

Ghost Fishing: Haunting our Oceans' Sustainability

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SUMMARY

Marine ecosystems are seriously threatened ecologically and economically by ghost fishing, which is the unintentional capture of marine species by lost or abandoned fishing gear. The main cause of this phenomenon is several kinds of derelict fishing gear (DFG), like gillnets, traps, and fish aggregating devices, which linger in the ocean and indiscriminately trap both target and non-target species. Ghost gear can cause long-term damage to fish stocks, endangered species, and coral reefs. It also disturbs marine environments and contributes significantly to marine plastic pollution. Because ghost gear entangles marine life, injures them, and creates a vicious cycle of mortality and scavenger trapping, the effects are especially harmful to coastal populations and the viability of fisheries. To mitigate ghost fishing, technological solutions like the use of biodegradable materials and retrieval technologies like remotely operated vehicles (ROVs) are crucial, as are regulatory measures like GPS tracking and geographical zoning. This highlights the critical necessity for cooperation from all parties involved, including governments, environmental groups, and fishing communities to solve this worldwide problem and preserve ocean health for coming generations.

Highlighted Points

- Ghost fishing gear may be found in shallow (<1m) and deep sea (900m+) habitats.
- Ghost fishing gear is a pernicious form of marine plastic as it unspecifically snares marine life like seabirds and mammals.
- Capturing a creature with abandoned fishing gear is not regarded as “ghost fishing” unless there is a mortality.

INTRODUCTION

Ghost fishing' means if a fishing gear becomes abandoned, ceased or lost in our staggering waters and refers to what happens when this derelict fishing gear 'continues to capture aquatic life'. It also contributes to the decline of commercial fishery resources and the profits made from fishing. The statistics of nets lost annually and their potential impact on marine life are still being determined. The United Nations Food and Agriculture Organization (FAO) reports ghost fishing as one of the most pernicious threats to capture fisheries. Derelict, lost or discarded fishing gear is alleged as a universal concern with negative impacts on marine life and ecosystems, providing serious ecological and significant socio-economic challenges (Brown and Macfadyen, 2007). Aquatic life that are caught in ghost nets often die and lure scavengers which can get trapped in that same net, creating a vicious cycle. Ghost fishing gear is considered a pernicious form of marine plastic as it unselectively snares marine life and seabirds. Ghost nets also damage/kill corals because they become hooked and powerful ocean currents pull on the fishing nets in the water, tearing off pieces of coral and destroying the reef ecosystems. Derelict fishing gear is known as '*Silent Killers*' because marine oceanic currents frequently carry these nets to longer distances. Trade winds and oceanic currents can also carry these deadly derelict fishing gear into protected zones and no-fishing zones of marine habitats. The detrimental impact of ghost fishing on target and non-target species can result in ecological and economic disruptions, which therefore affects the sustainable fisheries, food security and livelihoods of fisherfolk communities.

Ghost fishing occurs when the fishing gear becomes derelict or lost and the fisherman can no longer get access to it. Such ghost fishing nets can also be called as derelict fishing gear (DFG). Gill nets, trawl nets, long lines, and traps are the most prominent forms of derelict fishing gear. Ghost fishing is a big global issue in several aquatic systems like inland and marine ecosystems. Like various sorts of marine trash, ghost nets and other derelict fishing gear have a variety of implications for the environment, animal conservation, human health, tourism, and local economy. Ghost fishing gear may be found in shallow (<1m) and deep sea (900m+) habitats, affecting different species. Any fishing gear (commercial or recreational) can become Derelict fishing gear which can ghost fish. However, fish traps and various fishing nets are the most prevalent. Gillnets, fishing lines, fish and lobster traps, crab pots, and fish aggregating devices (FADs) account for the majority of the ghost gear (Mitchell, 2019).

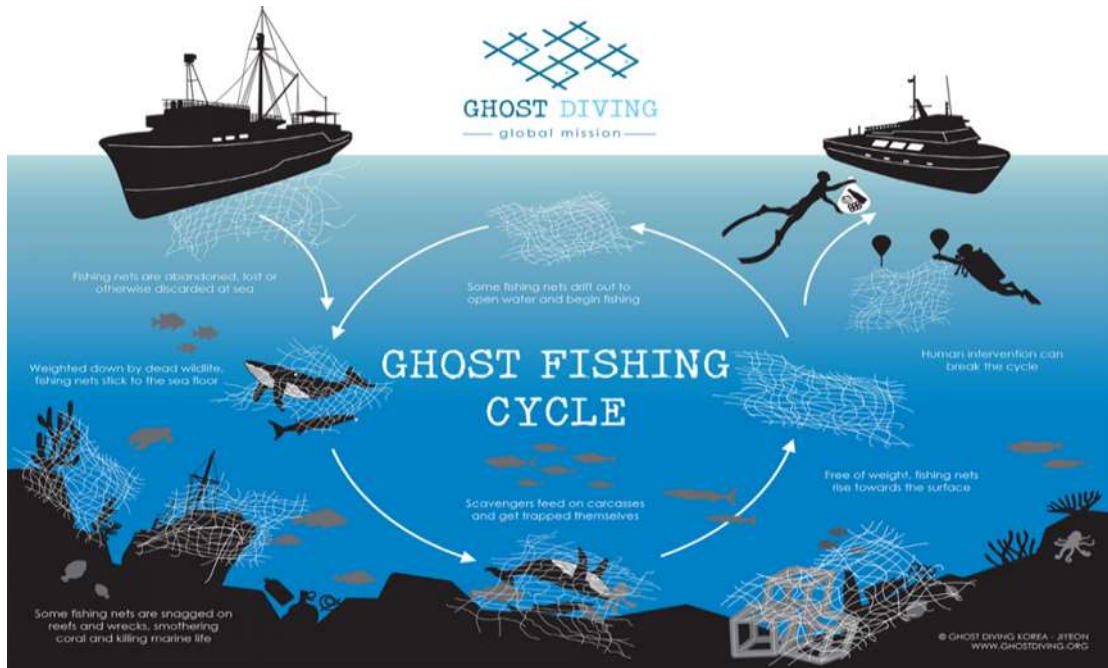


Figure 1: Ghost Fishing Cycle and Fate of Ghost Net (source: <https://www.ghostdiving.org>)

Fishermen originally wanted to target and catch a specific fish and shellfish species for commercial or recreational purposes; nevertheless, derelict fishing gear cannot be species-specific it can catch both target and non-target species (NOAA, 2015). The type and percentage of DFG vary regionally and can be determined by several variables including the kind of fishing activity, the topography of the fishing ground, water currents in maritime habitats, and the handling of fishing gear (WSPA, 2014). This intensifies that just capturing a creature with abandoned DFG does not constitute "ghost fishing" until fatality happens. For understanding, during a storm, if a lobster trap breaks free from its buoy then it becomes DFG and continues to catch lobsters. These lobsters then serve as bait, attracting other predatory species that were not initially targeted for capture. Derelict fishing gear might continue to phantom aquatic life for days or years (NOAA, 2015). Drifter tests conducted across the world have identified five major sites where marine garbage accumulates. Ocean currents and trade winds converge water masses in these particular areas, which contain marine trash such as abandoned fishing gear. These places are referred to as convergence zones. Some of these areas are the Northwestern Hawaiian Islands, the North Pacific Ocean, the South Pacific Ocean, and the North Atlantic Ocean. Other coastal sites, such as the Chesapeake Bay, Puget Sound, and Gulf of Mexico, also have derelict fishing gear (NOAA, 2015).

Impact on Marine Ecosystems

Ghost fishing, similar to all other sorts of marine trash, has a wide variety of environmental, species conservation, human health, tourist, and local economic consequences that stand as a global challenge in the fisheries sector (Baeta et al., 2009). These marine debris create hindrances while fishing and destroy fishing crafts and gear, pollute coastal beaches, endanger human health, impede ships, hamper quality by contaminating fish catch, hinder tourists and visitors, and are expensive to recycle. Furthermore, it also has various detrimental effects, including injury to wildlife through ingestion and entanglement around their bodies, asphyxiation of marine beds, leaching of toxic chemicals into waters, and the transport of exotic species (Mitchell, 2019). It has adverse effects on fish stocks and possible repercussions on red-listed species and benthic ecology (Macfadyen et al., 2009).



Figure 2: Seagull dead in a ghost net (source: <https://www.dw.com>)

When marine animals like whales, dolphins and sea turtles swim through a DFG get entangled around their body parts like flippers, resulting in drowning. Young seals entangle their heads into DFG loops or fishing ropes that become lodged around their neck or body, gradually ripping into their tissues as they grow. Rope and line ligatures can result in amputations and septic wounds. Plastic monofilament lines can slash arteries and limbs, causing strangulation. Aquatic birds become trapped in DFG and may be unable to swim, feed, forage, or fly. The trapped aquatic life suffers from chronic pain and misery, which worsens over time. However, some animals experience acutely, which is defined as pain and anguish that occurs quickly and for a short amount of time. The total number of animals damaged by abandoned fishing gear is extremely uncertain because many tales involve creatures that have been spotted alive (WSPA, 2014).

Contribution of Ghost Gear

According to an FAO report, approximately 700,000 tonnes of fishing gear enter the ocean waters each year. It is believed that ghost gear accounts for at least 10% (500,000 to 1 million tonnes) of marine trash. According to a recent study, 5.7% of all nets, 8.6% of traps and pots, and 29% of all lines used for fishing globally have been lost or discarded in the environment. DFG was discovered to entangle over 5,400 organisms from 40 distinct species of marine animals (whales and seals), reptiles (sea turtles), birds (seagulls, penguins), cartilagenous (sharks and rays) and bony fishes (Lively and Good, 2019).

Risk of Different Gears and Their Level of Impact in Environment

Ghost fishing turns out when passive gears such as gillnets, trammel nets, pots and traps and other damaged parts of active gear are lost or abandoned and continue to catch economically viable and non-target fish and shellfish species, aquatic birds, and other marine animals. Ghost gears can also harm benthic habitats translocating sea bed structures, cause litter when washed ashore, and pose potential risks to fisherfolks when they become entangled with active fishing gear and craft propulsion systems. Furthermore, Synthetic fishing nets that have aged and fractured into tiny contaminants at sea could ultimately accumulate in marine environments, potentially having major prolonged biochemical effects on marine life.

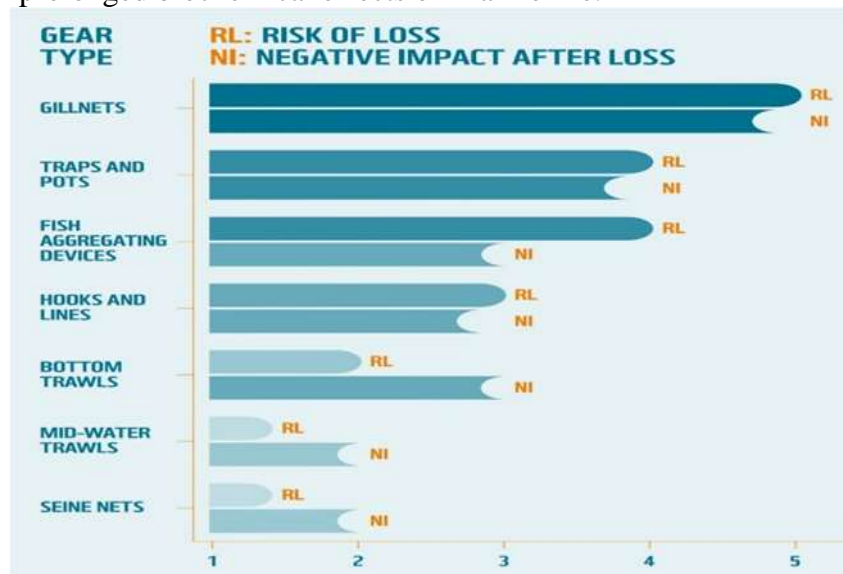


Figure 3: Risk level of various fishing gears (NOAA, 2015)

Gill Nets are the most harmful passive fishing gear type among all commercial nets. Gillnets hang in the water like an invisible wall and trap any fish that tries to swim across its meshes (Thomas et al., 2023). They can also cling onto coral reefs and seagrasses, creating a knock-on effect on anything that thrives in that area. The most typical methods for gillnets to become derelict include disconnecting away from floats or buoys, entanglement with the benthic rocks, and entangling with the other operated fishing gear (Mitchell, 2019).

Traps and Pots- show high impact on ghost fishing gear. It gets lost due the similar reasons as the gill nets. Each has a different structure and is made up of different kinds of material and traps using bait. Even if they are lost, they keep on alluring the prey with their baits, this brings about a feedback loop leading more scavengers allured towards it.

Purse Seines- Intermediate-risk ghost fishing gear. Occasionally during purse seining, a fragment of seine may be damaged and need to be cut off, ending up as DFG in the ocean. Sometimes if the catch is too heavy there is a chance of an entire loss of nets if a line holding the net aloft breaks. Purse seiners naturally attempt rigorously to recover a lost net since it is economically viable and difficult to purchase new costly seine.

Trawl Nets- Intermediate-risk ghost fishing gear. While trawling in the rocky substrates, there are possibilities for the net to get struck and partially get lost, this is one such common problem in bottom trawls. Surface trawls are lighter and when torn, they float in the water.

Hook and Lines- High-risk ghost fishing gear. As it is affordable, these are generally left apart if they get entangled or damaged. In the Florida Keys, this type of trash caused severe damage, with the monofilament line contributing the most by harming reef morphology and ecosystems (Macfadyen et al., 2009).

Fish Aggregating Devices- The fishing gear that creates most of the ghost gear. FADs are mostly used for tuna fishing around the world. FADs are commonly designed utilizing materials from old purse seines or others. Drifting FADs are majorly monitored using satellite buoys and when some FADs drift outside the fishing area they stop the tracking instead of retrieving those lost FADs.

Factors Contributing to Ghost Net

Adverse sea conditions lead to the dislodging of set fishing gear, causing forfeiture. Fishermen frequently dry their nets on beaches, which may get carried away during storms.

Poor disposal and recycling facilities at ports and lack of technology for recycling.

Improper maintenance of nets leads to reduce the efficiency and durability of nets.

High retrieval costs- Discourages fishermen from recovering lost nets, which can also be time-consuming.

Conflict between fisheries & vandalism- fishing gear operated might hinder the navigation of other crafts or fishing vessels leading to conflicts and vandalism in fisherfolk.



Figure 4: IUU* and Ghost Gear (Source: <https://www.ghostgear.org>)

Illegal, Unreported and Unregulated (IUU*) fishing activities can create fishing conflicts and if identified by a Coast Guard, a quick escape may leave behind/damage net away.

Catch overloads can damage the integrity of the operating gear.

Destructive fishing operations like Bottom trawling led to snagging of gear on the seafloor resulting in tear or ultimate loss of gear.

Harmful Impacts of Ghost Fishing

Ecological Impacts

- Directly harms aquatic life by entanglement or through ingestion
- Indirectly show a negative impact on habitat degeneration and ecology
- Plastics in DFG break down into microplastic pieces, polluting the ocean.
- Derelict gear can transport toxins and chemical pollutants along marine food chains and food webs.

- Floating derelict gear can travel and spread non-native species to areas where they may harm the ecosystem, economy and human health.
- Ghost fishing gear ends up in nearshore habitats negatively impacting aesthetic value, tourist activities, educational and research investigations.
- Nets can destroy the coral reefs and seaweed ecosystems.
- These DFGs can obstruct navigation as well as operating other fishing gear, posing risks and equipment damage in the sea.

Economic Impacts

- It is reported around 90 per cent of the global ghost catches are commercially viable.
- Cost of replacing lost gear.
- Cost incurred to restore damaged marine environments.
- Declined populations of commercial stocks due to mortality in derelict fishing gear.

Preventive Measures to Mitigate Ghost Fishing

- Implemented spatial zoning in fisheries to prevent gear clashes and improve navigation awareness.
- Reducing fishing effort like lowering the soaking time of the gear, restricted fishing time etc.
- Minimizing ghost fishing efficiency of gear (improve eco-friendly aspects for release or disabling of lost gear). One type of trap contains escape passages that are secured with a biodegradable rope material. As a result, if the trapping gear becomes derelict, the rope will ultimately decay, allowing the passage to open and free any caught creatures (Mitchell, 2019).
- Tagging and marking gears with integrated GPS helps in proper inspection, continuous monitoring, and immediate recovery of gear.
- Affording port disposal facilities and providing incentives to manage improper disposal.
- Initiatives like Fishing for Energy or encouraging art from gear wastes can mitigate pollution and also provide income to local people.
- Increase awareness and its negative impacts as marine trash.
- Collaboration between manufacturers, government and NGOs can promote change and help in better management of DFG.
- Comprehensive data must be known regarding ghost fishing and derelict fishing gear like the regulations, compliance rates, ghost catch rates etc.
- Improved gear design to minimize failure of gear or snagging.

According to a recent NOAA study, the majority of derelict fishing gear losses may be avoided. Integrated-GPS tagging is employed in EU fisheries, and they have led to higher recovery chances. A unique type of completely decomposable escape passage for pots has been developed utilizing polyhydroxy alkanooates, with the entire escape door disintegrating rather than just the cable (Mitchell, 2019). Cooperation between rope manufacturers and fishermen resulted in improved ground line modifications that reduced the loss of traps on rocky bottoms, lessening the likelihood of becoming DFG.



Figure 1: Underwater ROV (Source: <https://www.deeptrekker.com>)

Technologies for Ghost Gear Retrieval

The DTG3 ROV and REVOLUTION ROV are easy to operate, portable, and designed to withstand severe open sea settings. Deep Trekker has a revolutionary pitching mechanism for optimal manoeuvrability. Additionally, with an extra grabbing claw, the Deep Trekker ROV can even recover ALDFG. The portable controller, which includes a video display, makes it simple to pilot the machine and survey photographs. Because of the unit's great mobility, you may survey in tough or problematic places up to depths ranging from 100 to 150 metres. The inbuilt HD camera's 330-degree field of vision may be viewed in real time. When finished, all DTG3 ROV components are placed in a single, compact container (NOAA, 2015).

Problems in Management

It is difficult to obtain accurate figures owing to inadequate reporting of the statistics of gear lost. Difficulty in effectively monitoring or recovering abandoned fishing gear. Fishermen lack sufficient awareness. Clean-up costs make it difficult to use innovative technology on a broad basis. Globally, little is known about the incidence of loss and how long gear remains ghost fish. This is due, in part, to fishermen's hesitancy to disclose lost gear, and also the time required to conduct comprehensive ghost fishing investigations.

CONCLUSION

Ghost fishing is a severe environmental issue with long-term effects on marine ecosystems. The uncontrolled and unintentional trapping of aquatic life by abandoned, missing, or derelict fishing gear endangers fisheries' viability and general ocean health. To summarize, combating ghost fishing necessitates a multifaceted approach that includes better waste management, stronger laws, technological advancements, and enhanced education, and awareness among the fisherfolk and the common people. Governments, environmental organizations, and fishing communities must collaborate to decrease ghost fishing and establish more sustainable and responsible fisheries. By taking decisive action, we may reduce the ecological and viable losses of ghost fishing and contribute to its preservation.

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