Tracking Movements of Swordfish, Xiphias gladius, Using Empirical Orthogonal Function Analysis of Temperature by Depth Profiles

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The application of satellite tags for tracking purposes has shown success in tracking certain large pelagic species. However, the diel movements of swordfish prevent light-based geolocation from effectively locating their position. Advances in geolocation methods have allowed coordinate estimates of swordfish to be within 0.3° longitude and 0.7° latitude. To produce more accurate tracks of swordfish, a mathematical model was created to analyze temperature and pressure data recorded by archival tags rather than light data. This model applies empirical orthogonal function analysis to project the most probable movement between the initial location of release and the location of the tag pop-off. Data from three pop-off satellite archival tags (Microwave Telemetry) attached to swordfish and blue marlin, *Makaira nigricans*, was used to generate daily coordinate estimations. The blue marlin data provided enough light information to create accurate geolocation estimates using the ‘TrackIt’ model. Comparison analyses of the two models results in lower root mean square error than error estimated from the most precise geolocation methods. This demonstrates an improvement in accuracy using our analysis. This study shows the feasibility of using temperature and depth data instead of light levels to allow effective tracking of swordfish.