NEED

The Navy is responsible for compliance with a suite of Federal environmental laws and regulations that apply to marine protected species, including the Endangered Species Act (ESA). As part of the regulatory compliance process associated with these acts, the Navy is responsible for implementing a marine species monitoring program to assess potential impacts from Fleet and Systems Command military readiness activities involving active sonar and the use of explosives and explosive munitions. Some of these activities occur in areas that overlap with the natural habitat of the marbled murrelet (Brachyramphus marmoratus), a member of the Auk family that is listed as threatened under ESA in Washington, Oregon and California, and state-listed as endangered in California. Sound, both in-air and underwater, has the potential to affect marbled murrelets in Navy training and testing areas. Potential effects from sound might include auditory impacts such as temporary and permanent hearing threshold shifts as well as non-physical behavioral effects.

Currently there are no basic data on the hearing of marbled murrelets or any other Auk species, thus limiting predictions of the frequencies or sound levels that would actually induce effects. Lacking the information needed to predict with any certainty the appropriate criteria for evaluating the onset of behavioral response or injury in the marbled murrelet, the U.S. Navy has had to use criteria for other species as a surrogate to predict effects.

SOLUTION

This project will define the hearing of up to three Auk species—related to but not including the marbled murrelet—to provide data needed to predict the marbled murrelet’s hearing. Efforts will include comparative in-air physiological and behavioral audiometry tests to outline the frequencies and sound levels to be used in the underwater tests, as well as to help ground-truth the underwater data and address potential Auk underwater auditory adaptations. The resulting audiograms will provide the data and training foundation for a temporary threshold shift (TTS) response feasibility study.

METHODOLOGY

This study will include both auditory evoked potential (AEP) methods and behavioral audiometry methods to study hearing in Auk species. Because Auk hearing has never been studied before, the team will conduct initial field-based, physiological AEP hearing tests prior to the behavioral tests. The field-based AEP tests—widely used, non-invasive, rapid hearing test methods—involve measuring small voltages that the brain and auditory nervous system generate in response to sound. These tests will provide much needed hearing data on several Auk species. The marbled murrelet...
About the LMR Program

The Living Marine Resources (LMR) program seeks to develop, demonstrate, and assess data and technology solutions to protect living marine resources by minimizing the environmental risks of Navy at-sea training and testing activities while preserving core Navy readiness capabilities. For more information, contact the LMR program manager at exwc_lmr_program@navy.mil or visit www.lmr.navy.mil.

About the Principal Investigator

Aran Mooney is an Associate Scientist in the Biology Department at the Woods Hole Oceanographic Institution, where he leads the Sensory Ecology and Bioacoustics Laboratory. His research addresses how marine animals detect and use sound and how animals may be affected by anthropogenic noise. Dr. Mooney holds a Ph.D. in zoology (marine biology emphasis) from the University of Hawaii.

Key collaborators include Marianne Rasmussen from the University of Iceland and Magnus Wahlberg from the University of Southern Denmark.