



## LIVING MARINE RESOURCES PROJECT 27

# High Fidelity Acoustic and Fine-scale Movement Tags

### NEED

The Navy is responsible for compliance with a suite of Federal environmental laws and regulations that apply to marine mammals and other marine protected species. As part of the compliance process associated with these regulations, 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 underwater detonations of explosive munitions.

To improve understanding of marine mammal behavior in relation to Navy activities, researchers often use monitoring tags that, while attached to an animal, use sensors to measure animal movement and the sounds made and heard by the tagged animal. This information can then be used to infer several acoustic and behavioral activities. As the need for marine mammal monitoring has increased, researchers require new, readily available tags to collect fine scale acoustic and movement information during acoustic response studies that are key to meeting the needs of the Navy.

### SOLUTION

The Office of Naval Research (ONR) Marine Mammal Biology program supports basic research on developing new and improving existing monitoring tag technology. After the tags resulting from such research have been sufficiently tested, they need to be field demonstrated, which falls within the mission of the LMR program. LMR-funded researchers can

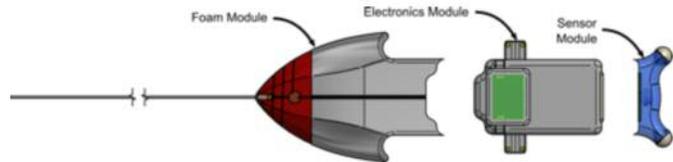


Illustration of the three main subassemblies that make up the DTAG3x V1.0 design.

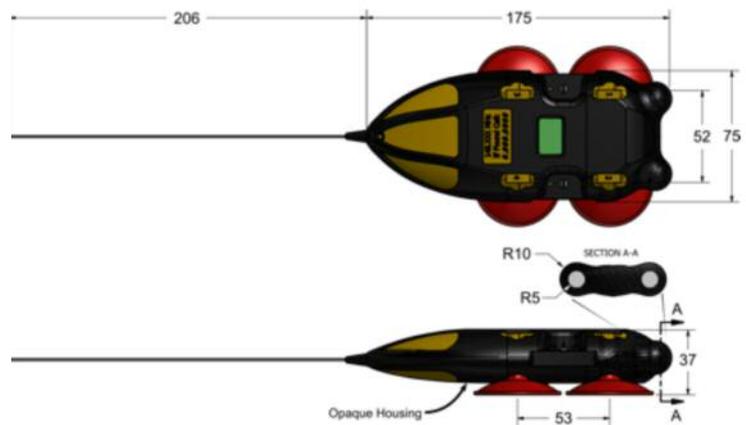


Illustration of the encapsulated DTAG3x V1.0 assembly with suction cups. The external urethane housing acts as a second water barrier in addition to the low viscosity epoxy and urethane used with the sub-assemblies. In addition to acting as a water barrier, the external housing protects the hydrophones, provides the attachment point for the cups and acts as a hydrodynamic fairing. All dimensions in (mm).

then provide critical feedback on tag performance under field conditions, while concurrently collecting critical behavioral data.

### METHODOLOGY

Digital acoustic recording TAGs (DTAGs) are highly integrated, compact, low-power, high fidelity acoustic bio-logging tags that are well suited for studying both deep diving beaked whales and large baleen whales. The tags are a key enabling technology for any behavioral response research.

In designing the third generation DTAG, the DTAG-3, lower cost and ease of manufacturing were among the design objectives. These objectives had to be reconciled with multiple field requirements: reduced size suitable for small odontocetes, longer duration tag attachments and wider bandwidth recordings. To reconcile these potentially conflicting requirements of lower cost, smaller size and more capability, a number of innovative features were introduced in the DTAG-3 design. An important part of any tag design process is rigorous testing in the field. In this project, the DTAG-3 design will be field tested by a number of researchers on a range of animals.

This project will build 20 new generation DTAGs, to be made available for upcoming behavioral response studies. The researchers using the tags will demonstrate tag field reliability, and feedback from these deployments will be used to improve the design of future tags.

## SCHEDULE

Throughout 2017 the project team will build, assemble, calibrate and test tags. The tags will be available for lease to behavioral response studies planned for 2017 and 2018.

## NAVY BENEFITS

In addition to field demonstrating an ONR-developed technology, the project will enable upcoming behavioral response studies by providing recording bandwidth, sensitivity and software support not available

via other commercially available tags. The tags will measure exposure intensity and the animal's responses on a precise timeline, resulting in high fidelity acoustic and movement data.

## TRANSITION

This project will result in 20 new generation DTAGs made available for lease through the University of Michigan to behavioral response studies. Navy-funded studies will be given priority for use, but the DTAGs also will be available for lease by the larger research community. The lease program will allow the developers to maintain and assess the reliability of the pool of DTAGs, as well as to collect from the field researchers feedback on what to address in future DTAGs.

## ABOUT THE PRINCIPAL INVESTIGATOR

Alex Shorter is an Assistant Research Scientist in the University of Michigan's Mechanical Engineering department. He specializes in biomechanics and persistent monitoring applications for both people and animals. Shorter was one of the original DTAG engineers and has extensive experience with the design and fabrication of marine bio-logging tags. Dr. Shorter earned his Ph.D. in Mechanical Engineering from the University of Illinois at Urbana-Champaign.



## 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](mailto:exwc_lmr_program@navy.mil) or visit [www.lmr.navy.mil](http://www.lmr.navy.mil).

