Deep-Sea Octocoral Biogeography: Exploring Genetic and Oceanographic Patterns through MutS Phylogenetic Analysis

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Despite covering less than one percent of the ocean floor, coral reefs sustain an estimated one-third of all known marine species, with most coral species inhabiting deep or cold waters across the world's oceans. However, many deep-sea coral habitats are unexplored and at risk due to rising sea temperatures, ocean acidification, and advancing technology enabling deep-sea mining and bottom trawling. The anthozoan subclass Octocorallia is one of the least studied categories within the phylum Cnidaria. This study represents the first comprehensive investigation into the phylogeny and connectivity of deep-sea octocorals across various regions in the North Pacific. By sequencing the MutS gene from octocoral species in the Aleutian Islands, California coast, Papahanaumokuakea, and Palmyra Atoll, a molecular biogeographic phylogeny was constructed, revealing strong genetic connections among corals from different geographic regions, likely facilitated by broadcast spawning and larval dispersal via ocean currents. Following this theory, larval dispersal pathways between reef sites were mapped to visualize connectivity, incorporating bathymetry mapping to optimize prediction accuracy and highlight oceanographic features' role in shaping the biogeographic distribution of octocorals. Investigating connectivity among these organisms is crucial as it directly informs the development of resilience assessments and the planning of Marine Protected Areas (MPAs), MPA networks, and other conservation initiatives, essential for the optimal preservation of Octocrallias' unique biodiversity amidst anthropogenic threats.

Awards Won:
Fourth Award of $500