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DESIGN AND CONSTRUCTION OF PASSIVE FISHING GEAR INCLUDING GILL NET, TRAPS, HOOK AND LINE NETS

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INTRODUCTION

Fishing gear has often been developed by observation and experimentation, and until recently, empirical methods rather than analytical techniques have been employed to determine design parameters.

Fishing gear has often been developed by trial and error, as empiric processes have been used instead of analytical procedures to assess design parameters (Boopendranath, 2009). In recent times, design and creation initiatives have emerged based on scientific studies, system analyses, and model studies that incorporate the conservation of resources and ecological and economic challenges (Hubert et al., 2012).

PASSIVE FISHING GEAR

By using entangled, entrapment, or angling techniques that are not actively manipulated by people or equipment whereas the organisms are being collected, passively capture techniques involve fish capture or other aquatic species. Fish pots, Hook and line, traps, and gill nets are examples of passive fishing gear, distinguished by the lack of gear motions or/and the pursuit of the particular species (Brandt, 1984). The animals are captured as a result of their actions and behavior. Over the years, the methods employed for obtaining food have been similar to those used for passive surveys of fish populations (Edwin et al., 2019). Many currently used tactics date back to the ancient Egyptians, Romans and Greeks, who utilized nets and traps on a large scale. Passive sampling equipment can be categorized into three kinds based on how they are captured:

1. Entanglement: Devices hold fish while trapped or tangled in mesh or webbing built of natural or synthetic materials. E.g. Gill nets and trammel nets.
2. Entrapment: In one or more funnel- or V-shaped holes that prevent egress after entry, devices are used to trap creatures that enter an enclosed space. Entrapment gears include pot devices, trap nets, and hoops (Hubert et al., 2012).

3. Angling: Devices use a baited hook and line to catch fish. E.g., longlines and trotlines.

ADVANTAGES OF PASSIVE GEARS

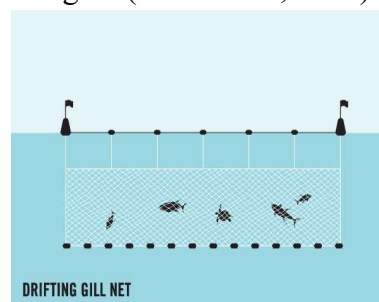
- Passive gears are made of relatively simple materials and are easy to operate.
- They often do not need any automated help apart from a boat to manage them, and operating them does not take much specific knowledge.
- Fish can be caught with passive gear for various reasons, and this method can provide information on the relative abundance of various species in various aquatic settings.
- Similar passive gear types and designs fished similarly at the same of the year can offer reliable indicators of changes in stock abundance.
- The managing effort is a crucial benefit of so many passive gears compared to most active gears.

DISADVANTAGES OF PASSIVE GEARS

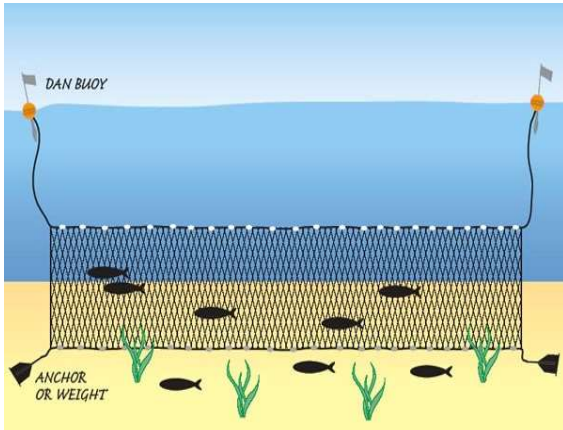
- Every passive sampling tool is to promote particular animal types, sizes, or sexes.
- Commercial fishermen who employ passive gear use their understanding of gear selectivity to increase the effectiveness of catching selected species in various sizes.
- An animal must first come into contact with the equipment, then be caught, and finally, it must be held by the equipment until it is retrieved.
- Selectivity takes place at every stage of the capturing process.
- A quantitative understanding of gear selectivity is required to interpret data from passive gears, but little data is available for the majority of gears and target species.

1. Gill Nets and Entangling Nets

Gill nets are rectangular netting walls held erect that are held erect by floats and sinkers and placed in the layer of target fish that swims. Fish are caught by being held in the mesh by gills in a gill net. Gill nets are horizontal netting panels often arranged in a straight line. Gill nets can catch fish in one of three ways: wedged, gilled, or tangled (Sreekrishna & Shenoy, 2001). Wedged captures fish by the mesh wrapping around the body, gilled captures fish by the mesh slipping behind the opercula, and tangled captures fish by the teeth, spines, maxillaries, or other protrusions without the body penetrating the mesh. Combining the capture modes is a common way to keep fish. Depending on the species being sought after and the relevant ecosystems, gill nets can be put up in various ways (Hubert et al., 2012). Gill nets are divided into three categories: drift, set, and encircling gill nets, depending on their use. Drift gill nets are used in the upper layers of the water and drift either independently or alongside the boat to which they are attached (Sinha, 2013). Gill nets set or secured to the bottom or a distance above it use anchors or ballast. Stakes are used to secure fixed gill nets in shallow coastal waters, and low tide is used to retrieve the fish. In coastal areas, encircling gill nets are used in the top strata. After encircling the fish, noise and other vibrations are used to drive them towards the net so that they are either entangled (Huert et al., 2012).



Drift Gill Net

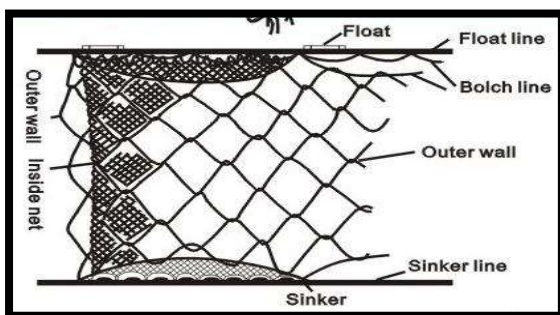


Bottom set gill net

Based on the design, there are three-walled nets known as trammel nets and small gill nets with supported by floats and sinkers.

Trammel net

The trammel net, which is often operated as a bottom-set, features an inner wall that is loosely attached and two outside walls with more significant mesh sizes. When a fish enters through the larger mesh on the outer wall, the inner wall stops it, forms a pouch, and holds the fish firmly after it exits through the huge meshes on the outer wall on the opposite side (Sreekrishna & Shenoy, 2001). The lower portion of the combined gill net-trammel net is made of trammel material, and the upper portion is made of a basic gill net. Due to their high flexibility, cotton/nylon webbing is typically used to make trammel nets. Commercial fishermen have utilized a variety of trammel net designs. Trammel nets have been made using both multifilament and monofilament materials (Hubert et al., 2012).



Trammel net

Large, mobile animals that live in shallow water in lakes and reservoirs are selectively caught in trammel nets. When the nets are drifting with the stream in the channels of significant rivers, trammel nets can also successfully catch enormous fish (Sreekrishna & Shenoy, 2001).

2. Entrapment Gears

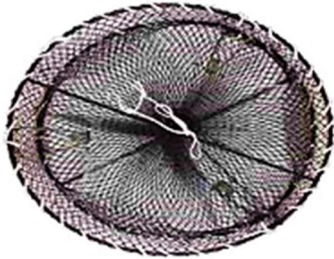
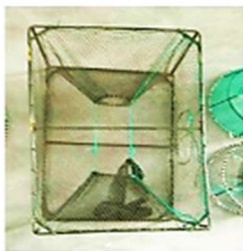
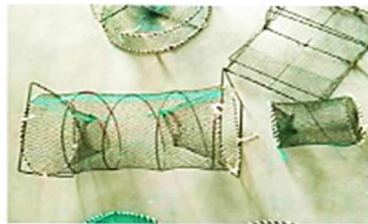
Animals are drawn into entrapment devices by their motions. They are caught when the entry to the equipment is in their line of travel, when they try to maneuver around, over a barrier, when the availability of bait, lure, other animals, or the cover it looks to offer draws them to the enclosure. An animal that has been admitted may leave through a doorway or may be kept in place until it is evacuated. Entrapment devices are made to take advantage of aquatic creatures' movement patterns, cover-seeking behaviors, escape responses, or diets. Minor, transportable variations of commercialized fishing gear are frequently utilized as entrapment gears in fisheries science.

Traps

Traps are passive fishing equipment with enclosures into which fish are drawn or steered and from which they must struggle to escape due to labyrinths or delaying techniques such as funnels or constrictions. Here, a variety of conventional fishing equipment is gathered. Using baits or shelter areas, pots are cages or baskets made of wood, metal rods, wire netting, and reinforced plastic used to catch fish, crustaceans, or cephalopods. They are given one or more entrances with the proper gap. Typically, they are placed on the bottom singly or in groups, linked by ropes and buoys to indicate their positions. Animals enter pot gears, which are movable, stiff traps with small openings. They are employed to

catch other invertebrates as well as fish and crabs.

baited hook. The nomenclature for these multiple-hook systems varies depending on

Crab Trap**King Crab Trap****Shrimp Pot****Fish Trap****Round Fish trap****Lobster Trap**

Fyke nets

In order to be used in the lentic system, fyke nets that resemble hoop nets have been adapted. To direct fish into the cage, fyke nets have 1 to 3 leads or webbing wings attached to the mouth. A cone-shaped netting bag with rigid rings to retain the cylindrical shape of the net body & wings to guide fish into the bag makeup fyke nets, which are employed in shallow seas (Hubert et al., 2012). Stakes or ballast are used to secure the bottom of the fyke nets, which can be used singly or in groups. Fish of a particular species & size can only be caught with fyke nets & trap nets.

3. Angling Gears

Worldwide, baited hooks & lines have been employed for passive angling to catch fish in freshwater and marine environments. To catch fish, anglers use various equipment, from a single, baited hook strung on a line to a float or tree limb to commercial longlines with a mainline and numerous vertical (drop lines), each with a

the target fish species and geographical region. However, some of the more prevalent titles are drift lines, outlines, trotlines, and trawl lines.

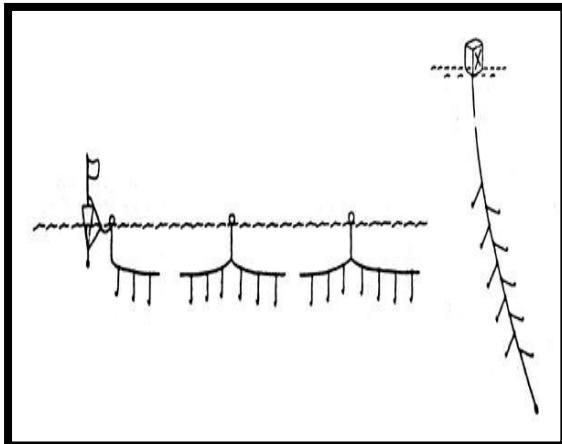
Hooks and Lines (passively operated)

Fish are drawn in through edible bait or lures before being captured by a hook tucked inside the bait or lure. A line or snood is attached to the hook. They can be used singly or in huge quantities. The small-scale industry's hand-operated lines and long lines, where numerous hooks are connected to the mainline using branch lines, are actual examples of hooks and lines that are passively operated.

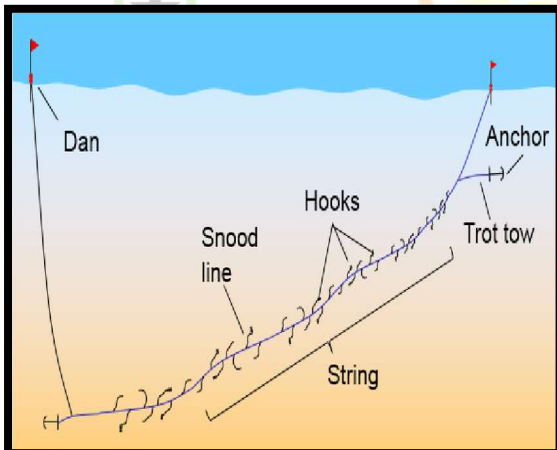
Long lines are defined as drifting long lines when set on surface or mid-water with the ability to drift with the current. Bottom-set long lines are set close to the bottom. Vertical long lines are set vertically, and bottom vertical long lines combine the characteristics of bottom and long vertical lines (Sreekrishna & Shenoy, 2001).



Trotlines are much smaller in scale than long lines employed in maritime fishing. Each longline might include thousands of baited hooks and span many kilo meters. On the ocean floor, long lines are positioned in search of haddock and Pacific halibut (Meenakumari et al., 2009).



Drift long line



Set long line

CONCLUSION

The most beneficial instruments available to fisheries researchers and managers for evaluating commercial or sport fisheries or assessing environmental influences on aquatic animal populations are passive sampling gears. However, issues with gear selection and sampling variability are prevalent worldwide. Strict sampling techniques and standardization of sampling equipment are required to minimize sample

variance and identify potential stock changes brought on by management actions or environmental factors.

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