ABSTRACT

This research involves a habitat model of sperm whale (*Physeter macrocephalus)* distribution utilizing Passive Acoustic Monitoring (PAM) within the central Gulf of Alaska. The main goal of this project was to explore the relationship between distinct occurrences of sperm whale vocalizations and environmental variables within a 144,560 km^2 Temporary Maritime Activities Area (TMAA) during the Summer of 2013 (Rone et al., 2014). A total of 6,304 km of trackline was utilized to produce 426 hours of 'standard' real-time monitoring to detect vocally active cetaceans. Acoustic activity, along with nine static geophysical and dynamic oceanographic variables were used to produce empirical statistical models in order to express correlations and spatially represent their probable habitat range. The application of customized GIS-based components has allowed the performance of iterative geoprocessing, and a precision-based spatial approach to habitat distribution modeling. Various Generalized Additive Models (GAMs) were developed with discrete trackline acoustic encounters and combinations of habitat variables to offer a comparison of encounter rate differences across the study area, as well as demonstrate the habitat variables' ability to predict sperm whale presence. Modeling efforts indicated that the most important explanatory variables for sperm whale habitat within the spatial and temporal scale of this study were depth, slope, proximity to the 2,000 m isobath, sea surface temperature, chlorophyll-a concentration, and magnitude of oceanic currents. This work demonstrated that acoustically detected sperm whales found within the central Gulf of Alaska follow predictable foraging patterns and demonstrate consistent preferences for specific oceanographic conditions.