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Fishing Gears with Improved/ Modified Technologies

S. Archana

Dept. of Fishing Technology and Fisheries Engineering, Fisheries College and Research Institute, Thoothukudi, Tamil Nadu (628 008), India

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Corresponding Author

S. Archana

e-mail: fishco.archana@gmail.com

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Abstract

Although the basic principles of wounding, hooking, trapping (by gills, fins, and spines), surrounding, scooping, and filtering can still be recognized, fishing gears have experienced a lot of modification and advancements in recent years, in accordance with advances in modern technology. Early fishing crafts comprised rudimentary devices such as floating logs, bamboo, papyrus rafts, and calabash craft, canoes, but at the other hand, were probably developed subsequently as an enhancement. Most of these ancient crafts can still be seen today, particularly in tropical developing countries. Modern fishing craft, including fishing gear, have seen significant improvements in size, quality, and sophistication, all of which have been made possible by modern technology. The use of turtle excluder devices (TEDs) in shrimp trawls has drastically reduced the number of turtles caught. The introduction of turtle excluder devices (TEDs) in shrimp trawls has dramatically reduced the mortality of endangered sea turtle.

Introduction

The fishing industry has developed and expanded during the last century because of enhanced consumer demand. Fishing technological advancements supported this expansion by enabling for the capture of larger quantities of fish at lower costs and with less labour. By damaging the seafloor habitat of surrounding plant and animal species, certain methods, particularly bottom trawling, induce extinction (Kaiser *et al*., 2002). Large-scale harvesting was accompanied by increased bycatch (non-target species obtained by fishermen), resulting in the destruction of some populations accidently caught with marketable fish.

Technology developments in fishing are reducing severe ecological impacts while improving selectivity in both species and size of fish harvested. The restoration of fish habitats and the protection of threatened or endangered species are the major objectives. To achieve these objectives, multiple groups must operate simultaneously. To save depleting fisheries, governments must develop and enforce restrictions. Manufacturers must simultaneously introduce sustainable fishing technologies to the worldwide market. As new machinery gets more widely used, prices will fall, and acceptability will rise. Fish are caught using a variety of fishing gear and practices, ranging from small-scale traditional to large-scale industrial systems. Fishermen can use a variety of fishing gear and methods depending on the species, as well as the environment and ground conditions.

Trawl Net

Trawling is one of the most popular fishing methods in the world, catching everything from small shrimp to large tuna. Trawling techniques have evolved over time, with the most notable change being the increase in gear size, which has often resulted in significant fishing efficiency

for specific targets. Trawl gear has the inherent difficulty of catching organisms that should have been avoided for several reasons, including undersized individuals of the target species, endangered species, low-value fish, and charismatic endangered animals like sea turtles and marine mammals. The mesh in the trawl's retention bag (the cod end) is too small to allow non-target species to escape, which is one of the main reasons for non-target organisms' capture (Figure 1). As a result, cod cod-end selectivity has become a target of trawl conservation regulations. With relatively simple constructional modifications, such as increasing mesh size or changing the form of cod-end meshes, positive outcomes have been obtained in single-species fisheries. Modifying the general cod-end design, type, and thickness of the twine, as well as eliminating cod-end attachments such as chafers, lifting bags, and other similar items, might help with size selection. Certain fisheries have successfully used sorting grids and special selectivity panels inserted into the trawl for size-sorting, and current innovations of flexible sorting grids give new opportunities for practical and effective size-sorting. Simple gear improvements, on the other hand, do not easily improve size- and species selectivity in mixed-species trawl fisheries. Taking use of various behaviour patterns of target and non-target species during capture is the main method used in such scenarios.

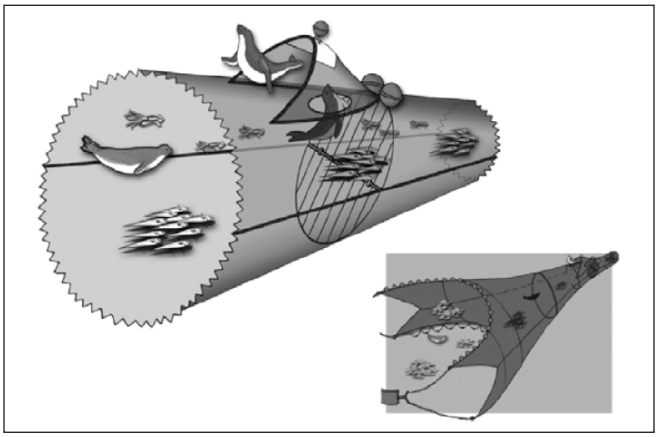

Figure 1: Turtle Excluder Device

Purse Seining

Purse seining is a widely utilized technique for encircling and capturing a detected shoal of fish. The incidental capture of dolphins and marine mammals in tuna purse seine fisheries in the 1960's was a major source of concern. It was the first time when environmental and conservation groups brought the issue of bycatch to the forefront of international fisheries management. The pressure from these organizations was so intense that authorities and the fishing industry were encouraged to come up with practical approaches to significantly decrease dolphin mortality in the tuna purse seining fishery. The practice of encircling groups of dolphins associated with tuna was one of the major causes of problems. The unintended mortality of dolphins caught using this method was enormous in the early years of the fishery (an average of 3,50,000 dolphins per year in the 1960's), causing significant declines in dolphin populations.

Dolphin mortalities have been reduced to appropriate levels either by a range of modifications to purse seines, release procedures, and education and training of skippers and crews (Hall, 1996). Different mesh sizes in different portions of the purse seines, a different manner of connecting the cork line called "backdown" once dolphins were surrounded, the deployment of speedboats as dolphin rescue boats inside the seine and avoiding areas with populations of dolphins particularly prone to entrapment were among the alterations. The success of this fishery's efforts shown that dolphins may be saved without eliminating a major fishery.

Small fish, sharks, rays, and other species caught as by-catch in tuna purse seines when fishing near or under floating objects and Fish Aggregating Devices have recently raised concerns (FADs) (Figure 2 and 3). Because these unwanted organisms relate to floating items, it is difficult to avoid catching them while targeting tunas swimming near them. This method of fishing is considered unsustainable, and a remedy is urgently required. Other purse seine fisheries have shown some effectiveness with sorting grids, but one issue with this technology is the significant mortality of escaping fish, particularly small-sized pelagic species (Beltestad and Misund, 1995).

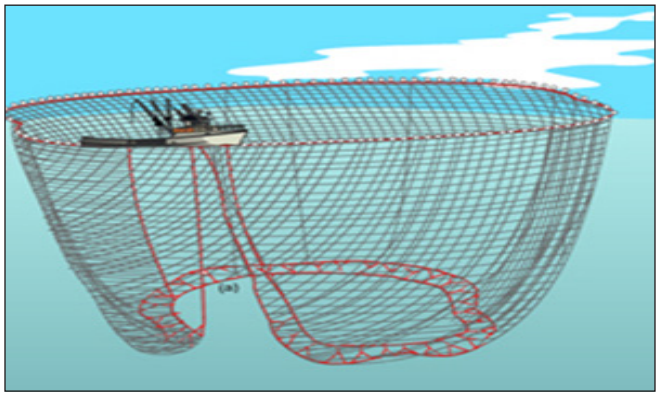

Figure 2: Operation of Purse seine

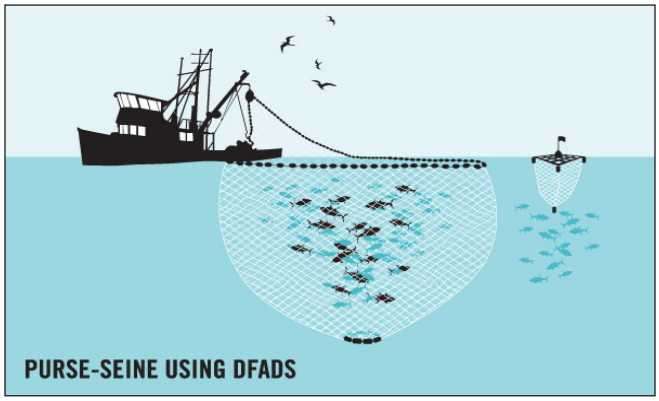

Figure 3: Purse seine using FAD's

Gill Netting

Gillnets capture fish by intercepting fish as they move, and such gear can be highly effective for species that would otherwise only be caught with trawls or other active fishing gear. Gillnets have relatively strong size selectivity for finfish, but limited species selectivity. The quality of the catch is normally relatively high if appropriate soak durations are followed, but most fish perish during the capture, thus releasing by-catch seems to have little possible benefits. Concerns about the entanglement of sea birds, turtles, and marine animals have recently arisen, prompting various potential remedies to be investigated. Acoustic scare devices (pingers) may be effective in preventing cetacean entanglement; however, such signals might become habituating. Setting nets parallel to mammal migration patterns or several meters below the surface may decrease unintentional capture, and gaps between large fleets of nets allow cetaceans to pass through. Regardless of these options, limiting the quantity of nets deployed during important seasons and places may be the most successful strategy.

Gillnets may catch large numbers of sea birds during certain seasons while diving for prey, which is a particular problem in many coastal areas. Acoustic or visual alarms, such as strips of highly visible netting in the upper part of the net, may serve to decrease entanglement without causing large catch losses. The effects of ghost fishing by lost gillnets are causing growing concern (Figure 4). Depending on the depth and the prevailing environmental conditions, lost gillnets may continue to fish for weeks, months, or even years (light levels, temperature, current speed). This issue can be addressed in part by using biodegradable materials or other methods to disable unattended gillnets, increasing efforts to avoid losing them, or aiding the speedy recovery of lost nets.

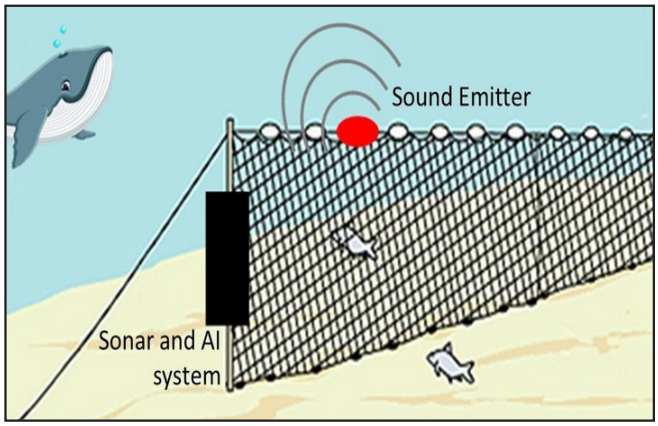

Figure 5: Gill netting along with pingers to avoid capture of Dolphins

Longlining

Longlines are employed to catch tunas, swordfishes, gadoids, flatfishes, and sharks in various parts of the world. By-catches are common in some longline fisheries, but they are normally alive when pulled on board, and if released gently, many may survive. Barotrauma or temperature stress, on the other hand, may harm the survival of released fish. Longline species and size selectivity can be influenced by bait size and type, and artificial baits that target specific species and sizes are an interesting study field. Hook design and size can also influence selectivity.

When seabirds try to eat the bait on the hooks while they are floating on the surface behind the vessel, they can be dangerous to them. Seabirds are caught accidentally in most longline fisheries, although the problem is worst at higher latitudes in both hemispheres, where seabirds are most abundant and longline fisheries are most common (Figure 5). To tackle this issue, make the baited hooks less accessible to seabirds. To a significant extent, this can be accomplished by rigging the longline with bird-scaring lines above it, or by rigging the longline through a tube that leads the lines directly underwater, rendering the baited hooks invisible or inaccessible to birds.

Many of the solutions that have been developed also reduce the loss of baits and thereby increase the fishing efficiency of the gear. The international plan of action for reducing incidental capture of seabirds in longline fisheries, developed by FAO, should help to create the required awareness of the problem, and encourage states that have such problems to take appropriate action.

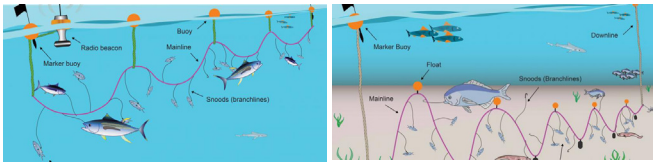

Figure 5: Operation of Longlines

Trap Fishing

Most of the trap fishing catches are alive and unharmed, undesirable by-catch species can usually be released with a good chance of survival, though factors like on-deck injuries and exposure, as well as barotrauma or thermal shock, may threaten the survival of released organisms. In comparison to many other fishing methods, traps have the potential for reduced by-catch mortality (Figure 6 and 7).

Figure 6: Collapsible crab trap

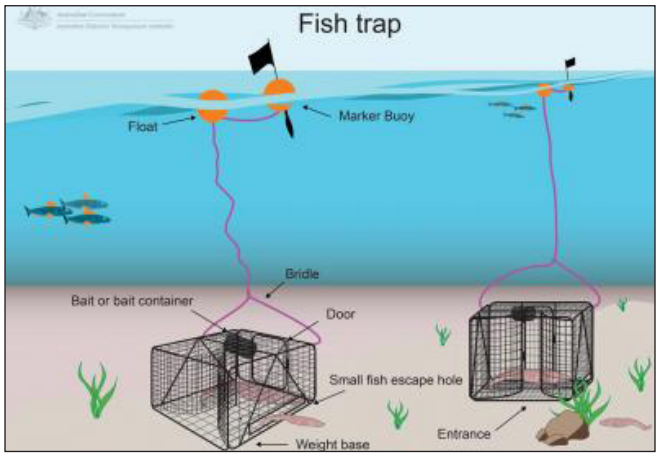

Figure 8: Setting up of Traps

Excl usionary Devices, Modified Gear and Thoughtful Fishing Practices

Any fishing method can be made less harmful by using exclusionary devices, modified gear, and fishing responsibly:

• Exclusionary devices can prevent non-target species from being caught in nets.

• Nets can be sized so that juveniles or smaller fish species can escape.

• Nets and lines can be made from non-tangling and biodegradable materials to reduce ghost fishing.

• Lines can be weighted to sink more quickly, quickly taking them out of range for seabirds and turtles.

• Acoustic devices can be used to scare away some marine animals while fishing is in progress.

• Flappers and flags can be used on lines to scare away birds and prevent them from getting hooked or caught up in lines.

• Hooks can be designed to do less damage and make it easier to release bycatch safely.

• Fishing can be done at specific times of the day to reduce incidents of bycatch.

• Specific types of fishing can be banned from areas that will not quickly recover from the method used.

Conclusion

To summarize, recent technological advances show that the impact of fishing gear on non-target species and habitats can be greatly decreased without having a significant detrimental influence on the profitability of the fishing operation. The innovation of new types of gear and modifications that limit by-catches and reduce habitat impact should be encouraged economically. As earlier stated, some revolutionary technologies are already accessible, with more on the way. This process will be accelerated by increased global awareness of the issues.

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