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Developing a Model to Predict the Abundance and Distribution of Sharks in Southern Sri Lanka

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Abstract

Sharks play a crucial role ecologically and economically. The distribution and abundance of marine sharks are highly influenced by natural environmental factors. This research identified the key environmental variables affecting the distribution and abundance of sharks along the southern coast of Sri Lanka. The study area covered the 0°N–6.5°N and 76°E–85.6°E tropical marine region. Monsoonal cycles significantly influence this region, producing rich upwelling that serves as a productive fishing zone. Catch data from gillnets and longlines, were obtained from the Department of Fisheries and Aquatic Resources, focused on the Silky shark, blue shark, Mako shark and Oceanic whitetip shark. Oceanographic variables, including Sea Surface Temperature (SST), Sea Surface Salinity (SSS), Sea Surface Height (SSH), and Mixed Layer Depth (MLD), derived from the remote sensing satellites (RSS), were extracted from Copernicus Marine Service for 2019, and converted into $1/3^0$ spatial resolution to align with shark catch data. By using special python codes, processed satellite data and catch data were merged together. The effect of the oceanographic variable for distribution and abundance of sharks were analyzed using histogram analysis. Developed Generalized Additive Models (GAM), and Empirical Cumulative Distribution Function (ECDF) models were used to identify nonlinear relationships between environmental variables and shark Catch Per Unit Effort (CPUE). According to the results of Histogram analysis, GAM and ECDF model analysis status shows that high CPUE values were observed from July to December with corresponded to SST ranges of 28.5–28.9 °C, SSS level range of 34–35 practical salinity unit, SSH range of 0.42–0.46 m, and MLD depths range of 18–22 m. These favorable values in oceanographic variables were obtained during the southwest monsoon and second inter monsoon period from July to December 2019. This suggests that these oceanographic variables changers with monsoonal currents and upwellings may play a critical role in sustaining shark population and increased shark distribution in southern areas. At last, these findings explain how oceanographic variables shape shark ecology and distribution in this region.

Keywords: *Abundance, Distribution, Oceanographic variables, Model, Monsoon patterns.*

Proceedings of the 29th International Forestry and Environment Symposium 2025 of the Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka

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