Poster 10

Estimation of Acoustic-Based Detection Functions for Sperm Whale Encounters in the Northern Mariana Islands

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A three month visual and acoustic line-transect survey of a large (584,800 km^2) study area centered on the Northern Mariana Islands (MISTCS) was conducted in winter of 2007 (DoN 2007). Line-transect survey and analytical methods are well developed for estimating abundance of marine mammals using visual sighting data. These methods also can be applied to acoustic data when a perpendicular distance from the trackline to the "detection" is obtained. Sperm whales produce distinctive broadband (100 Hz to 25 kHz) echolocation signals. Although sperm whales typically produce "regular" clicks, males are known to produce high amplitude clicks with slow inter-click intervals (i.e. "slow" clicks). Previous studies have used a combination of acoustic and visual survey methods to estimate sperm whale densities. The aim of this study was to use acoustic localizations of sperm whales to estimate a detection function for the MISTCS study area. Sperm whale acoustic encounters were post-processed using PAMGuard software to obtain "click files" that were then processed using Rainbow Click software (IFAW). Rainbow Click was used to visualize time/bearing and map displays of detected clicks and associated bearing estimates, and mark individual click trains ("events") for each encounter. Target motion analysis methods utilizing a least squares algorithm to calculate perpendicular distances to each "animal/event" were applied using custom MATLAB code that interfaced with Rainbow Click. Next, perpendicular distances and transect length data were imported into the software program Distance (6.0 release 2) to model detection functions. Models were fit for all clicks types combined, regular clicks only, and slow clicks only. Slow and regular click localizations exhibited different shapes in their distribution, likely because slow clicks have higher amplitudes and can be detected over greater ranges than regular clicks. A discussion of these results and comparisons to similar research using acoustic-based line-transect data will be presented.

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