

Assessing essential fish habitat and connectivity of reef fish Otolith Microchemistry

P.I.: Edward Durbin, PhD

The deterioration of marine habitats and the depletion of fish stocks worldwide are of major concern to fisheries managers and conservationists. It is believed that habitat loss is the single greatest cause of the worldwide decline in biodiversity and has serious implications for ecosystem functioning and integrity. Habitat is known to profoundly affect the productivity of a fish stock and is therefore believed to be fundamentally important to fishery production. Some of the most threatened habitats include coastal marine and estuarine habitat such as mangroves, sea grass beds and coral reefs.

One of the most basic requirements of a marine protected area for fish is that it includes the area occupied by the subpopulation of the fish species of interest, including both the adults and the different ontogenetic development stages of juveniles. Since many species occupy different habitats during these different development stages, evaluating the contributions of these different habitats and the linkages between them is critical in any MPA design.

Many studies in the Caribbean have observed juveniles of coral reef fishes migrate from the mangroves and sea grass beds to the reef or deeper waters at a certain age. These results suggest a critical role of sea grass meadows and mangrove lagoons as nurseries for adult reef populations. Thus, there is a critical need to assess the importance of these different juvenile nursery habitats and to determine if management measures are necessary to protect or restore their ecological functions.

Otoliths will be used by Edward Durbin of the University of Rhode Island to determine population structure and connectivity of juvenile French Grunt (*Haemulon flavolineatum*) and Schoolmaster (*Lutjanus apodus*) from two different habitat types (mangroves, non-mangroves in Puerto Rico and St. Croix in the US Virgin Islands) to the adult population on the adjacent fore reefs. Otoliths are mineral structures located in the inner ear of fish made up of crystalline calcium carbonate. They grow continually during the fish's life by depositing alternate layers of protein and calcium carbonate onto the outer surface of the otolith. The elemental composition is a reflection of the fish's ambient water conditions. Because otoliths are metabolically inert, once elements are deposited within the otolith they are not altered or resorbed. As a result unique elemental concentrations, or chemical fingerprints, arise from distinct ambient water conditions present in different geographic locations. The otoliths of juveniles from each habitat type will be examined and the microchemical signatures for each sampling site and habitat region determined.

This proposal will increase knowledge of biology and ecology of commercially and recreationally valuable species. It will identify habitats considered essential for the survival and subsequent recruitment of marine fish increasingly important given the pressures of land use, rise in invasive species and decline in endemic aquatic fauna.