LIVING MARINE RESOURCES PROJECT 72

UUV Technology to Enable Range Readiness

NEED

The Navy seeks to develop technologies to collect a broad spectrum of acoustic data that allows for large scale spatial and temporal research on ambient sources of sound and biologic vocalizations. The objective is to develop a passive acoustic monitoring (PAM) system to integrate with an unmanned underwater vehicle (UUV) to enable more cost-effective methods of monitoring marine mammal species of interest. The PAM system needs to provide the capability of calculating directionality of a broad frequency range of marine mammal signals within 30 degrees accuracy while consuming minimal power to increase system endurance. This technology will fundamentally change the methods of monitoring marine mammals by increasing the quality of acoustic data, increasing system endurance and lowering operational costs.

PROJECT

This project was initiated as a Small Business Innovative Research (SBIR) project. During Phase I (2020–2021), Triton Systems proposed initial design specifications for a Phase II prototype that would best address the need. The team evaluated potential UUV platforms and selected the Seaglider platform for testing its prototype. The Seaglider met most of the goals in the SBIR topic including, long endurance, small form factor, low cost, easily deployed and sufficient payload capacity.

During the Phase II (2022–2023), the team proceeded to develop and test its DIrectional Cetacean Acoustic Recorder (DICAR) featuring low-frequency (LF) and high-frequency (HF) acoustic receiver arrays to monitor marine mammal species of interest. The recorder can archive the data, with the potential future capability of running detection and classification software to enable transmitting detection events in nearly real time. Initial testing of the DICAR system in controlled aquatic settings demonstrated that it could provide directionality in the target frequency bands when integrated with Seaglider. Based on these

Preparing for high frequency testing at Chase Ocean Engineering Lab at University of New Hampshire.
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EXWC Engineering and Expeditionary Warfare Center

results, the LMR program decided to co-fund an expanded Phase II with the SBIR program.

During the expanded Phase II (2024–2025), the team is focused on integrating the acoustic recorder into the platform, achieving proper balancing and ballasting of the platform with all components integrated, and completing two full engineering tests in a relevant environment. Field test goals include demonstrating both platform and recording technology performance. The team will assess the system's endurance and power management, as well as ability of the recorders and algorithms to differentiate individual calling animals.

A successful system could offer a cost-effective platform for extended surveying periods. Additionally, by providing relative position information, this technology could increase acoustic data quality and support Navy marine mammal monitoring and density estimation efforts.

ABOUT THE PRINCIPAL INVESTIGATOR

Jeff Gilbert is an acoustic engineer in the Engineered Systems group at Triton Systems, Inc. where he has led a variety of research efforts for the Navy including development of a tactical oceanography training system, statistical methods to account for biological noise in anti-submarine warfare planning, and a quiet launch system for submarines deploying acoustic countermeasures. He brings a thorough understanding of computational acoustics and numerical simulation to the Triton team. He holds a Ph.D. in mechanical engineering from Boston University.

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About the LMR Program

The LMR program's fundamental mission is to support the Navy's ability to conduct uninterrupted training and testing, which preserves core Navy readiness capabilities. LMR is an applied research program that funds Navy-driven research needs to support at-sea compliance and permitting. For more information, contact the LMR program manager at exwc_lmr_program@us.navy.mil or visit exwc.navfac.navy.mil/lmr.