Size Matters: A Miniature Marine Acoustic Recording System (MicroMARS)

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A low-cost, miniature, autonomous recorder called the micro Marine Acoustic Recorder System (microMARS) was developed recently as part of a collaborative effort with Desert Star Systems (Marco Flagg) and the Northwest Fisheries Science Center (NWFSC, Brad Hanson). Two of the primary design goals of the microMARS were lowering power requirements and miniaturization. The small size (relative to other recorders) facilitates deployment and recovery of the recorders from smaller boats, airplanes and platforms of opportunity. A smaller recorder also allows the size of the overall mooring configuration to be reduced. The current microMARs can record up to 4 TB of data using 8 paired SD cards (based 512 GB cards now available). A prototype with an extended a battery (microMARS-X) was just completed and allows operating times of up to 68 days. The basic microMARS system has been field tested and was successfully used to collect data during a recent underwater noise monitoring project in the Santa Barbara channel. We expect these small, low-cost devices will allow for higher spatial sampling and more affordability to collect acoustic data. We provide examples of data collected during field tests and mooring configurations successfully used in the field. We also discuss applications for use of microMARS in marine mammal research and monitoring work. [Work funded by NOAA Advanced Sampling Technology Working Group (ASTWG)]

To know when a dolphin catches a fish, listen for the victory squeal

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Dolphins make sound to find their way, to communicate and most importantly to catch food. We hear sounds after dolphins catch fish. When a trainer's whistle signals that a dolphin will get a fish for a correct response, we often hear similar sounds after the whistle. For a long time, we have called these after fish catch and after whistle sounds victory squeals. These calls have reminded us of a child's squeal of delight. Victory squeals are pulse bursts that vary in duration, peak frequency and amplitude. They are a reflection of dolphin emotions. Victory squeals are also food calls that may communicate to other dolphins about food. (You can hear these sounds at our poster).

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Behavioral Ecology of Risso's Dolphins (Grampus griseus) in the Southern California Bight Based on Focal Follows during Aerial Surveys

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15 aerial surveys (72,667 km, 86 days) occurred in the Southern California Bight October 2008 - April 2012, spanning January-November, funded by the U.S. Navy as part of their marine mammal monitoring program. Behavior of cetaceans in this region is poorly known, particularly for Risso's dolphins, and previous published surveys are >12 years old. Our surveys included focal follows of high priority species, including Risso's, circling outside the plane's sound transmission range and video recording. Risso's were the third most common species (n=286 groups, ~5,384 dolphins), with the most focal follows (n=51 groups), averaging 21.6 min (SD ±12.9). Risso's showed preferential use of steep underwater drop-offs. Risso's were significantly more likely to slow travel/rest than other species, with 60% of time spent in this state, 33% spent in medium/fast travel, 7% spent milling. Preponderance for slow tra vel/resting likely reflects Risso's nocturnal foraging habits. Milling behavior increased across the year, while slow travel decreased, possibly related to changes in prey and/or reproduction timing. Milling and slow travel/rest increased with distance from shore and time of day, likely related to regional underwater topography and prey behavior/distribution. Mean group size was 18.4 (SD ±16.50, range 1-120). Mean maximum dispersal distance between dolphins within groups was 6.7 body lengths--significantly higher than more closely spaced, smaller-sized common dolphins. Group size was significantly higher when other species and calves were present (reduced predation risk?), increasing across the year. Maximum dispersal distance also increased significantly across the year and with water depth, but decreased with time of day. 6% of Risso's groups included another marine mammal species. Risso's tended to have higher reorientation rates when other species were present, possibly due to social interaction, avoidance, or competition. Transitions from one behavior state to another were infrequent and were more common in groups with calves. Later in the day, Risso's were less likely to transition from traveling to another state. In summary, the behavior of Risso's dolphins was significantly affected by calf presence, time of day, time of year, presence of other species, and water depth. The tendency toward slow travel/rest during the day and their tendency to be visible from the aircraft above/below the surface for relatively long periods make this species a good candidate for studying potential reactions to Navy MFAS. Observations from aircraft facilitate a unique bird's eye view on spacing and social interactions of individuals, not possible from the low-vantage perspective of other platforms.

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Echolocation signals of an Antarctic beaked whale

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Beaked whales are the only cetaceans known to use frequency modulated (FM) upsweep pulses to echolocate, and these signals appear to be species-specific in their spectral and temporal properties. As a result, passive acoustic monitoring is a highly informative technique to investigate the behavioral ecology of these cryptic marine mammals. Acoustic recordings were collected with a four-element towed hydrophone array during a shipboard cetacean survey in Antarctic waters in February 2014. The towed array data contained FM upsweep pulses of unknown origin, likely produced by beaked whales. Of the five species of beaked whales known to occur in the Southern Ocean, an acoustic description has only been made for the FM pulses produced by Cuvier's beaked whales (Ziphius cavirostris). Statistical signal characterization using custom MATLAB-based routines revealed that the FM pulse type, named Antarctic BW29, is distinctly different from the wel l-described signal of Cuvier's beaked whales. It is also unlikely to belong to Arnoux's beaked whale (Berardius arnuxii), which is expected, based on its large size, to have a lower peak frequency and to possibly have similar frequency characteristics to its sister species, Baird's beaked whales (Berardius bairdii). The source of this echolocation signal is thus most likely to be Gray's beaked whales (Mesoplodon grayi), strap-toothed whales (Mesoplodon layardii), or southern bottlenose whales (Hyperoodon planifrons). Towed array recordings with concurrent visual identifications would allow us to make acoustic descriptions of beaked whale species whose FM pulse types are currently unknown, and subsequent