



Unveiling the Shadows: A Comprehensive Review of Ghost Fishing Impact Evaluation and Management Strategies

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Abstract

The unintentional capture of marine life by abandoned fishing gear, or “ghost fishing,” seriously jeopardizes marine ecosystems and economies across the world. This essay looks about ghost fishing’s sources, impacts and management strategies. Ghost gear, which includes nets, lines and traps, can destroy ecosystems, injure natural places and ensnare and kill a variety of marine life. The Food and Agriculture Organization (FAO) admits that the consequences of ghost fishing on marine environments have expanded over time. Empirical studies reveal that ghost gear has an annual impact on thousands of marine species, underscoring the pressing necessity for intervention. Ghost fishing is decreased by the application of management strategies including education, gear technological advancements and retrieval programs. However, because there are no set standards and underwater environments are complicated, assessing the effects of ghost fishing is difficult. To successfully prevent ghost fishing and protect marine biodiversity, innovative methods are required. This review summarizes current research to offer a thorough overview of the problem and make recommendations for more study and action.

Keywords: Assessment, Evaluation, Gear, Ghost fishing

Introduction

Ghost fishing refers to the phenomenon where lost, abandoned, or discarded fishing gear continues to catch and kill marine life. This gear, known as “ghost gear,” includes pots, nets, lines and traps. Various factors, such as bad weather, gear becoming entangled on obstacles, or intentional dumping, contribute to gear ending up in the water. Even after being discarded, ghost gear remains active, ensnaring fish, marine animals, sea turtles and birds, leading to harm or death. The impacts of ghost fishing extend to the environment and the economy, causing overfishing of certain species, disrupting ecosystems and damaging natural habitats like seagrass meadows and coral reefs. Additionally, ghost gear can damage fishing vessels and pose navigational hazards. Awareness of ghost fishing has evolved over time, initially describing abandoned gear that continued to catch fish but now recognized as affecting a wider range of marine species and environments. The Food and Agriculture Organization (FAO) of the United Nations

defines ghost fishing as “the process of fishing gear that has been abandoned, lost, or otherwise discarded, continuing to fish or trap animals without the control of the fishing vessel or its owner”.

The ecological impacts of ghost fishing on marine ecosystems are so severe that immediate action is necessary. When lost, abandoned, or discarded fishing gear continues to capture and kill marine life, it disrupts the natural balance of marine habitats. This gear captures a variety of marine species, including fish, crabs, molluscs, marine mammals, sea turtles and seabirds, leading to population declines and disturbances in food chains and ecosystems. Research by Hardesty *et al.* (2021) highlighted the scale of the issue, indicating that abandoned fishing nets trap and kill between 5,700 and 30,000 marine species in the northern Indian Ocean alone each year, underscoring the urgent need to address ghost fishing.

Ghost fishing, the continued capture of marine life by

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abandoned or lost fishing gear, is poses significant threats to marine ecosystems and coastal communities. This phenomenon can lead to financial losses for coastal towns and fisheries due to damaged equipment and wasted resources. Moreover, ghost gear can cause navigational hazards, endangering ships and marine operations (Chhaba et al., 2023). To address these issues and promote marine biodiversity and sustainable fisheries management, policies must be implemented to reduce ghost gear, such as improved gear technology, retrieval programs and education campaigns.

The review on ghost fishing offers a thorough examination of the current understanding, with a focus on assessment methods and control approaches. While prior research has been insightful, there is a call for innovative solutions. It discusses various impact assessment methods, encompassing both quantitative and qualitative approaches, to gauge ghost fishing's effects on marine environments. Additionally, it addresses challenges in evaluation, including undefined criteria and the complexity of assessing underwater habitats. The review also proposes management strategies, such as improved gear designs, retrieval efforts and legal frameworks, to reduce ghost fishing's impact.

Impact Evaluation Approaches

1. Quantitative Methods

The estimation of lost gear and the computation of species death rates are two quantitative techniques for assessing the effects of ghost fishing. These techniques offer insightful information on the scope of ghost fishing and its effects on marine environments.

Estimation of Lost Gear

This technique entails calculating the quantity of fishing equipment that is dropped, lost or left in the water. This may be accomplished in a number of ways, including underwater surveys, fisherman interviews and analysis of data on fishing effort. Researchers can evaluate the scope of the issue and its possible effects on marine life by putting a number on the quantity of lost gear. Ghost fishing has a major negative influence on marine ecosystems; over 640,000 tons of fishing gear are lost or thrown in the ocean annually.

Calculation of Species Mortality Rates

This method involves counting the marine life affected by ghost fishing, which can be done by analyzing bycatch data, conducting necropsies on stranded animals and estimating mortality rates using mathematical models. Researchers use these techniques to assess the impact of ghost fishing on species and ecosystems. For instance, Richardson et al. (2019) found that ghost fishing is a major cause of sea turtle deaths in some regions, underscoring the need for targeted conservation efforts. These quantitative methods are essential for understanding ghost fishing's effects and developing effective management strategies to mitigate its impact on marine ecosystems.

2. Qualitative Methods

In order to assess the impact of ghost fishing, qualitative techniques such as stakeholder interviews and observation

and anecdotal evidence are used. These techniques add qualitative information to quantitative data to give important insights into the effects of ghost fishing on marine populations and ecosystems.

Observation and Anecdotal Evidence

This approach includes seeing ghost fishing operations first-hand or learning about how they affect the ecosystems and marine life. Anecdotal information from fishermen, divers and other people with direct knowledge of ghost fishing experiences may also be gathered by researchers. Quantitative approaches might not be able to capture the context and detail that this qualitative information can offer. The existence of ghost fishing gear in marine habitats and its effects on marine species were documented by Hidalgo-Ruz et al. (2018) through observation and anecdotal evidence, underscoring the necessity for focused management approaches.

Interviews with Stakeholders

This method involves engaging with diverse stakeholders, including residents, government officials, fishermen and environmentalists, to gather insights into the impacts of ghost fishing on society, the economy and the environment, as well as the effectiveness of current management strategies. Interviews with fishermen and environmentalists revealed various perspectives, such as the challenges fishermen face in locating lost gear and the importance of community engagement in managing ghost gear. Stakeholder interviews, observations and anecdotal evidence are qualitative approaches that researchers use to gain deeper insights into the social, economic and environmental aspects of ghost fishing and its impacts.

3. Challenges in Impact Evaluation

Assessing underwater settings and the absence of established measurements are two obstacles in the effect evaluation of ghost fishing. These difficulties may make it more difficult to determine the precise scope of ghost fishing and the effects it has on marine environments.

Lack of Defined Metrics

One of the main obstacles to assessing ghost fishing's effects is the absence of defined metrics for calculating and contrasting effects across various ecosystems and geographical areas. This can make comparing the relative effects of various fishing gear types and evaluating the efficacy of management actions challenging. The establishment of such measures might increase the efficacy of management efforts by highlighting the need for standardized criteria to evaluate the impact of ghost fishing on marine ecosystems.

Difficulty in Evaluating Underwater Habitats

Assessing the impact of ghost fishing on underwater habitats is challenging due to the complex underwater environment. A team of researchers emphasizes the difficulties in evaluating ghost fishing effects in submerged habitats, highlighting the need for innovative technologies and approaches for data collection and analysis. These challenges underscore the importance of developing

standardized measures and creative methods to assess ghost fishing's impact on marine ecosystems, enhancing our understanding and mitigation efforts.

Management Solutions

1. Prevention

Ghost fishing prevention techniques centre on creating equipment that is less likely to be misplaced or abandoned and putting in place initiatives to recover misplaced equipment from the ocean.

Better Gear Design

Creating and utilizing equipment that is less likely to be misplaced or abandoned is a crucial step in the fight against ghost fishing. This might involve making changes to lessen gear entanglement, using biodegradable materials, and installing escape screens for bycatch animals. Fishermen may lessen their gear's impact on marine ecosystems and lessen the chance that it will become ghost gear by including these elements into their designs. The inclusion of biodegradable panels in crab pots decreased the quantity of ghost gear left in the environment, demonstrating the efficacy of better gear design in reducing ghost fishing.

Implementing Gear Recovery Programs

Collaborative programs among fishermen and stakeholders to recover lost or abandoned gear from the marine environment are vital preventive measures against ghost fishing. These programs employ advanced tools such as sonar and underwater cameras to locate and remove ghost gear, thereby lessening its impact on marine species and ecosystems (Schneider *et al.*, 2023). Successful initiatives have effectively reduced ghost gear in certain areas, underscoring the importance of these efforts in preventing ghost fishing. Such prevention methods are crucial for managing ghost fishing and minimizing its adverse effects on marine environments. Stakeholders' cooperation is the key to reducing ghost gear, safeguarding marine life and environments and enhancing gear design and retrieval programs.

2. Mitigation

The removal of ghost gear from the marine environment and stakeholder education on the effects of ghost fishing are the main objectives of mitigation techniques for regulating ghost fishing.

Ghost Gear Removal Efforts

Identifying and eliminating lost or abandoned fishing gear from the maritime environment is a major mitigation method that involves collaboration between stakeholders. To find and recover ghost gear, these operations may make use of specialized machinery like underwater drones and remotely controlled vehicles. These initiatives can lessen the influence of ghost gear on marine species and ecosystems by eliminating it from the environment. The usefulness of ghost gear removal initiatives in lowering the quantity of ghost gear in the marine environment was shown by research underscoring the significance of such initiatives in minimizing the effects of ghost fishing.

Education and Outreach Programs

Educational and communication campaigns are crucial in raising public awareness about ghost fishing and its impacts. These initiatives educate fishermen, communities and policymakers on sustainable fishing practices and ways to prevent ghost fishing. By increasing understanding of ghost fishing, these efforts can reduce ghost gear in ecosystems. Successful programs have already reduced ghost gear in some areas, emphasizing the need for collaboration among stakeholders to remove ghost gear and promote education, crucial for controlling ghost fishing and protecting marine ecosystems.

3. Policy and Regulation

To combat ghost fishing, policy and regulation are essential. Key elements of successful management techniques include international agreements, national laws and enforcement.

International Accords

Agreements and conventions that seek to control fishing methods and lessen the impact of ghost gear are among the main ways that ghost fishing is handled on a global scale. These agreements frequently contain clauses requiring the creation of cooperation procedures to combat cross-border ghost fishing, the implementation of reporting and monitoring requirements and the setting of minimum criteria for fishing gear. An international agreement that attempts to stop illicit, unreported and unregulated (IUU) fishing, which includes ghost fishing, is the FAO's Port State Measures Agreement (PSMA). It states that, participating nations must put policies in place to stop ships involved in IUU fishing from utilizing their ports.

National Law and Enforcement

To address ghost fishing in their waters, countries can enact laws and regulations at the national level. These measures may include fines for improper disposal of fishing gear, restrictions on certain gear types in sensitive areas and requirements for biodegradable gear. Enforcing these rules is crucial to deter illicit fishing. Few Scientific Studies highlights the need for effective legal frameworks and strong national enforcement to mitigate ghost fishing's impact. Countries can collaborate through international agreements, national laws, and enforcement strategies to combat ghost fishing and protect marine ecosystems.

Conclusion

The phenomenon known as "ghost fishing," in which lost, abandoned or discarded fishing gear is still capturing marine life, presents serious ecological and financial difficulties. The intricacy of the problem is shown by the use of both quantitative and qualitative methodologies in the effect evaluation of ghost fishing. Quantitative techniques, such measuring species death rates and quantifying lost gear, shed light on the scope of the issue. Qualitative approaches, such as stakeholder interviews and observation, provide context and draw attention to issues including the absence of standardized measures and the problems associated with evaluating underwater habitats. Prevention, mitigation and policy measures are the main

focuses of management solutions; tactics including better gear design, gear recovery programs, education and policy enforcement are important components of these solutions. Future studies should concentrate on creating uniform criteria for impact assessment, enhancing techniques for evaluating underwater ecosystems and investigating novel equipment designs to stop ghost fishing. Further thorough research is also required to determine how well education campaigns and gear retrieval programs work to lessen the negative effects of ghost fishing. Effective management of ghost fishing is crucial for sustainable marine resource use and ecosystem preservation. Ghost fishing significantly impacts ecosystem health, fisheries and marine biodiversity. Stakeholders can collaborate on preventive, mitigation and policy actions to reduce ghost gear and protect marine life and ecosystems.

References

- Chhaba, B., Goud, E.A., Kachave, V., Aitwar, V.S., Gangan, N.D., 2023. The negative impact of desalination brine on marine Flora and Fauna. *Biotica Research Today* 5(9), 644-646.
- Hardesty, B.D., Roman, L., Duke, N.C., Mackenzie, J.R., Wilcox, C., 2021. Abandoned, lost, and discarded fishing gear 'ghost nets' are increasing through time in Northern Australia. *Marine Pollution Bulletin* 173(Part A), 112959. DOI: <https://doi.org/10.1016/j.marpolbul.2021.112959>.
- Hidalgo-Ruz, V., Honorato-Zimmer, D., Gatta-Rosemary, M., Nuñez, P., Hinojosa, I.A., Thiel, M., 2018. Spatio-temporal variation of anthropogenic marine debris on Chilean beaches. *Marine Pollution Bulletin* 126, 516-524. DOI: <https://doi.org/10.1016/j.marpolbul.2017.11.014>.
- Richardson, K., Asmutis-Silvia, R., Drinkwin, J., Gilardi, K.V.K., Giskes, I., Jones, G., O'Brien, K., Pragnell-Raasch, H., Ludwig, L., Antonelis, K., Barco, S., Henry, A., Knowlton, A., Landry, S., Mattila, D., MacDonald, K., Moore, M., Morgan, J., Jooke Robbins, J., van der Hoop, J., Hogan, E., 2019. Building evidence around ghost gear: Global trends and analysis for sustainable solutions at scale. *Marine Pollution Bulletin* 138, 222-229. DOI: <https://doi.org/10.1016/j.marpolbul.2018.11.031>.
- Schneider, F., Parsons, S., Clift, S., Stolte, A., Krüger, M., McManus, M., 2023. Life cycle assessment (LCA) on waste management options for derelict fishing gear. *The International Journal of Life Cycle Assessment* 28, 274-290. DOI: <https://doi.org/10.1007/s11367-022-02132-y>.