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The Acoustic Behavior of Minke Whales in Relation to Mid-Frequency Active Sonar

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A preliminary analysis of minke whale (*Balaenoptera acutorostrata*) acoustic behavior using data collected from Marine Acoustic Recording Units moored off Jacksonville, Florida in the fall and winter of 2009-2010 indicated that the duration of detected minke whale pulse trains was negatively influenced by the presence of Mid-Frequency Active Sonar (MFAS) activity. Other possible responses to MFAS include changes in characteristics of vocalizations, and movement away from the study area, which would result in a perceived change in vocal activity. Due to a low sample size, more data were needed to further investigate this potential change in vocal activity. Additional analysis was conducted by examining the occurrence and characteristics of minke whale pulse trains twenty-four hours before, during, and twenty-four hours after sonar activity. Acoustic data used for this analysis were collected in 2010-2012 with four High-frequency Acoustic Recording Packages (HARPs) deployed off of Jacksonville, Florida, Onslow Bay, North Carolina, and Cape Hatteras, North Carolina. Periods of MFAS activity were detected and characterized using custom MATLAB® code (SonarFinder). Of the four datasets analyzed, two contained minke whale pulse trains that occurred before, during, and/or after periods of MFAS activity. Over 120 hours of recordings containing minke whale pulse trains from 49 encounters (a sequence of pulse trains with no more than 30 minutes between calls) were reviewed. Pulse trains were annotated and characterized by pulse train type (slow-down, speed-up, or constant), signal to noise ratio (SNR), and frequency range. Only pulse trains with an SNR of greater than 8dB were further analyzed to measure additional variables, including duration and pulse repetition rate. Our statistical analysis to assess changes in the occurrence and characteristics of minke whale pulse trains in relation to MFAS activity will provide insight into minke whale behavior and help guide the development of mitigation strategies for this species.

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