OERA Student Research Travel Program Summary Report

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Topic: BioAcoustics Summer School (SeaBASS)
Trip duration: 15 June – 21 June 2014 (7 days)
Destination: National Conference Centre, Leesburg VA

Purpose:

Several critical knowledge gaps have emerged within the marine renewable energy sector in Nova Scotia, including questions related to near-field behavior of marine biota near tidal turbines and methodology required to assess direct interactions with fish, marine mammals, and large debris (i.e. logs, sea ice). A diverse suite of acoustic technologies and methods are being considered and tested to address long-term monitoring needs and to support decision-making.

This travel grant provided travel to a graduate level hydro-acoustics course in the USA. The SeaBASS program runs annually and provides training in bioacoustics for selected applicants. I attended the course to obtain essential training in hydro-acoustics for a marine mammal detection research project underway at the FORCE test site.

Experience:

The SeaBASS program educates attendees on the most recent technologies and topics in bioacoustics and also fosters collaboration and networking with experienced bio-acousticians and other participants.

The first session was an introduction to acoustics and sound propagation in water. This session not only provided information on the basics of bioacoustics but also provided a template for good practice on data reporting. Training included use of the program MPEE for modeling sound propagation in different environments. With this tool we can better understand how sounds generated by marine animals propagate through different environments. Such information helps to inform filed placement of sensors.

The active acoustics lecture focused on detection of species that do not make sound (e.g. fish). The course covered passive acoustic monitoring and the limitations and strengths of hydrophones. The echolocation lecture provided useful information on how cetaceans use sound to communicate, navigate and hunt. For my thesis research, I focus on the echolocation click trains of harbour porpoises and their presence/absence statistics.

During the fish acoustics lecture we were introduced to the program Raven. All attendees were given a one-year subscription to the program. Raven can be used to do in-depth analysis of sounds recorded by hydrophones. Using Raven it is possible to calculate intensities and frequencies of a single echolocation click to determine the distance between the animal and the hydrophone. Behaviour can be derived by examining inter-click intervals and amplitudes of click trains.

The passive acoustic monitoring (PAM) lectures provided by Dr. Klinck opened my eyes to the possibilities PAM has to offer. Dr. Klinck has a limited background in biology but has an extensive background in electrical engineering and has created multiple open source programs including Ishmael and Osprey. Before taking this course I did not know these programs existed, and with minor changes to my data collection techniques these programs will allow for a quick and efficient way to process my data using tried and tested click detector algorithms instead of the lengthy visual inspection in practice now.

The statistics segment of the course offered insight into what information is required when collecting passive acoustic data in order to make density estimations. Armed with this knowledge it may be possible to make density estimations instead of relying solely on presence/absence statistics. Introduction to a program named Distance showed us how to produce the best model for density estimation depending on the information available. Distance can be used on many types of studies ranging from autonomous archival hydrophones to towed line transect hydrophones.

High ambient noise levels are an issue for hydrophone work in the Minas Passage. Seeing examples from different environments has given me references for comparison to the Minas Passage. The course has been valuable in helping me to understand how to quantify and report on the "noise" experienced at my study site.

Other students and professionals are struggling with the same bioacoustics issues and through this course and the network it generated, we can learn from each other's mistakes and successes, saving both time and money. Students attending the program ranged from biologists to electrical engineers. It is clear that a multidisciplinary approach and networking/collaborating can help generate better projects and increase the likelihood of succeeding.

SCHEDULE

	Sunday June15	**Monday June 16**	**Tuesday June 17**	**Wednesday June 18**	**Thursday June 19**	**Friday June 20**
7:00-8:00		Breakfast and Welcome	Breakfast	Breakfast	Breakfast	Breakfast
8:00-12:00		**A. Frankel** *Introduction to Acoustics & Propagation*	**M. Halvorsen** *Hearing and Measurement*	**A. Rice** *Fish Acoustics and Behavior*	**H. Klinck** *Passive Acoustic Monitoring - marine mammals*	**S. Van Parijs** *Communication and Behavior*
12:00-13:00		Lunch	Lunch	Lunch	Lunch	Lunch and closing remarks
13:00-17:00	Software Installation workshop (16:00- 20:00)	**J. Warren** *Active Acoustics*	**L. Kloepper** *Echolocation*	**J. Miksis-Olds** *Hot Topics in Bioacoustics*	**T. Marques** *Passive Acoustic Monitoring – Density Estimation*	**S. Parks** *Effects of noise on marine mammals*
18:00-19:30	Dinner	Dinner	Dinner	Dinner	Dinner	Adjournment
19:30-22:00	Participant Introductions and social	Poster Session and Social		Informal career discussions with presenters and sponsors	Evening bowling event	

Overall benefits of OERA Travel support:

SeaBASS was the first formal course in bioacoustics that I have had the opportunity of taking. Interacting with leaders in the field of bioacoustics allowed me to cover a seemingly impossible amount of information in a short time. The lessons learned provide me with a stronger knowledge base to build on and I can now easily converse with acoustic technology providers and users. Knowledge from this course will be applied to my thesis research and will shape any future passive and active acoustic monitoring projects that I am involved in.

The connections made with presenters and sponsors have been highly beneficial and likely to foster further growth in the application of acoustics to address monitoring challenges in the MRE industry. Many useful connections were made with other graduate students from other countries including Poland, Italy and Brazil, and these relationships are likely to be career-building and enduring.