An Eco-Friendly Biodegradable Fishing Gear From Fish Scales and Crustacean Shells: A Novel Approach to Combat Marine Pollution

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The global fishing industry faces significant challenges due to plastic pollution from non-biodegradable fishing gear, which contributes to marine waste accumulation and environmental degradation. Conventional plastic fishing gear has persisted in marine ecosystems for decades, posing threats to aquatic life and biodiversity (Grolms, 2019). Fish scales, discarded from the aquaculture sector, account for 4% of the estimated 7.2-12 million tons of fish waste discarded annually, potentially causing environmental pollution problems (Qin, D., et al (2022).). Our fishing gear was developed from fish-scale collagen, chitosan from crustacean shells, cattle glycerol, and hemp fibers. The process involved the extraction of collagen, chitosan, and glycerol, after which the collagen and chitosan were mixed into a solution, then plasticized with glycerol and molded into fishing nets, lines, and traps. Tests on the bioplastic showed it degrades in marine environments, reducing marine pollution. Seawater absorption remains below 33.7%, while freshwater absorption reaches 26.3%. The bioplastic is flexible, with an average bending angle of 52.3° and a tensile strength of 37.5MPa. The study suggests that fish-scale-based bioplastic is a promising alternative to traditional plastic fishing gear due to its biodegradability and durability. It effectively degrades marine environments, reduces plastic pollution, and can withstand typical fishing conditions. Its controlled water absorption ensures resistance to excessive swelling, making it suitable for both freshwater and saltwater applications.

Awards Won: