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Integrating remote sensing methods to measure social delphinid baseline behavior and responses to Navy sonar

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Background

Oceanic delphinids (*e.g.*, common dolphins, bottlenose dolphins) are generally not endangered or threatened and have typically not been observed in mass-stranding events associated with sound. Potential responses are often inferred from laboratory observations, with very different exposure contexts from free-ranging animals, or include anecdotal observations of responses that lack calibrated exposure measurements or detailed aspects of behavior. These provide some insight into the nature and variance of potential response, but each has limitations. There have been behavioral response measurements with tagged Risso's dolphins in the southern California Behavioral Response Study (SOCAL-BRS), but no such data exist for other common delphinids that are less amenable to tagging. Our goal is to experimentally study potential behavioral responses of free-ranging delphinids in controlled conditions using a novel integration of remote sensing technologies.

Objectives

I. Develop integrated, cross-disciplinary methods to simultaneously track group movement and behavior using integrated remote sensing methods.
II. Apply group-sampling methods using these integrated technologies to better characterize the typical (undisturbed) range of behavioral parameters for these species.
III. Obtain direct measurements of group behavioral changes, if any, resulting from experimentally controlled simulated Navy MFAS for three delphinid species that occur in large numbers in Navy range areas.

Methods

Building on our recent and ongoing research, we will develop and utilize a novel integration of (1) shore- and vessel-based visual sampling; (2) unmanned aerial systems (UAS) for aerial photogrammetry; (3) and remote-deployed passive acoustic sensors to document aspects of baseline behavior and potential behavioral responses in three delphinid species (common, bottlenose, and Risso's dolphins). We will evaluate potential responses to simulated mid-frequency active sonar (MFAS) using controlled exposure experiments (CEEs). The resulting data will be necessarily and categorically different from previous response studies involving tagged individuals. Beyond the fact that getting tags to remain attached on some of these species has proven infeasible, these social species typically occur in groups and group members likely interact in their response to external stimuli, making the group likely the more relevant unit of analysis, as they are in this study.