Impact of Thermocline Variability on Yellowfin Tuna Catch Rates of Sri Lankan Long-Liners

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Tuna fishery is an important source of income to Sri Lanka, having a greater potential for development. Yellowfin tuna: *Thunnus albacares* is a major species, exported to Japan and EU countries. Vertical migration of fish with changes in temperature is considered as an important parameter to ensure fishing efficiency, thus harvest of yellowfin tuna is associated with the thermocline layer and its seasonal changes. The objective of the present study was to investigate the influence of vertical structure of temperature on catch rates of longline fishery. Temperature-depth recording sensors were used to understand the depth penetration level of hooks and associated temperatures, during the period from July 2012 to February 2014. Based on sensor data and catch records, fishing depth was determined by means of sag caused by slack of the main line in between two buoys. Thermocline variability was analyzed using oceanographic datasets obtained from Copernicus Marine Environmental Monitoring Service. Temperature vertical profiles were extracted from those datasets at each fishing positions and a 5-parameter sigmoid model was used to determine the thermocline properties. Most commonly, 6-9 hooks per basket have been used in longlines, while total number of hooks was 800-1000. Buoy-lines and branch-lines were ranged between 20-30 m and 45-50 m, respectively. Based on the hooks per basket, the depth penetration level closer to buoy-line is -70 m and -100 In at the center of a basket. Sagging variability of hooks in a basket have shown a linear relationship (r^2=0.9992) with the distance between branch lines starting from buoy-line to the middle of a basket. Catch per unit effort was ranged between 15-70 kg / 1000 hooks. Thermocline depths altered between 100-125 m with variations of corresponding temperatures at 21-23 °C. The developed model is capable of predicting hooking depths, thus the longline configuration can be adjusted with thermocline information for successful fishing operations.

Keywords: Yellowfin tuna, Thermocline, Longline, Temperature—Depth recorders