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The Biodegradable Fishing Gear for Marine Conservation

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The idea of exploring biodegradable fishing gear emerged from a deep concern for the growing crisis of marine pollution and its devastating effects on ecosystems. As we grapple with the dual challenge of sustaining marine biodiversity and supporting the livelihoods dependent on fishing, it is clear that innovative solutions are required. Biodegradable fishing gear, a relatively recent advancement, offers a promising pathway to mitigate the impacts of abandoned, lost, or discarded fishing gear (ALDFG), also known as "ghost gear." Grounded in both ecological research and practical fisheries management, this innovation exemplifies how sustainable alternatives can transform the industry while addressing the urgent need to protect our oceans.

The importance of this topic cannot be overstated. Marine ecosystems are under immense pressure, and ghost gear is one of the most persistent sources of harm. Through this article, we aim to delve into the scope of the problem, explore the evidence supporting biodegradable gear, and highlight its potential long-term benefits. By the conclusion, it becomes clear that transitioning to biodegradable gear is not just an environmental necessity but a pragmatic solution with far-reaching implications.

Abandoned, lost, or discarded fishing gear (ALDFG) constitutes a significant portion of marine debris, with profound ecological and economic ramifications. According to the Food and Agriculture Organization (FAO) of the United Nations, ghost gear accounts for an estimated 10% of all marine debris by volume, equivalent to approximately 640,000 tons annually. This gear persists in marine environments for decades, if not centuries, causing widespread harm.

The environmental toll of ghost gear is particularly alarming. Derelict fishing nets and other materials entangle and trap marine organisms in a phenomenon known as "ghost fishing." Research from NOAA highlights that in the Pacific Ocean alone, ghost nets ensnare



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hundreds of thousands of marine animals each year, including endangered species like turtles, whales, and seabirds. The ripple effects of these interactions destabilize ecosystems, reducing biodiversity and threatening food security for communities reliant on fishing.

Compounding this issue is the contribution of conventional fishing gear to microplastic pollution. As traditional gear degrades, it releases synthetic polymers into the marine environment. A study published in *Nature Sustainability* (2020) identifies fishing gear as a major source of microplastics, which infiltrate the food web and pose potential health risks to marine life and humans. Given these cascading effects, addressing ghost gear is a pressing global priority.

Biodegradable fishing gear offers an innovative solution to the problems posed by ALDFG. Made from advanced materials such as polybutylene succinate (PBS) or polyhydroxyalkanoates (PHA), these alternatives degrade naturally in marine environments, leaving minimal harmful residues. This innovation directly addresses both ghost fishing and microplastic pollution, combining environmental sustainability with industry practicality.

Field studies substantiate the effectiveness of biodegradable gear. For instance, a 2019 study by the Korea Institute of Ocean Science and Technology found that biodegradable nets reduced entanglement rates by 90% compared to conventional nylon nets over six months. Similarly, pilot programs in Norway and Iceland demonstrated that biodegradable traps and nets maintained comparable catch efficiency to traditional gear while significantly reducing ghost fishing impacts.

Modeling studies conducted by the World Wildlife Fund (WWF) suggest that widespread adoption of biodegradable gear could prevent up to 30% of annual marine animal deaths caused by ghost fishing. These findings underscore the transformative potential of biodegradable gear, not only as an environmental intervention but also as a practical strategy for modernizing the fishing industry. The adoption of biodegradable fishing gear aligns with global sustainability goals, such as the United Nations Sustainable Development Goal 14 (Life Below Water). Beyond the environmental benefits, this transition offers substantial economic advantages for the fishing industry.

Ghost fishing depletes fish stocks and imposes significant financial burdens. The FAO estimates that ghost gear costs global fisheries approximately \$1 billion annually in lost revenue. By reducing unintended bycatch and ghost fishing mortality, biodegradable gear can enhance fish stock availability, leading to increased yields and greater economic stability. For instance, studies from Norway reveal that the use of biodegradable traps has led to measurable increases in local fish populations, demonstrating the cascading benefits of sustainable practices.

Moreover, adopting biodegradable gear enhances marketability. As consumer demand for sustainably sourced seafood grows, fisheries demonstrating environmental responsibility are better



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positioned to succeed. The transition to biodegradable gear serves as a marketing advantage, strengthening industry reputation and fostering public goodwill while contributing to marine conservation.

Despite its promise, the widespread adoption of biodegradable fishing gear faces challenges, including cost barriers and limited availability. Currently, biodegradable materials are more expensive to produce than conventional plastics, creating resistance among smaller fisheries. However, economies of scale and advancements in material science are likely to reduce these costs over time. Collaboration among governments, NGOs, and industry stakeholders is critical to overcoming these obstacles. Subsidies, incentives, and regulatory frameworks can accelerate the transition. For example, Norway's financial incentives for fisheries adopting biodegradable gear provide a model for global replication. Additionally, public-private partnerships can drive innovation, ensuring that biodegradable options become increasingly effective and affordable.

The idea of biodegradable fishing gear is not just a theoretical concept; it represents a tangible solution to one of the most pressing challenges facing our oceans. By addressing ghost fishing, reducing micro plastic pollution, and supporting sustainable fisheries, biodegradable gear aligns with ecological and economic imperatives. Scaling the adoption of biodegradable gear will require a collective effort, from policy Interventions to industry collaboration and consumer education. However, the benefits—healthier marine ecosystems and a step toward global sustainability—make this transition not only necessary but inevitable.

As we envision a future with cleaner oceans and thriving marine life, biodegradable fishing gear stands as a testament to the power of innovation and collective action. With commitment and collaboration, this vision can become a reality, ensuring that our oceans remain a vital resource for generations to come.