

T. Aran Mooney: Marine Mammal Hearing Diversity

There are several projects that fall under our investigation of marine mammal hearing diversity. They include (i) investigating the hearing range and sensitivity of previously untested species or populations and (ii) examining the diversity of cetacean auditory form and function.

Some current projects include:

Baseline hearing measurements in Alaskan belugas

Due to the opening of the Northwest Passage and interest in Arctic resources, human naval activities and consequent ocean noise (e.g., resource exploration, shipping and sonars) are increasing in northerly beluga waters. In this project we are measuring the hearing abilities of temporarily captured wild belugas from Bristol Bay. Our work is part of a larger health assessment of this population and is in collaboration with the National Marine Mammal Lab, Alaska Dept of Fish and Game, the Georgia Aquarium and Alaska SeaLife Center. Our hearing data are valuable because with these results we are substantially increasing the sample size and consequent knowledge of how this protected species naturally detects and utilizes sound. This work examines the frequencies and sound levels to which wild belugas are sensitive. A standard audiogram is being determined from the wild samples, noting the variation between animals and the audiogram of maximal sensitivity. This will be compared to available hearing data from captive belugas, evaluating any differences and potentially combining the two data sets. The hearing curves will be appraised relative to demographic and health-related meta-data from the animals from which the measurements were made. Through these data analyses we seek to: 1) define the natural and baseline hearing abilities and variability in belugas, 2) place the results in the context of potential ecological influences and that of anthropogenic noise, and 3) evaluate the validity of captive-based hearing data in relation to wild animals.



(Image: a wild beluga temporarily maintained during an evoked potential hearing test as part of a larger health study. Study and image were under NMFS permit #14245, TAM photo)

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Form and Function in Odontocete Hearing

By in large, almost all our hearing data has come from just a few "representative" species such as the bottlenose dolphin. But there are dolphins and whales of all shapes and sizes. We've been investigating how other species such as the Yangtze finless porpoise (*Neophocaena phocaenoides*) and the Risso's dolphin (*Grampus griseus*) hears. Dolphins generally receive sound through their lower jaw, just as our pinnae gathers and funnels sound to our middle and inner ear. The Risso's has a unique shaped head, with a blunt rostrum and melon (forehead) with a groove down the middle. Finless porpoise have a shorter rostrum (compared to dolphins). This subspecies also lives in fresh water. Both of these points suggest that there are subtle differences in how these animals receive sound. If this is true, it means they might use sound, and be affected by human-produced noise, somewhat differently than other dolphins. That's why it's important to investigate hearing diversity and how different species hear.



Risso's dolphin during a physiological hearing test.

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