Polyhydroxyalkanoate (PHA) biodegradable escape panel (biopanel) for crab, lobster, and fish traps.

Introduction to Polyhydroxyalkanoates (PHAs)

Polyhydroxyalkanoates (PHAs) are a family of naturally occurring biopolyesters that are produced by bacteria and are completely biodegradable by microbes found in the marine environment. Bacteria create PHA and use it to store energy in a similar way that humans store energy as fat. In aquatic environments, bacteria recognize the material as a food and consume it thus converting PHA to biomass, water, carbon dioxide, and naturally occurring monomers. PHA meets the American Society of Testing and Materials certification as well as European Standards for biodegradation in the marine environment [1]. PHA has physical characteristics similar to non-degradable plastics and can be formulated for extrusion into molded forms. A number of companies produce and sell a variety of PHA formulations [2]. The rate of biodegradation can be controlled by adjusting the thickness of the polymer [3].

Application of PHAs In Trap Fisheries

Researchers at the Center for Coastal Resources Management at the William & Mary Batten School of Coastal & Marine Sciences & VIMS tested PHA as the material of choice for use in developing escape panels for crab, lobster, and fish traps. VIMS researchers documented the extent of lost and abandoned blue crab traps and the effect on entrapped animals in the Virginia portion of the Chesapeake Bay USA. Over six consecutive winters, commercial fishers hired to recover lost traps removed over 34,000 traps containing over 32,000 animals [4]. Lost and abandoned traps is a global problem in almost all the trap fisheries[5]. Depending on the fishery, fishers lose from 10 – 70% of their traps annually [6, 7]. Problems with lost traps are compounded by the advent of long-lasting synthetic material in trap construction. Depending on the material type and the derelict trap location, traps can continue to capture animals for a couple of years to over decade [7,8]. In the Virginia portion of the Chesapeake Bay, removal of derelict traps resulted in an increase in harvest of blue crabs by more than $33M over 6 years [5].

Addressing the Issue of Lost and Abandoned Traps

Earlier methods of providing escape vents for animals captured in lost traps were prone to failure either by degrading too quickly or not at all [9]. Since PHA is consumed by bacteria, panels constructed of PHA have a high level of certainty of providing an avenue for escape. Since PHA is consumed by bacteria that naturally occur in water, PHA biopanels have an added benefit of lasting longer if regularly fished. This is because microbes feeding on the PHA are killed off when exposed to UV light during active trap retrieval requiring constant regrowth of bacteria on biopanels of active traps. Lost traps however, remain on the bottom out of UV light exposure and populations of bacteria can proliferate and more quickly consume the PHA [10, 11].

Expansion of PHA Biopanels to Other Fisheries

In addition to blue crab traps, VIMS researchers developed prototype biopanels and other components for a number of fisheries including lobster, Dungeness crab, black sea bass, and stone crab as well as a universal biopanel to fit most trap fisheries worldwide. VIMS researchers working with commercial fishers found that using biopanels in blue crab traps did not affect catch rates [12].

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