

Movement and Behavior of a Swordfish Tagged off Cayman Brac, Cayman Islands



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The swordfish (*Xiphias gladius*) is a solitary, pelagic, oceanodromous species found in tropical, subtropical and temperate waters worldwide from 45°N to 45°S, in temperatures from 5-27°C, and can function at extreme pressures and temperatures. Swordfish are known to exhibit diurnal movement patterns, spending the daylight hours at depths between 200 and 800 m and the nighttime hours between 0 and 160 m, presumably following prey abundance and distribution. Data from recent studies have shown a positive correlation between average depth at night and visible moon fraction, with the fish remaining deeper during a full moon and shallower during a new moon.

The Fisheries Research Laboratory at Nova Southeastern University's Oceanographic Center (Fort Lauderdale, FL) has recently begun a collaborative tagging study with a local organization in the Cayman Islands. The purpose of the tagging study is to conduct a preliminary evaluation of the behavior of swordfish in the waters off the Cayman Islands utilizing archival Pop-up tags. This project is a collaborative effort with Mr. Clarence Flowers, of Orchid Development, Ltd. in the Cayman Islands.

To obtain the fish needed for this study, Nova Southeastern University graduate students Jenny Fenton and Travis Moore participated in the annual Cayman Swordfish Challenge tournament, held on Grand Cayman Island March 29 to April 2, 2012, as ride-along research scientists conducting opportunistic tagging. The trip was very successful; all three tags for this study were deployed. The tournament also donated all of the release category prize monies for use in future swordfish tagging projects. The three electronic tags that were used in this project to test this surfacing periodicity were high-rate X-tags. These tags were programmed for a 90-second sampling interval, providing a high-resolution profile of the fish's vertical and horizontal movements and allowing for investigation into behaviors such as basking and straight-line distance traveled.

To date, we have confirmed mortality of one fish and data from one tag has been received. That same tag also washed up on a beach in Cuba, was found

by an Italian man, and is currently being sent back to the Fisheries Laboratory. Locations of where the tag was deployed, where the tag popped off and where it beached are shown in the map (figure 1). The data collected from that tag were analyzed with a model, developed in another study, that elucidates any diurnal



Figure 1. Study location of swordfish tagging project

vertical movement patterns as well as any movement patterns related to the lunar cycle. The preliminary data showed that the swordfish demonstrated a diurnal vertical migration pattern and movements related to the lunar cycle similar to swordfish tagged in previous studies (this is delineated by the fit line in figure 2). The swordfish exhibited a movement pattern of dives to deep water depths during the day and shallow water depths during the night (the red

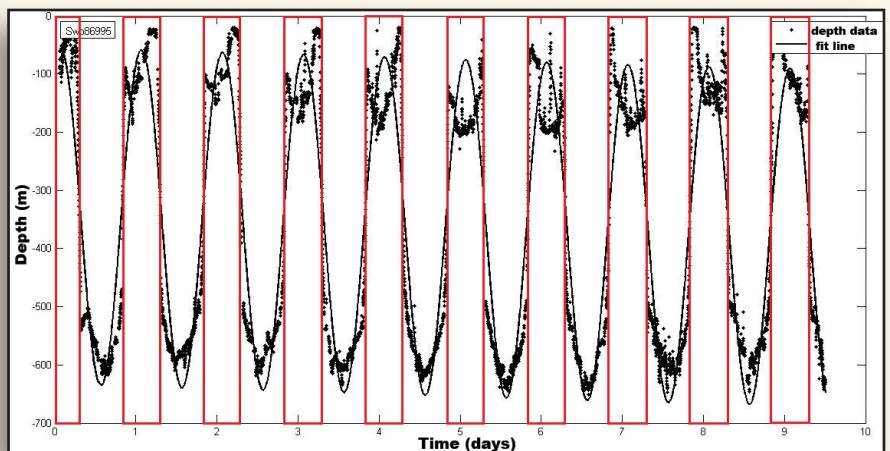


Figure 2. Depth profile illustrating diurnal vertical movement

boxes in figure 2 highlight the nocturnal hours). This movement pattern is consistent with what is known about swordfish movements. Temperature data from that tag were plotted with the depth data to obtain information about the temperature of the waters the fish was moving through during the tag's deployment (seen in figure 3). The data show that the surface waters were around 25 to 28°C and the waters at depth were around 8 to 10°C. This indicates that this fish sustained, and can tolerate, a wide range of temperatures throughout its daily vertical migrations. Currently, a detailed analysis of the data is underway to determine detailed swordfish behavior in tropical waters and whether these fish exhibit differences or similarities with fish tagged in more temperate waters.

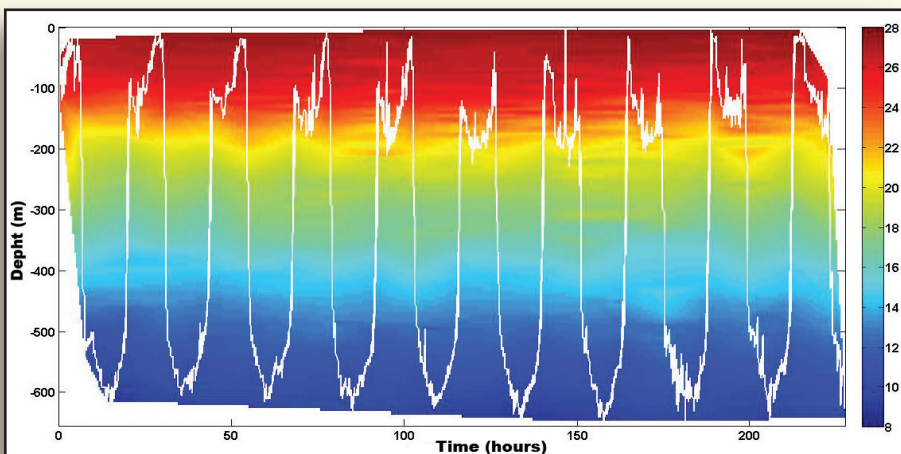


Figure 3. Plot showing temperatures encountered during vertical migrations