The Use of Satellite Derived Oceanographic Data for Fish Stock Assessment in the Gulf of Mexico

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In collaboration with Dr. David Lindo (RSMAS) and researchers from NOAA's Southeast Fisheries Science Center (SEFSC), ocean parameters and data of fish catches are being used to investigate the link between ocean dynamics and stock assessment of several species in the Gulf of Mexico. The oceanographic data includes sea surface temperature (SST), sea height anomaly (SHA), chlorophyll *a* and derived products, such as eddy kinetic energy (EKE) and sea surface height (SH). The data of catches correspond to bluefin tuna (BFT), yellowfin tuna (YFT) and swordfish (SWO) and were obtained from a U.S. longline fleet operating in the Gulf of Mexico. A methodology based on the oceanographic observations was developed to determine whether captures occurred in regions of anticyclonic or cyclonic features, frontal locations, or in Gulf common waters. Results show that catches of BFT, YFT and SWO were not homogeneous in space and time as reflected by their Catch-Per-Unit-of-Effort (CPUE). BFT catches seem to be associated with temperatures below 27.2°C, while YFT catches were associated with higher temperatures. BFT CPUE showed a 'dome shape' response to SHA, SH, SH gradient, ocean color, and EKE with highest values associated with the frontal areas of the cyclonic rings. BFT CPUE was zero in areas associated with anticyclonic rings. Lower fishing effort in areas dominated by anticyclonic features diminished the capability of drawing sound conclusions from the relationship between CPUE and these features. The qualitatively different responses of the CPUE of BFT, YFT and SWO to oceanographic features could be used to locate specific areas where the catches of a certain target species could be enhanced while reducing the incidental catch of non-target species. At the present time, estimation procedures used to standardize catch rates (CPUE) for the US pelagic longline fleet do not include environmental observations. Identifying the oceanographic features that affect catch rates is the first step towards the incorporation of environment effects in the process of stock assessment and ecosystem based management.

Captures of bluefin tuna, yellowfin tuna and swordfish are linked with the oceanographic features in the region. Each location is labeled according to the ocean dynamics: anticyclonic feature, cyclonic feature, frontal region, or common waters, based on values of sea height and on the horizontal gradient of sea height. The most important features of the region are revealed by the field of sea height, where cyclonic and anticyclonic rings and the main location of the Loop Current can be observed.