Marine traps operation, bycatch issues and mitigation measures

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Introduction

Traps are simple, passive fishing gear that allow fish to enter and then make it hard for them to escape. This is often achieved by putting chambers in the trap or pot that can be closed once the fish enters; having a funnel that makes it difficult for the fish to escape. Traps are energy efficient fishing gears which have economic advantages over other fishing methods. Traps are selective, both for species as well as size, and if operated responsibly can lead to sustainable fishery in the long run (Vadziutsina and Riera, 2020).

How do Traps and Pots work

Fish that enter a trap or pot find it difficult to get out and this gives the fisher time to take the fish that are caught. Traps can vary, from simple structures such as rock corrals able to hold various fish species passing by, to highly specialized equipment such as lobster pots. An advantage of trapping is that it allows some control over the species and sizes of the fish you catch. The trap entrance, or funnel, can be regulated to control the maximum size of fish that enter. The size of the holes, or mesh, in the body of the trap can regulate the minimum size that is retained (Sary et al., 1997; Robichaud et al., 1999).

Where do operate Traps and Pots

Traps can be operated in areas with underwater obstructions, like shipwrecks, rocky and coral reef grounds, where other gears can't be operated. The fish, cephalopods and crustaceans which 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 (mud shrimp, yellow shrimp, etc.) and a number of offshore shrimps.

Trap fishing of Indian marine waters

Trap fishing is one of the ancient fishing methods and it has been widely practised throughout the world in both tropical and temperate waters. In India, though the coral reefs are found in Gulf of Mannar, Gulf of Kutchch, Lakshadweep and Andaman and Nicobar Islands, trap fishing has been constrained to Gulf of Mannar. The first study on the trap fisheries along Indian waters by Prabhu (1954) given detailed account on perch fishery of Gulf of Mannar, south-east coast of India. Similarly, Miyamoto and Shariff (1961) described in detail on indigenous lobsters traps (Colachal type) used in south-west coast of India. Despite there has been subsistence level trap fishing throughout the Indian coast, the commercial trap fishing in marine water has been restricted to these two regions, mainly targeting lobsters (south-west coast) and reef associated fishes (south-east coast).

Factors influencing efficiency of traps

1. Rigging

Once a pot or trap has been constructed, it must be prepared for the fishing operation. Buoys or floats will mark the location of the pot, so buoy lines and bridles must be attached to the trap or pot for setting

and hauling. Appropriate rigging is also important to ensure that the pot or trap lands the right way up on the bottom. The length of the buoy line will vary with the trap type, the tidal range and currents in the fishing area. The usual length of the buoy line is about one-and-a-half times to twice the water depth being fished, but may be greater if there are strong currents. Floats or buoys are attached to the line so that you can find your trap or pot again and pick up the buoy line to remove the catch.

Fig. 1. Map showing the locations of marine traps operated along the Indian coast (yellow dots indicates crab ring operation location; red dots indicates the fish trap operation location).

2. Baiting

As stated earlier, some traps and pots (e.g. eel traps, octopus pots, pelagic traps and some Caribbean traps) do not require bait for their operation but attract fish by appearing to provide shelter. However, in most cases the placing of bait in the trap or pot gives an added reason for the fish to enter. The relationship between the funnel and the positioning of the bait is critical in getting good catches. The bait has to be positioned so that a fish entering to take it cannot back out through the funnel or find the funnel exit and escape. A good bait is effective at attracting the target fish; easy to secure in the trap; long-lasting; freely available when needed; not excessively expensive; easy to preserve and transport.

3. Setting

A key factor in successful fishing with traps and pots is the location in which you set them. This positioning will depend on the types of fish you are targeting. It is very important that you develop the capacity to understand how the fish will react to your trap or pot. For fish that live

under reefs or rocks and do not venture far from their shelter (e.g. rock lobsters, tropical cod), you must place the trap close to where they are sheltering. In these cases, considering the tide and current, the location of your trap is critical and may make the difference between a good catch and no catch

4. Soak time

As with many aspects of trap and pot fishing, fishing time will vary with the target species and their behaviour. Some fish feed actively only at night so, if you are using baited traps, night fishing is indicated. Other fish feed mainly during the day and can only be taken during daylight. Non-baited traps and pots such as the pelagic fish trap and those used in the Caribbean should be set for short periods at times when the target fish are seeking shelter. The duration of each set will also vary with the behaviour of the target fish and the durability of the bait. When fish are feeding very actively, the fishing time of each set may only need to be a few minutes. Some tropical snappers off northern Australia can be taken in only 30 minutes between setting and hauling. In other fisheries, the soak time may be several days depending on the fish and conditions. It has been found in the Caribbean that a soak time of two to three days is usual and that after four to five days the catch may actually decrease, possibly because the fish learn how to escape from the trap. Normally, depending on local conditions, traps are hauled every one to three hours in shallow waters, while at greater depths they are frequently set for longer. In some areas, new traps and pots are soaked in the water for some time before they are used for fishing to eliminate any foreign odours coming from the materials used or, in the case of cane and wooden pots, to eliminate any trapped air.

Disadvantages of Trap Fishing

Traps often are considered to have fewer holistic environmental impacts than active fishing gears (Stevens, 2020). However, in addition to the targeted catches, traps still cause unwanted mortalities due to (i) discarding, (ii) ghost fishing of derelict gear, (iii) depredation, (iv) escaping or dropping out of gear, (v) habitat damage, and potentially (vi) avoiding gear and predation and (vii) infection of injuries sustained from most of the above (Uhlmann and Broadhurst, 2013).

1. Ghost fishing

As with other fishing gear, special care must be taken to reduce the number of traps and pots can lost during fishing operations. Further, the lost gear may continue to attract fish for days or months, which is wasteful and reduces fish stocks without any return. In some fisheries, legislation has been passed to make it obligatory for fishers to design their gear with a section that will corrode quickly and make an opening for fish to escape from lost pots (Gomes et al., 2014).

2. Juvenile fishing

Trap fishing also poses a threat to juvenile fish because of the small mesh sizes used, particularly to high-bodied species such as surgeonfish (Acanthuridae). In areas with high levels of trapping, juveniles can represent a significant proportion of the catch and trapping can lead to reduced productivity through growth over-fishing, i.e. premature removal of fish leading to lower catches (Ben-Hasan et al., 2021).

Possible technical gear modifications

Examples of gear modifications that reduce unwanted by-catch

a) Square mesh escape window to release small fish and to increase the size selectivity
b) Encircling square mesh selection panel in a pontoon trap for better size selection
c) Size sorting grid to avoid the small and juvenile fish capture
d) Installing bent-tunnel openings in crustacean traps to reduce the rockfish.
e) Escape gaps in lobster traps reduce catch rates of undersized lobsters
f) Permanent magnets reduce bycatch of benthic sharks in an ocean trap fishery

Recommendations

1. Modifications of fishing gears has significantly helped to reduce by-catches
2. Economic rewards should be offered for the creation and use of gear modifications that reduce by-catches and minimize impacts on habitats
3. Co-operation between fishing industry, scientists and other stake holders is fundamental
4. Reduction of impact on grounds that has a “rich” biodiversity should be given highest priority
5. Fishing practice that has reduced bottom interaction should be promoted

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