Biophysical Connectivity in the Intra-Americas Sea

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Over the past 14 years, AOML/PhOD and the Southeast Fisheries Science Center - Early Life History laboratory (SEFSC/ELH) have worked in collaboration to study regional biophysical linkages at several locations within the Caribbean Sea and Gulf of Mexico (Intra-Americas Sea). PhOD - ELH partnered field programs typically include biological sampling combined with standard physical sampling methods. This approach provides greater insight to scientific and management questions regarding larval recruitment pathways than biological sampling alone.

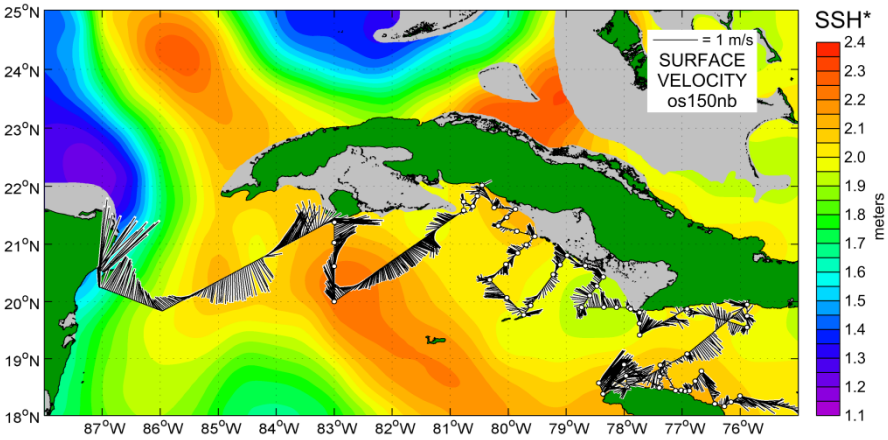

Figure 1. A 10-day composite of sea surface height, overlaid with surface current velocity vectors from hull-mounted acoustic Doppler current profiler (ADCP) measurements, is shown above for April 26 through May 5, 2015. Velocity vectors are show in black along the NOAA Ship Nancy Foster NF-15-02/03 cruise track for the period. Over the western portion of the map, meso-scale eddy circulation and dominant current systems (Yucatan, Loop, and Florida) are prevalent, while the surface conditions offshore southeastern Cuba are characterized by lower velocity small-scale eddy circulation.

Many of these partnerships have included work in the western Caribbean and Gulf of Mexico (GOM) targeted at improving our understanding of regional larval dispersal and recruitment connections for important pelagic (e.g. Atlantic Bluefin tuna, ABT) and reef fish (e.g. grouper, snapper, and parrotfish) species. By expanding the search for larval ABT outside of their known spawning grounds in the GOM, scientists will be able to improve larval habitat models for the species. Additionally, gaining a better understanding of the biophysical connectivity of coastal resources, such as the Mesoamerican reef system, the reefs of northwestern and southwestern Cuba, and the Florida Keys reef tract will help scientists determine what component of recruitment of reef fish species to these areas is due to regional biophysical connections versus self-recruitment within an individual site.

These collaborative endeavors have also focused on the northeastern Caribbean Sea, where transport of larval reef fish across the Puerto Rico and US Virgin Islands (PR/USVI) shelf and through passages between the islands is poorly understood. The natural dispersal of these newly spawned larvae is affected by many factors, including bottom regime, island/shelf/bank geometry, tides, small-scale retention mechanisms, mesoscale eddies, and larger-scale mean fields such as wind-driven transport. This work is designed to help scientists and resource managers gain a better understanding of how managed and non-managed areas of the US Caribbean and surrounding region (British Virgin Islands and Leeward Islands) are linked via the highly variable flow across this region, and to determine what economically important larval reef fish dispersal and recruitment pathways exist as a result. An improved understanding of region-wide coral reef ecosystem connectivity is required for the development of effective long-term adaptive fisheries management strategies in the US Caribbean.