

## Innovation in Fishing Technologies: Pioneering Sustainable Practices

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### SUMMARY

Fishing constitutes a vital industry providing sustenance and livelihoods for millions, yet faces significant challenges including overfishing, bycatch, habitat degradation, and pollution, threatening fish stocks and marine ecosystems. Recent advancements in fishing technologies, including GPS for navigation and satellite data utilization, have emerged. However, there's growing concern about fishing's environmental footprint. To address these concerns, innovative technologies have been developed to mitigate environmental impact and promote sustainability. Selective fishing gear represents a pivotal advancement, countering traditional methods like trawl nets that inadvertently catch non-target species, resulting in substantial bycatch. Incorporating features like TEDs for shrimp trawls or escape windows in nets enables non-target animals to evade capture, reducing bycatch and minimizing harm to marine ecosystems.

### INTRODUCTION

Sometimes, unhealthy fishing operations will have an impact on the environment. Fishing activity may also result in alterations like polluting the marine environment, accumulation of microplastics, habitat degradation, causes of bycatch, ghost-fishing, etc. Small-scale fisheries help to ensure food security and employ millions around the world. Overexploitation, however, jeopardizes the range of benefits that they can provide. Adopting innovation in gear technology can assist in overcoming challenges in fishing. Adopting of new technology in fishing sector for to overcome the income property and for being make well developed country Some Modifications in making to such fishing vessels and gear, as well as improvements to fishing operations and methods, have the potential to lessen fishing's environmental impact.

Fishing, a pastime as old as human civilisation, has seen a tremendous shift in recent decades thanks to technological improvements aimed at increasing productivity, lowering environmental effects, and ensuring sustainability. From ancient artisanal methods to cutting-edge technologies, innovation has transformed the fishing industry, creating new opportunities and difficulties in the pursuit of responsible fisheries management. However, the ecological characteristics of fished stocks make data collection difficult, time-consuming, and expensive because of their relative invisibility in the oceans, wide distribution and mobility across jurisdictional boundaries, and complex interactions within marine ecosystems and the physical environment. Fisheries bycatch is well recognized as a severe hazard to endangered marine megafauna on a global scale. Because of the significance of this phenomena, which endangers the survival of some species, technological advancements in fishing gear to limit bycatch have become necessary and have been included into legislation in several nations. These innovations are usually based on differences in sensory abilities between target and protected species, as well as physical and behavioural distinctions.

### Recent Developments in Fishing Technology

In the previous few decades, there have been dynamic improvements in fish harvesting technologies. Most significant developments include; Developments in craft technology, introduction of new synthetic gear materials, Advances in acoustic fish detection and satellite-based Remote sensing techniques, Advances development in navigation and communication equipment, Bycatch Reduction Devices (BRDs)

### Advanced Fish-Finding and Navigation Strategies

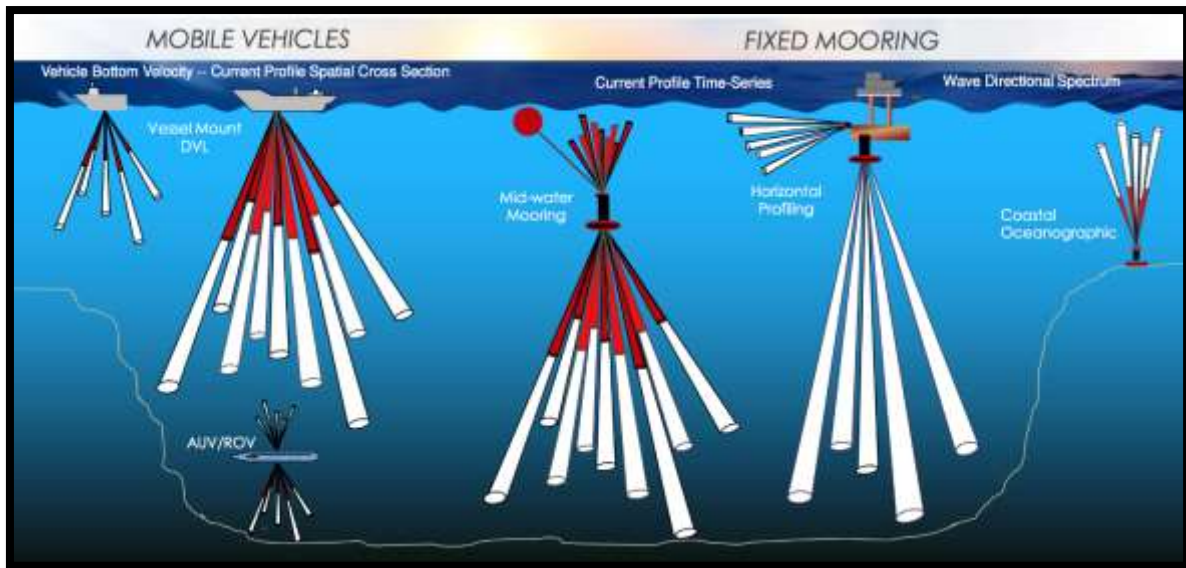
**GPS and satellite technology-** GPS helps fisherfolk navigate and optimally use satellite data by showing the exact latitude and longitude locations of fishing grounds. The satellite data is obtained with the help of sensors positioned on satellites. These sensors capture data about high sea surface temperature and intense chlorophyll distribution - two crucial indicators of potential fishing zones. The data is sent to fishing centres and local

fisherfolk through telegrams or faxes. It helps to Identify one's location, avoid getting lost, organize your trip, avoid mishaps, track, locate fish, and map the distribution of fish and monitor shoreline.

**Sonar and Fish finders-** A sonar is a device that locates objects by using sound waves. Within the fishing industry, a fish finder locates fish, structure, and the seafloor directly beneath the vessel, while a sonar finds fish around the vessel. By sending ultrasonic waves into the ocean and listening for returned echoes, a sonar may find these items. A school of fish can be found and its distribution, density, and movement shown by the sonar at an angle of 180° or 360° in all directions. Miniaturized general-purpose sonars have been installed in recent years.

**Multi beam Sonar System-** Multiple sound beams are used by multibeam sonar systems to produce an intricate three-dimensional map of the undersea environment. They can be used to quantify fish biomass and density, as well as to locate and monitor fish shoals.

**Acoustic Doppler Current Profilers (ADCPs)-** ADCPs can identify fish shoals and quantify water currents using sound waves. They can give real-time information on the number and location of fish shoals and are frequently mounted on boats or buoys.



### Adoption of New Fishing Gear and Craft

**Low drag trawling system-** The drag of a trawl system, which gives significantly to fuel consumption while trawling, is heavily impacted by the netting's design and rigging. The use of big mesh demersal trawls with optimal towing speed and thinner twines has been shown to minimize drag by around 7%, resulting in a proportional reduction in fuel consumption and operational expenses for mechanized fisherman in particular regions and moreover, the introduction of beam trawl was the best fishing method to maximize catch and profit.

**Cambered otter boards-** Otter boards are known to provide 20-25 % of the total drag of the trawl system. Introducing camber in otter board design is known to minimize resistance of the boards greatly, by boosting the hydrodynamic efficiency of the boards. ICAR-CIFT developed high aspect ratio, cambered otter boards for semi-pelagic trawling. Camber in otter boards reduces trawl drag by 4%, resulting in fuel savings.

**V-form otter boards-** V-form otter boards provide high hydrodynamic efficiency and stability. The ability to dig into the bottom and tide over tiny impediments makes it suitable for trawling on uneven and rocky ground. Properly rigged V-form boards offer a longer service life of 5-6 years and are cost-effective and safe for shooting and hauling.

**Bycatch Reduction Devices (BRDs):** Bycatch Reduction Devices (BRDs) refer designed to reduce the capture of non-targeted species in various species of marine megafauna, such as elasmobranchs, mammals, seabirds, and sea turtles. Several varieties of BRDs have been created and used in the fishing industry around the world.

**Turtle excluder device-** Devices used in shrimp trawlers, which are box-like structures that help to escape turtles or other larger animals that are caught in the net.

**Bycatch reduction panels-** Consists of large mesh-size panels present inside the trawl nets, which allow the escape of the smaller fish while the target species are retained in the net. BRPs can minimize the bycatch rate of juveniles or non-target species.

**Turtle Excluder Device (TED)-** It having a grid like structure that placed on shrimp trawls, helps escape of turtles or other larger animals.

**Bycatch Reduction Panels (BRPs)**- It having large mesh size panels placed inside the trawl nets that helps to escape of smaller fish. BRPs can minimize the bycatch of juveniles and non-target fish.

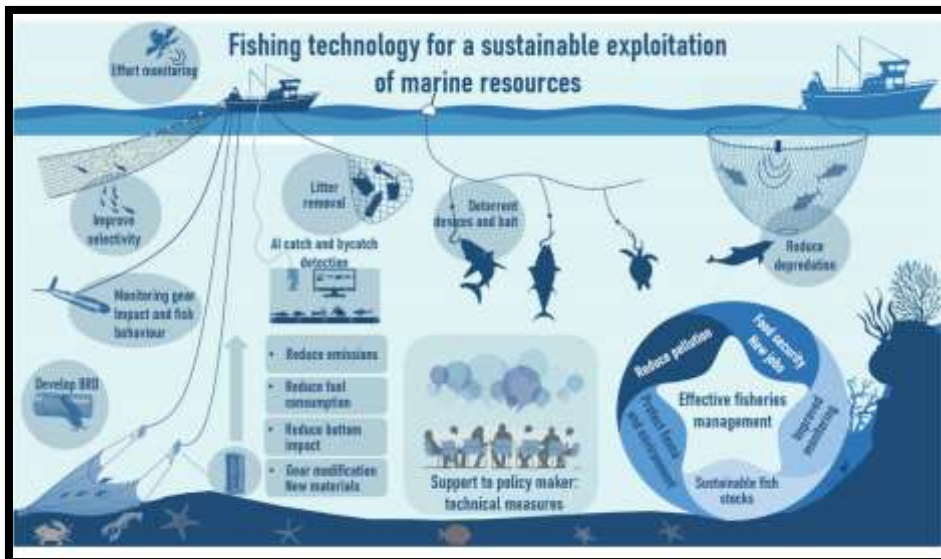
**Circle Hooks**- Used in Longlines, circle hooks are the modification of J baiter hook tends to reduce the mortality of elasmobranchs (Sharks, turtles) caught on lines.

**Bird scaring lines**- Used in longline fishing, it is made of colourful streamers that were created to prevent seabirds from diving for baited hooks, lowering the chance of bycatch.

**Escape Gaps**- These are openings in fishing gear, that allow small size or non-target species to escape. Placed in crab pots or lobster traps.

### Environmental Impact and Sustainability in Fishing Technology

Fishing is a significant sector that supplies food and income to millions of people throughout the world. However, the environmental impact of fishing has become a major worry. Overfishing, bycatch, habitat destruction, and pollution are among the biggest threats to fish stocks and marine ecosystems' long-term viability. In response to these issues, novel technologies have been created to reduce fishing's environmental impact while also promoting sustainability. The creation of selective fishing gear is one of the most important advancements in fishing technology that has helped to lessen environmental effect. Traditional fishing gear, such as trawl nets, frequently captures non-target species with the target species, resulting in significant amounts of bycatch. Selective gear, such as TEDs (turtle excluder devices) for shrimp trawls or escape windows in trawl nets, allows non-target animals to escape, lowering bycatch and lessening the impact on marine ecosystems.



### CONCLUSION

However, traditional fishing methods have frequently been linked to environmental deterioration, overfishing, and unsustainable activities that endanger marine ecosystems. In response to these issues, there is an increasing interest in developing and implementing new fishing technology devices and modifications to increase efficiency, sustainability, and lessen the impact on marine environments. In recent years, Technological innovation in fishing has revolutionised the sector and made it possible for fishermen to fish more sustainably and productively. The fishing business is always changing, from old-fashioned techniques to cutting-edge advances, motivated by the need to protect marine environments and satisfy the world's increasing need for seafood.

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