Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
NAVSEA #17-533

Topic # N131-045
Mitigation of Biologically Induced Active Sonar Reverberation in Littoral Regions
Applied Research in Acoustics LLC

WHO

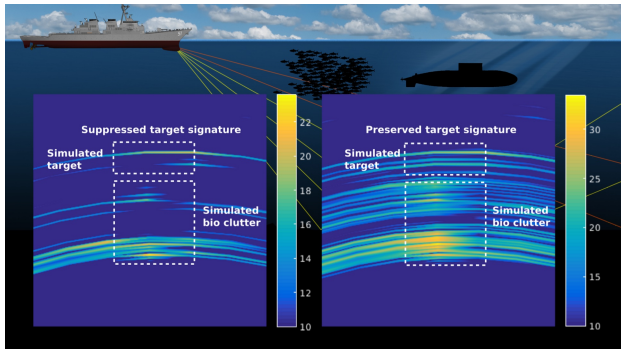
SYSCOM: NAVSEA

Sponsoring Program: PEO IWS 5A Undersea Systems

Transition Target: AN/SQQ-89A(V)15 Undersea Warfare (USW) / Anti-Submarine Warfare (ASW) Combat System, Advanced Capability Build (ACB) 21

TPOC:
(401) 832-8648

Other transition opportunities: Sonar signal processing for: Arleigh Burke (DDG) class destroyers, Ticonderoga (CG) class cruisers, fitted with the AN/SQS-53C mid-frequency active (MFA) hull array and the AN/SQQ-89A(V)15; Littoral Combat Ship (LCS)/Fast Frigate (FF) ASW Mission Package (MP); and Coherent Multistatic Acoustic Processor (CMAP) on the P-8A Poseidon.



Notes: MFA sonar detection performance may be degraded by target suppression near strong biologically induced clutter. ARiA's adaptive signal processing algorithms preserve signals to increase detectability of weak targets masked by clutter. The image compares output of a conventional ordered statistic normalizer (left) relative to ARiA's adaptive normalizer (right) for simulated data in a region where a submarine is partially masked by a region of extended bio clutter. Suppression of the target signature is evident in the output of the conventional normalizer.

WHAT

Operational Need and Improvement: Navy midfrequency active sonars, such as the AN/SQS-53C, are adversely affected by spatially spread biologically induced clutter. Clutter and reverberation due to resonant scattering from heterogeneous aggregations of fish result in increased display clutter, increased false alarm rate (FAR) for both operators and machine classifiers, and increased operator workload due to excessive FAR. The technology gap addressed by this work is the need for enhanced processing before classify-and-track to mitigate the effects of fish clutter.

Specifications Required: Signal processing algorithms for mitigating the effects of biological clutter should provide a significant improvement in the performance and detection capability of active sonar by reducing the number of false contacts and reducing operator work load by decreasing the amount of display clutter.

Technology Developed: ARiA is developing adaptive signal processing algorithms to unmask targets near regions of spatially extended biological clutter and to prevent target suppression in the detector. Better-preserved signals provide more information to the classifier to enable better discrimination of targets from clutter, thus reducing the workload of the operator and automation.

Warfighter Value: ARiA's adaptive signal processing algorithms improve detectability of targets, particularly near strong spatially-extended clutter, thus improving discrimination between targets and clutter. Better discrimination enables a reduction in the number of false contacts and operator workload.

WHEN

Contract Number: N00024-16-C-4040 **Ending on:** April 7, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype demonstration (ACB21 Step 1)	Low	Demonstrated increased detectability, fewer false contacts	4	September 2017
Independent prototype evaluation on recorded data (ACB21 Step 2)	Low	Demonstrated increased detectability, fewer false contacts	5	February 2018
Testing & Evaluation of Full Tactical-System Integration in a Laboratory Environment (ACB21 Step 3)	Med	Integrated system, demonstrated reduced FAR, improved classification performance	6	December 2018
At-Sea Testing & Evaluation (ACB21 Step 4)	Med	Successful shipboard tactical integration	7	March 2021

HOW

Projected Business Model: ARiA plans to retain the SBIR data rights for the developed signal processing algorithms, working with Navy and large primes to integrate algorithms into tactical systems for fleet use. ARiA's algorithms are targeted for initial transition into the AN/SQQ-89A(V)15 USW Combat System in ACB21 with transition to related tactical systems to follow.

Company Objectives: ARiA's objective is to further investigate and develop Navy and DoD applications of adaptive signal processing algorithms for clutter mitigation. ARiA intends to integrate these algorithms into the AN/SQQ-89A(V)15 USW Combat System in ACB21 as the initial application of this technology to tactical sonar systems. ARiA is looking for programs and prime partners working with other tactical sensor systems that can benefit from improved detection and clutter mitigation.

Potential Commercial Applications: The signal processing algorithms that ARiA has developed are applicable to a wide range of sensing modalities including radar and sonar. Algorithms may be adapted most directly to commercial midfrequency sonars, e.g. for subbottom profiling, single-beam and multiple-beam (swath) bathymetry, and acoustic seafloor characterization.

Contact: Dr. Jason E. Summers, Chief Scientist / Managing Member
jason.e.summers@ariacoustics.com (202) 629-9716