during their migration to shore come under aerial traps. Fishes like mullet and milkfish are harvested using this type of mechanism in south Indian states like Kerala, Tamilnadu and Andhra Pradesh.

Targeted species

Most of the fishes, crustaceans and cephalopods can be caught with traps and pots. The catch rate of the trap fishing depends on the distribution and assemblage of the targeted species in the fishing ground also the behaviour of the fishes.

The species of fish, crustaceans and cephalopods caught in the different regions of the world are often characteristic of those regions. Some types, however, are found in a wide range of marine and estuarine areas, for example snappers, sharks and squids (Slack-Smit, 2001).

In India,, shallow-water reef and estuarine fish and shellfish are commonly caught with traps and pots, Most pots and traps used in the tropics have been designed for fishing in reefs, rocky areas and on the rough bottom. The fish, cephalopods and crustaceans taken include snappers, emperors, groupers, parrot fish, surgeon fish, squirrelfish, angelfish, tropical rock lobsters and others. Pot fishery is widespread in mangrove creeks and estuarine areas for various crabs (mud crabs, swimmer crabs, spanner crabs, etc.), adult prawns (giant freshwater prawn) and a number of offshore shrimps. Various types of squid and octopus are also trapped in most tropical waters.

Factors considered during the fabrication of fish traps

The cost for material and the charge for fabrication of fishing traps should be made minimal, by using locally and easily available materials. The material used for the construction should be durable and should be able to withstand the physical stress of the fishing environment. If the traps are for marine use, the material used should be sturdy in sea water or it should be coated or treated with suitable anti corrosion agent. By using biodegradable

materials, ghost fishing can be prevented in the event of losing the trap during operation. The design should be simple and easy to set and haul. The gear should be easy to carry in the vessel and should not have any complex structures, projections or attachments. The catch quantity can be improved by using more number of traps. For this stack ability of the gear plays an important role. If the traps are of light weight and collapsible, more number of gear can be accommodated in boat or vessel. The design should be selected based on the biological characteristics of the targeted species like morphology, feeding and swimming behavior, niche etc. Any designs mentioned in table 1 can be selected depending on the physical and biological characteristics of the fishing ground and targeted species respectively.

Parts of a typical fishing trap

A typical fish trap consists of the following parts

Main frame skeleton (rib)

Frames are the main skeleton or ribs of trap. Usually strong materials prevent the traps and pots from losing their shape during fishing. Wood, bamboo or metal are the commonly used materials for the fabrication of main ribs,

The outer covering

This part may be with bamboo slits, synthetic meshes or metallic webbings. In traditional pots, coconut or palms leaves are used. The selection of material is mainly based on the traditional usage, cost and availability.

Funnel (entrance)

Funnel or entrance is the major part of a trap. These are the entrance to the trap. The number of funnel varies depending on the design of the trap. The entrance may be single or multiple. Studies show that more number of funnel increases the catching efficacy of the gear.

Door

Doors are referred to the catch collecting area. Some designs may be provided with, an area where the meshes can be opened and closed for collecting the catch

Escape gaps

An Escape vent ensures responsible fishing. These are the gates for the escapement of juveniles entering inside the gear (Fig 1). Escape gaps are common in lobster traps in many parts of the world, but not in India.

Bait area

Normally bait will be provided in the trap to attract the fishes. Bait will be fixed in the main chamber of the trap with suitable bait bags or chambers. Small pelagic fishes, slaughter house waste and small animals are commonly used as bait for attracting the fishes. Even artificially formulated bait can be used in traps.

Ballast

In the area with higher tidal flow or current, suitable weights need to be provided in the traps to prevent losing of traps. Ballast are normally used in the traps constructed with light weight material. Ballast also helps to maintain the original posture of the traps during operation.

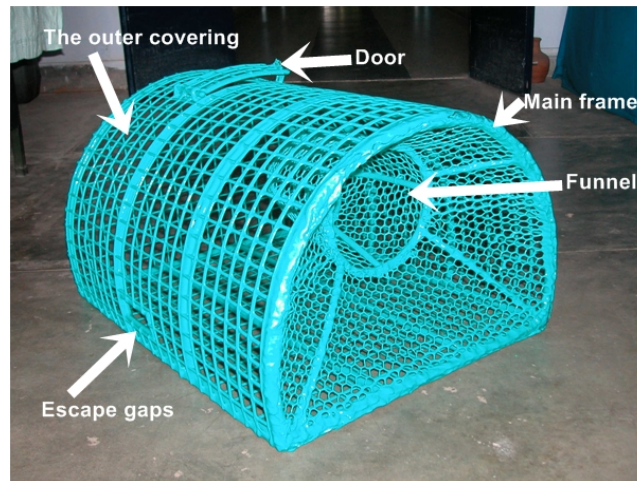


Fig. 1. Modern lobster trap (ICAR-CIFT Design)

Collapsible fish traps – Design and construction

Use of collapsible traps is an option to increase the catch rate and profitability of fishers. By using foldable traps, more number of traps can be stacked in the fishing craft. Recently ICAR-CIFT has developed a collapsible fish trap for marine and inland waters. These collapsible traps are of simple design and fishers can easily adopt the technology. These traps are of low cost and light weight when compared to the conventional traps.

The trap is made with two rectangular stainless steel frames of 1.0 X 0.60 m size and two square frames of 0.6 X 0.6 m size (Fig. 2). The two sides of the frames are cover with high density polyethylene netting with 80 mm mesh size and 1.25 mm diameter. The entrance funnel of the trap is made of polymer mesh netting. A 4 mm diameter PP rope is attached at the centre of the upper frame with a float attached at the other end for locating and retrieving the trap (Remesan and Prajith, 2018).

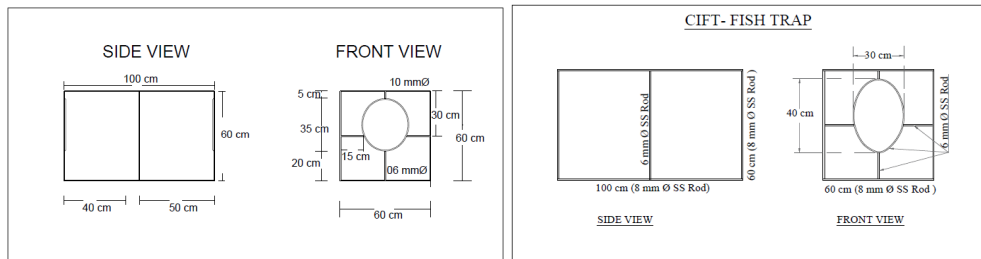


Fig. 2. ICAR-CIFT collapsible fish trap spherical and oval mouth designs

Operation of traps

Before operating traps, we should have some basic idea on following things (Slack-Smit, 2001).

- The type(s) of fish you want to catch and the type(s) of traps or pots that will catch them;
- The type(s) of bait needed for these fish and where you can get it;
- Suitable landing and storage for your catch on board;
- Market for your catch

Simple trapping and potting can be carried out from small boats or canoes or from large vessels. The efficiency of fishing with pots or traps can be improved by the use of equipment like power winches, haulers etc. Once the fishing grounds are fixed, traps can be setup at any time of a day.

Buoys or floats are normally attached to mark the location of the traps. There will be a buoy line attached to the traps/pots for the operation. Proper rigging is essential for the successful operation of the gear. The type and size of the buoy and the length of the buoy line vary based on the area of operation. Normally the length of float line is kept as one and half to twice the water depth of the fishing ground. The length of the line can be increased if the water current is higher at the fishing site. Bright coloured flags, radar, reflectors and even radio beacons are used in advanced trap designs for easy identification. Traps can be operated as single or in series (Slack-Smit, 2001).

Traps and pots can be operated with or without bait. In the case of habitat traps, there will not be provision for the bait attaching area. Funnel shape and positioning of the bait play

important role in catch rate. Normally, centre of the traps is the ideal location for attaching the bait. The position of the bait can be optimised by fishers by continuous trial and error method. Depending upon the targeted species, waste from poultry slaughter house, fish and shrimp waste, molluscan meat, wheat flour mix etc can be used as bait. Quality of a good bait include effectiveness to attract targeted species, easy to attach in the gear, long lasting, local availability, low cost etc.

Soaking time also depends on the targeted species and its behaviour. It also depends on the species abundance at the fishing ground. Soaking time varies from few minutes to two to three days while 12- 24 hours is ideal soaking time.

After suitable soaking time, traps can be hauled onboard. This can be done either by hand or by mechanical hauler. After collecting the catch, re-baiting can be done and traps can be deployed again in the same or different location.

Ghost fishing in trap sector

Due to bad weather condition, gear conflicts, physical condition of the fishing ground, entangling of large marine animals etc. there will be a chance to loose or abandon the fishing gear during operation. These lost or discarded fishing gear which are no longer under a fisherman's control known as derelict fishing gear (DFG), can continue to trap and kill fish, crustaceans, marine mammals, sea turtles, and seabirds. The most common types of DFG to ghost fish are gillnets and pots/traps. Ghost fishing can impose a variety of harmful impacts, including: the ability to kill target and non-target organisms, including endangered and protected species; causing damage to underwater habitats such as coral reefs and benthic fauna; and contributing to marine pollution (NOAA, 2015). To prevent the ghost fishing in traps fisheries, the following steps can be adopted.

- Using proper ballast and anchoring mechanism
- Always operate traps in good weather condition
- During unfavourable conditions, remove traps from fishing ground
- Select suitable site for the installation of traps
- Always provide escape vent or escaping mechanism in the design.
- Use of biodegradable meshes in specific locations

Conclusion

Traps are highly energy efficient low cost fishing gears with high size selectivity. Trapping allows some control over the species and sizes of the catch. The trap entrance, or funnel, can be regulated to control the size of fish that enter. Fresh and live catch ensure premium price to the fishers. Once the traps are set, the fishers can operate other gear or engage in other works to increase their income. Collapsible traps developed by ICAR-CIFT permit the transportation and operation of several traps at a time unlike traditional rigid traps (Remesan et al., 2006). In the context of energy conservation and responsible fishing techniques, trap fishing in the artisanal sector need to be promoted.

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