



**Course Program**

Virtual SeaBASS 2021

July 11-16, 2021

**Organizers**

Jennifer Miksis-Olds<sup>1</sup> & Susan Parks<sup>2</sup>

1- Center for Acoustics Research & Education, University of New Hampshire

2- Biology Department, Syracuse University

## Financial Support

Funding to support the Bioacoustics Summer School was generously provided by the following sponsors.

### Office of Naval Research



### The Acoustical Society of America Scientific Committee on Oceanic Research



### National Oceanic and Atmospheric Administration



### International Quiet Ocean Experiment/Monmouth University- Rockefeller University Marine Science and Policy Initiative



## FORWARD

Welcome to the seventh biennial **BioAcoustics Summer School** program. SeaBASS was developed in response to the success of the long-standing Physical Acoustics Summer School (PASS), a biennial course that brings together educators and graduate students in the field of physical acoustics for a week-long retreat. With this seventh installment we feel that SeaBASS has matured and established its own place in the marine bioacoustics community, as a number of alumni have graduated and continue as professionals in the field.

The goal of the SeaBASS program is to provide the opportunity for graduate students interested in pursuing careers in marine bioacoustics to develop a strong foundation in marine animal biology and acoustics, foster technical communication across disciplines, and to develop professional relationships within the field. Experts within the field of marine animal bioacoustics will provide half day virtual seminars that describe fundamental aspects of underwater sound and marine animal behavior, summarize the present state of the field, identify current obstacles and challenges, and discuss important “hot topics” areas. Each seminar will include introductory lectures followed by group discussions or group projects to gain a more in-depth understanding of the issues.

We hope that SeaBASS will be more than a short course introducing students to the fundamental aspects of the field. We hope that the opportunity for close interaction over the week of the course will allow all of the participants, presenters and students alike, to develop lasting professional contacts that will help develop the next generation of marine bioacousticians.

Jennifer Miksis-Olds & Susan Parks

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**\*\*\*Supplemental materials for each lecturer will be provided in a GoogleDrive folder that will be emailed to all students in the course prior to SeaBass.**

## SCHEDULE

	<b>Sunday July 11</b>	<b>Monday July 12</b>	<b>Tuesday July 13</b>	<b>Wednesday July 14</b>	<b>Thursday July 15</b>	<b>Friday July 16</b>
<b>Live Session 1: 10:00-12:00 ET</b>		<i>J. Miksis-Olds Introduction to Acoustics &amp; Propagation</i>	<i>J. Warren Active Acoustics</i>	<i>J. Luczkovich Fish Acoustics</i>	<i>J. Miksis- Olds Soundscapes</i>	<i>Activity Regroup Period from Mon-Thurs</i>
<b>Live Session 2: 13:00-15:00 ET</b>		<i>J. Reidenberg Sound Production &amp; Transmission Mechanisms in Cetaceans</i>	<i>H. Klinck &amp; S. Madhusudhana Technology, Data Analysis &amp; Automation</i>	<i>S. Parks Hot Topics in Bioacoustics</i>	<i>D. Costa Acoustic Behavior &amp; Impacts of Noise</i>	<i>P. Nachtigall Echolocation</i>
<b>Live Session 3: 17:00-19:00 ET</b>	Optional Software Installation & Meeting	<i>Poster Session/Speed Talk Part 1</i>	<i>Poster Session/Speed Talk Part 2</i>	<i>Career Discussions</i>	<i>R. Dunlop Marine Mammal Behavior</i>	

**LINK TO THE GOOGLE DRIVE FOLDERS FOR THE COURSE:**

<https://drive.google.com/drive/folders/1Ij2hOehUSomZPMdVaZgEi9Xdzf1dACI?usp=sharing>

## **ZOOM LOGIN INFORMATION**

Topic: SeaBASS 2021

Join from PC, Mac, Linux, iOS or Android: <https://unh.zoom.us/j/6872165413>

Keyboard shortcuts are available to navigate this Zoom meeting or webinar:  
<https://support.zoom.us/hc/en-us/articles/205683899-Hot-Keys-and-Keyboard-for-Zoom>

Or iPhone one-tap: 16468769923,6872165413# or 13017158592,6872165413#

Or Telephone:

Dial: +1 646 876 9923 (US Toll)

Meeting ID: 687 216 5413

International numbers available: <https://unh.zoom.us/u/atjtbhBcC>

Or a H.323/SIP room system:

H.323: rc.unh.edu or 162.255.37.11 (US West) or 162.255.36.11 (US East)

Meeting ID: 687 216 5413

SIP: 6872165413@zoomcrc.com

**TROUBLESHOOTING STEPS:**

Audio Echo In A Meeting: <https://support.zoom.us/hc/en-us/articles/202050538-Audio-Echo-In-A-Meeting>

Want to Join a Test Meeting?: <https://zoom.us/test>

## **SLACK CHANNEL INFORMATION**

Follow this link to sign up for the slack channel:

[https://join.slack.com/t/slack-t3a1977/shared\\_invite/zt-sna7bzzb-\\_x0LPAZ4IVrWeESuROZKkg](https://join.slack.com/t/slack-t3a1977/shared_invite/zt-sna7bzzb-_x0LPAZ4IVrWeESuROZKkg)

If you are not familiar with Slack, you can read more about it at this link:

<https://slack.com/help/articles/360059928654-How-to-use-Slack--your-quick-start-guide>.

## PARTICIPANT DIRECTORY

### Presenters

#### **Dan Costa ([costa@ucsc.edu](mailto:costa@ucsc.edu))**

Daniel Costa completed a B.A. at UCLA and a Ph.D. at U.C. Santa Cruz followed by postdoctoral research at the Scripps Institution of Oceanography. His research focuses on the ecology and physiology of marine mammals and seabirds, taking him to every continent and almost every habitat from the Galapagos to Antarctica. He has worked with a broad range of animals including turtles, penguins, albatross, seals, sea lions, sirenians, whales and dolphins and has published over 400 scientific papers. His current work is aimed at recording the movement and distribution patterns of marine mammals and seabirds in an effort to understand their habitat needs. This work is helping to identify biodiversity hotspots and the factors that create them. He has been developing tools to identify and create viable Marine Protected Areas for the conservation of highly migratory species. In addition his research is studying the response of marine mammals to underwater sounds and developing ways to assess whether the potential disturbance may result in a population consequence. He has been very active in graduate education having supervised 22 masters and 30 doctoral students as well as 15 post-doctoral scholars. With Barbara Block he co-founded the Tagging of Pacific Predators program, a multidisciplinary effort to study the movement patterns of 23 species of marine vertebrate predators in the North Pacific Ocean. He is an internationally recognized authority on tracking of marine mammals and birds. He has served as member of a number of international science steering committees including the Integrated Climate and Ecosystem Dynamics program, The Census of Marine Life, Southern Ocean GLOBEC, CLIOTOP, the Southern Ocean Observing System (SOOS) and the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER).

#### **Rebecca Dunlop ([r.dunlop@uq.edu.au](mailto:r.dunlop@uq.edu.au))**

Originally from Ireland, Dr. Dunlop completed her BSc (Honours) degree in Environmental Biology, and then her PhD in fish neuroethology from The Queen's University of Belfast. She then migrated to Australia in 2004 where she completed a post-doc in humpback whale social communication. She began lecturing in the School of Veterinary Science at the University of Queensland in 2010, mainly in animal physiology. She then moved to the School of Biological Sciences in 2021 where she teaches animal behaviour, ecophysiology and marine science. Her research interests are in animal physiology, behaviour, and communication. She mainly works on humpback whales, though has worked on bottlenose dolphins, beaked whales, pilot whales, and false killer whales. She is the Director of the Cetacean Ecology and Acoustics Laboratories, based at North Stradbroke Island, Queensland, where her research lab is based. Her PhD students focus on: cetacean acoustic communication and behaviour; the effects of noise on humpback communication, behaviour, and physiology; humpback whale social behaviour; endocrine physiology in cetaceans.

**Holger Klinck ([Holger.Klinck@cornell.edu](mailto:Holger.Klinck@cornell.edu))**

Dr. Holger Klinck is the John W. Fitzpatrick director of the K. Lisa Yang Center for Conservation Bioacoustics (CCB) at the Cornell Lab of Ornithology. He is also a Faculty Fellow with the Atkinson Center for a Sustainable Future, Cornell University. In addition, Holger holds a Courtesy Professor position at Oregon State University (OSU). Before moving to the U.S. in early 2008 for a postdoctoral position at OSU, he was a Ph.D. student at the Alfred Wegener Institute for Polar and Marine Research in Germany. Holger's graduate work focused on developing the Perennial Acoustic Observatory in the Antarctic Ocean and the study of the leopard seal vocal behavior. His current research focuses on developing and applying hard- and software tools for passive-acoustic monitoring of terrestrial and marine ecosystems and biodiversity. One of his goals is to enable researchers around the globe to acoustically monitor wildlife and habitats at ecologically relevant scales. Holger is also studying the impacts of anthropogenic noise on the vocal and locomotive behavior of animals.

Holger is a full member of the Acoustical Society of America (ASA) and the moderator of the popular Bioacoustics-L mailing list hosted by CCB. In addition, he advises several undergraduate, graduate students, and postdocs at Cornell and OSU and regularly teaches national and international classes on bioacoustics. Holger is an avid college and professional sports fan. His hobbies include running, sailing, and tinkering with gadgets. He and his wife Karolin live in Lansing, NY, and enjoy hiking with their two Australian shepherd dogs Lilly and Sammy, and their miniature dachshund Marvin.

**Joseph Luczkovich ([luczkovichj@ecu.edu](mailto:luczkovichj@ecu.edu))**

Joseph Luczkovich is a Professor of Biology at East Carolina University. He was educated at Lehigh University (B.S. Biology), Rutgers University (M.S. Ecology), The Florida State University (PhD Biological Sciences), and completed post-doctoral fellowship at the Harbor Branch Oceanographic Institute in Ft. Pierce, Florida. It was at Harbor Branch that he was introduced to the sound production of drums and croakers (Family Sciaenidae) by R. Grant Gilmore. After this post-doc, he worked at Humboldt State University and NC State University, and then joined the faculty at East Carolina University. He has published extensively on the use of passive acoustics in monitoring sound-producing fishes. Dr. Luczkovich has used the passive acoustic approach to determining spawning areas of Sciaenidae, which make sounds during their spawning activities, with males making the sounds as advertisement calls to attract females. By recording sounds of captive specimens of each of the four species (silver perch, *Bairdiella chrysoura*, weakfish, *Cynoscion regalis*, spotted seatrout, *C. nebulosus*, and red drum, *Sciaenops ocellatus*), Dr. Luczkovich and colleagues were able to identify the species making the calls simply by listening to captive fish and comparing these sounds to field recordings. These recordings were analyzed for their spectral properties and correlated with plankton samples, which lead to the maps of spawning areas for each species. One sound recorded in this study was difficult to identify: "the chatter" sound. Previous researchers had misidentified it as being

produced by weakfish, but the ECU group realized that it was produced instead by striped cusk eels (*Ophididon marginatum*). From these recordings, Luczkovich and the ECU Sciaenid Acoustics Research Team (SART) discovered that silver perch became acoustically inactive when bottlenose dolphins (*Tursiops truncatus*) making signature whistles were in the area. He has recently been using acoustic data loggers and an autonomous wave glider to monitor the impact of anthropogenic noises from vessels on fish sound production and is interested in the role the species-specific sounds may play in reproductive isolation of the Sciaenidae, which could lead to speciation events within this group. Dr. Luczkovich continues to study the sound production of fishes and marine mammals in Pamlico Sound, Atlantic Ocean and the Caribbean Sea.

**Shyam Madhusudhana ([shyamm@cornell.edu](mailto:shyamm@cornell.edu))**

Dr. Shyam Madhusudhana is a postdoctoral researcher at the K. Lisa Yang Center for Conservation Bioacoustics (CCB) within the Cornell Lab of Ornithology. His research interests are largely multidisciplinary as is his academic background – Bachelors in Engineering, Masters in Computer Science, and PhD in Applied Physics. He has also worked as a speech scientist for a leading Automatic Speech Recognition solutions provider. Prior to joining CCB, he has been a research associate at the Centre for Marine Science and Technology in Australia, a research associate at the National Institute of Oceanography, Goa, India and a postdoctoral research fellow at the Indian Institute of Science Education and Research in Tirupati, India. His current research involves developing deep-learning techniques for realizing effective and efficient machine-listening in the big-data realm, with applications in the monitoring of both marine and terrestrial fauna.

He is a Senior Member of IEEE, and currently serves as an Administrative Committee member in IEEE's Oceanic Engineering Society (OES). He is also the Coordinator of Technology Committees in OES and a co-Chair of the Student Poster Competitions at the biannual OCEANS conference. He referees manuscripts for journals focused on animal bioacoustics, pattern recognition and machine learning.

**Jennifer L. Miksis-Olds ([J.MiksisOlds@unh.edu](mailto:J.MiksisOlds@unh.edu))**

Dr. Jennifer L. Miksis-Olds is the Director of the Center for Acoustics Research and Education, Research Professor in the School of Marine Science & Ocean Engineering at the University of New Hampshire (UNH), also holding a research position in the UNH Center for Coastal and Ocean Mapping. Dr. Miksis-Olds is the university Member Representative and on the Board of Trustees of the Consortium for Ocean Leadership. She is a member of the Scientific Committee of the International Quiet Ocean Experiment Program and serves as a Scientific Advisor to the Sound and Marine Life Joint Industry Programme (International Oil & Gas Producers). Most recently, she is the lead PI of a National Oceanographic Partnership Program project partnering with BOEM, ONR, and NOAA focused on the development of the Atlantic Deepwater

Ecosystem Observatory Network (ADEON). Dr. Miksis-Olds was the recipient of an Office of Naval Research Young Investigator Program award in 2011 and the Presidential Early Career Award in Science and Engineering in 2013. Dr. Miksis-Olds received her A.B. cum laude in Biology from Harvard University, her M.S. in Biology from the University of Massachusetts Dartmouth; she was a guest student at Woods Hole Oceanographic Institution, and then received her Ph.D. from the University of Rhode Island. Her primary research interests are patterns and trends in ocean soundscapes, animal behavior and communication, and the environmental effects of anthropogenic activities.

**Paul E. Nachtigall ([nachtiga@hawaii.edu](mailto:nachtiga@hawaii.edu))**

Paul E. Nachtigall is the former editor (1991-2000) and current editorial board member of the journal *Aquatic Mammals* for the European Association for Aquatic Mammals, past president of the over 2000 member international Society for Marine Mammalogy, Fellow in the Acoustical Society of America and Honorary member of the European Association for Aquatic Mammals. His research interests primarily focus on the hearing and echolocation of marine mammals. Former head of the Research Division of the, now closed, Naval Ocean Systems Center's Hawaii Laboratory, Dr. Nachtigall is the founding director of the marine mammal research program of the University of Hawaii at Manoa's Hawaii Institute of Marine Biology where he is also an emeritus Research Professor and a member of the graduate faculty in Zoology, Psychology and Marine Biology. He has published six edited books (including two on whale echolocation) and over one hundred and fifty peer-reviewed journal articles and chapters in reviewed books. His recent efforts include the measurement of the hearing of odontocetes while they echolocate and determining that dolphins, whales and porpoises learn to adjust their hearing sensation levels when warned that a loud sound is about to arrive.

**Susan E. Parks ([sparks@svr.edu](mailto:sparks@svr.edu))**

**@ParksLabSU (Twitter)**

Susan E. Parks is an Associate Professor in Biology at [Syracuse University](http://Syracuse University). Her primary research interests are the behavioral function and evolution of sound production in animals, their perceptual abilities, and the impact of noise on their ability to communicate. She has been involved in animal bioacoustics studies since 1995, first as an undergraduate working on whale acoustic census data and studying male frog calling behavior, then as a graduate student focusing on acoustic communication of the North Atlantic right whale. She earned her B.A. in Biology (Neurobiology and Behavior) from Cornell University and her Ph.D. in Biological Oceanography in the Massachusetts Institute of Technology/Woods Hole Oceanographic Institution Joint Program in Oceanography. She has received numerous awards in her career including the Office of Naval Research Young Investigator Award and a Presidential Early Career Award for Scientists and Engineers from the White House. She has served as PI and Co-PI on several federally funded research projects through the National Oceanic and Atmospheric Administration (NOAA), Office of Naval Research (ONR), and the National Science Foundation

(NSF) studying acoustic behavior, hearing, soundscapes and noise impacts on a variety of marine and terrestrial species. She is currently a member of the Committee on Offshore Science and Assessment for Ocean Energy Management for the U.S. National Academies of Sciences and an Associate Editor for the journal Behavioral Ecology and Sociobiology.

**Joy S. Reidenberg ([joy.reidenberg@mssm.edu](mailto:joy.reidenberg@mssm.edu))**

Joy S. Reidenberg, Ph.D. is a Professor at the Icahn School of Medicine at Mount Sinai in New York City, a Fellow of the American Association of Anatomists, and an Inaugural Fellow of the Society for Marine Mammalogy. She received a B.A. in 1983 from Cornell University's College of Arts and Sciences. She earned her M.Phil. in 1985 and her Ph.D. in 1988 in Anatomy from Mount Sinai's Graduate Program in Biomedical Sciences in New York. Dr. Reidenberg has also held appointments as a Guest Investigator at the Woods Hole Oceanographic Institution, and as an Associate Scientist at the National Museum of Natural History of the Smithsonian Institution. Dr. Reidenberg is a biomedical research scientist who studies comparative anatomy. She has examined a large variety of animals ranging from insects to humans, but her particular fascination is with aquatic animals. Much of Dr. Reidenberg's recent work is focused on how animals adapt to environmental extremes. Current research is focused on the anatomy of whales, dolphins and porpoises, especially in understanding how they produce sounds and withstand the pressures of diving. Her anatomical research focuses on these animals as "natural experiments" from which we can learn about basic biomechanical relationships that affect all animals, including humans. Dr. Reidenberg is interested in how these animals have evolved adaptations to solve problems we consider a survival challenge in humans. She hopes to learn from nature and develop protective/preventive technologies or new medical treatments for injuries and diseases based upon mimicking these adaptations. Dr. Reidenberg work has been federally funded by: Office of Naval Research, Department of Defense, National Oceanic Partnership Program, and National Oceanic and Atmospheric Administration. She is also a well known popular television figure, having been the comparative anatomist for several television documentary series including: *Inside Nature's Giants*, *Sex in the Wild*, *Born in the Wild*, *Whale Detective*, *Humpback Whales: A Detective Story*, *Big Blue Live*, *Wild Alaska Live*, *Mythical Beasts*, *Jimmy and the Whale Whisperer*, *Brave New World with Stephen Hawking*, *Decoding Humpbacks*, *Science of Whales*, *Cracking the Humpback Code*, *Whale Communication*.

**Joseph D. Warren ([joe.warren@stonybrook.edu](mailto:joe.warren@stonybrook.edu))**

**@warren\_lab (Twitter)**

I'm an associate professor in the School of Marine and Atmospheric Sciences at Stony Brook University. I was an undergraduate engineering major and discovered underwater acoustics as a summer student at WHOI working on acoustic measurements of sediment transport. I quickly realized that animals are more interesting than sand grains and started working with Tim Stanton (a physicist) and Peter Wiebe (a biologist) on using active acoustics to measure zooplankton populations in the Gulf of Maine. The majority of my field work involves acoustic surveys of

zooplankton and nekton populations and my research interests include: improving our ability to get “biologically-meaningful” information from acoustic echosounders, development of acoustic scattering models for different types of scattering processes, and examining predator-prey relationships between zooplankton and their charismatic megafauna (including seabirds) consumers. “Studying whale food” has become a larger part of my lab's activities in the past few years and I’ve done a bit of work looking at small zooplankton in freshwater lakes which has allowed me to make the [completely unverified] claim that I've used an underwater echosounder at a higher elevation (7000 ft above sea level) than anybody else in the world. I’ve also dabbled in the world of passive acoustics using them to examine dolphin-human interactions at artificial reefs in New York, fish behavior in local estuarine habitats, and even some terrestrial acoustics.

## Student Directory

Student names, contact information and description of research.

Student Name	Affiliation	Research Description
Petrisha Alvarez	University of Hawaii at Hilo	Using passive acoustic monitoring to study Hawaiian spinner dolphins habitat use off Hilo, Hawaii
Jack Barkowiski	Moss Landing Marine Laboratories	Patterns in humpback whale song and nonsong vocalizations in US national marine sanctuaries
Mackenzie Farrell		
Leigh Gaffney	University of Victoria	Impacts of predator playbacks on Coho Salmon behaviour
Burooj Ghani	University of Goettingen	Autonomous diving robot-assisted observation of fish shoals
Rachel Hamrock	Oklahoma State University	Dolphin communication and signature whistles
Helen Hiley	Scottish Association for Marine Science/ University of the Highlands and Islands	Unlocking the enigma of Scottish harbour porpoise ( <i>Phocoena phocoena</i> ) fine scale habitat use
Ilysa S Iglesias	University of California, Santa Cruz and NOAA NMFS-Southwest Fisheries Science Center	Using hull-mounted EK60 data (active acoustics) from a long-term fisheries survey along the California coast to examine changes in the abundance and distribution of mesopelagic fishes in response to oceanographic variability
Sonia V Kumar	University of Alaska Fairbanks	Passive acoustic monitoring of Cook Inlet beluga whales in two rivers and impacts of anthropogenic noise and activity on their distribution
Mark Langhirt	Penn State	Investigating theoretical derivation and implementation of a 3D Energy Flux model for range-dependent ocean acoustic propagation
Melissa Leone	Graduate Student at Stony Brook University	Using passive acoustics to study terrestrial and marine soundscapes on Long Island, New

		York.
Audrey Looby	University of Florida	Review and website on global fish sound production (beta version at fishsounds.net) and coastal soundscape ecology in the Gulf of Mexico
Chelsey McGowan-Yallop		
Grant Milne	Graduate Student at University of New Hampshire	Investigating the role of soundscape attributes and genetic material as sentinel indicators of the acoustic propagation environment in marine ecosystems
Patricia Muller	Graduate Student at University of São Paulo	Passive acoustic monitoring of franciscana dolphins in southeastern Brazil
Kelsie Murchy	University of Victoria	Impacts of anthropogenic noise on Chinook salmon behavior and physiology
Lewis Naisbett-Jones	University of North Carolina at Chapel Hill	Using novel telemetry approaches to track the movements of sheepshead in North Carolina. My background is in fish migration/magnetoreception/sensory ecology – I'm hoping to branch out into a new sensory modality!
William Oestreich	Stanford University	
Kirby Parnell	Marine Mammal Research Program, University of Hawai'i at Mānoa	Hawaiian monk seal underwater acoustic communication and impacts of anthropogenic noise on vocal and non-vocal behavior
Dawn Parry	K. Lisa Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University	Passive acoustic monitoring of cetaceans in the offshore GoMex, Bermuda, and South Pacific Islands
Jessie Perelman	University of Hawai'i Department of Oceanography	Using hull-mounted and Saildrone (EK80) active acoustics to study patterns and behaviors of mesopelagic scattering layers in the Clarion-Clipperton Zone, a large region being targeted for deep-sea polymetallic nodule mining
Valeria Perez	Syracuse University	Interested in the impacts of anthropological activities on acoustic communication of whales

Oliver Semblante	Graduate student at University of San Carlos and Faculty at Visayas State University (both in the Philippines)	Proposed thesis: Fish abundance and seafloor mapping of coastal areas using active acoustics
Jennie Shield		
Mark Thomas	Dalhousie University and JASCO Applied Sciences	Applications of deep learning to passive acoustic monitoring of baleen whales
Aditi Tripathy	University of New Hampshire School of Marine Science and Ocean Engineering	Impacts of episodic events such as hurricanes on the acoustic detection of cetaceans
Julika Voß	BioConsult SH (Husum, Germany)	My research focus is on cetacean ecology, so I have gained practical experience in the Azores (Espaço Talassa), Iceland (Háskóli Íslands) and Italy (CIMA Research Foundation). My master's thesis at BioConsult SH (Germany) was about the response of harbour porpoises to the FaunaGuard and subsequent piling during the construction of offshore wind farms. The FaunaGuard is an acoustic harassment device that can temporarily deter harbour porpoises from a small area before noisy pile driving begins, without causing far-reaching disturbance like the previous acoustic harassment device (the seal scarer). Currently, I am working as a research associate at BioConsult SH in two areas: (1) monitoring the impact of noise from offshore wind farms on harbour porpoises using Passive Acoustic Monitoring, and (2) a new service (SPACEWHALE) that uses artificial intelligence to detect large whales in very high-resolution satellite images.
Louise Wilson	Institute of Marine Science, University of Auckland	Impacts of sound pollution from small recreational boats on shallow coastal habitats.
Marie Zahn	University of Washington	Beluga and narwhal differentiation and classification using echolocation clicks

