Course Program

University of New Hampshire

Durham, New Hampshire

July 8-13, 2018

Organizers

Jennifer Miksis-Olds[1] & Susan Parks [2]

1- School of Marine Science and Ocean Engineering, University of New Hampshire

2- Biology Department, Syracuse University

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University of New Hampshire

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FORWARD

Welcome to the fifth biennial **B**io**A**coustics **S**ummer **S**chool 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 fifth 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 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 want the opportunity for close interaction 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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SCHEDULE

	Sunday July 8	Monday July 9	Tuesday July 10	Wednesday July 11	Thursday July 12	Friday June 10
7:00-8:00		Breakfast and Welcome	Breakfast	Breakfast	Breakfast	Breakfast
8:00-12:00		**A. Frankel** *Introduction to Acoustics & Propagation*	**P. Tyack** *Noise Impacts*	**J. Koblitz** *Technology & Signal Processing*	**J. Warren** *Active Acoustics*	**D. Houser** *Hearing & Physiology*
12:00-13:00		Lunch	Lunch	Lunch	Lunch	Lunch and closing remarks
13:00-17:00	Check-in at Adams Tower	**S. Parks** *Communication and Behavior*	**A. Rice** *Fish Acoustics and Behavior*	**J. Miksis-Olds** *Hot Topics in Bioacoustics*	**D. Harris** *Passive Acoustic Monitoring – Density Estimation*	**P. Nachtigall** *Echolocation*
18:00-19:00	Dinner	Dinner	Dinner	Dinner	Dinner	Adjournment at 17:00
19:30-21:30	Software Installation workshop @ Adams Tower	Poster Session and Social	Miniature Golf	Informal career discussions with presenters and sponsors	Evening event	

PARTICIPANT DIRECTORY

Presenters

Adam Frankel (adam.frankel@marineacoustics.com)

As a Senior Scientist for Marine Acoustics, Inc. (http://www.marineacoustics.com), Dr. Adam Frankel is primarily responsible for bioacoustic research, modeling and marine environmental compliance on a wide variety of private and government funded projects. These projects include at-sea acoustic monitoring and mitigation, modeling and predicting acoustic exposure of marine animals to a variety of sound sources, and describing whistle characteristics of wild dolphins. As a founding member of the Hawai‘i Marine Mammal Consortium (http://www.hmmc.org), Dr. Frankel continues his long-term research on humpback and melon-headed whale behavior and bioacoustics off Hawai‘i Island, an interest that developed from conducting humpback whale-sound playback experiments at the University of Hawai‘i in the mid 1980s. His UH dissertation used both passive acoustic and visual tracking methods to learn more about humpback whale distribution, behavior and bioacoustics. Post-doctoral work at Cornell University involved diverse aspects of marine animal behavior and bioacoustics, including the response of marine mammals to anthropogenic sound. Over the years, Dr. Frankel has collaborated with others in different parts of the world, for example, using passive acoustic tracking to census bowhead whales on the North Slope of Alaska, examining the response of eastern Pacific gray whales to active sonar, and studying sperm whale behavior off Kaikoura, New Zealand. Over the years, his responsibilities have ranged from field equipment repair, data collection, acoustic and statistical analyses, to project direction and oversight. Dr. Frankel continues his strong commitment to teaching, mentoring and citizen science. During graduate school he worked with Earthwatch volunteers. From 1996 to present, he has taught for Cornell University’s Bioacoustical Oceanography workshops and field courses on Hawai‘i Island and San Juan Island. He has served on graduate committees for students at Texas A&M, University of North Carolina at Wilmington, North Carolina State University and Georgetown University.

Danielle Harris (dh17@st-andrews.ac.uk)

Danielle Harris is a post-doctoral research fellow at the Centre for Research into Ecological and Environmental Modelling (CREEM) at the University of St Andrews, with a multi-disciplinary background involving biological, statistical and acoustical analyses. Her BSc. was in Marine and Environmental Biology (2005, University of St Andrews) followed by a Masters in Environmental Biology (2007, Universities of St Andrews and Dundee). Her BSc and M.Res

research projects provided an introduction to the fields of marine mammal acoustics and population monitoring methods, by studying bottlenose dolphin whistles during her BSc (supervised by Prof. Vincent Janik) and analysing visual survey data during her M.Res (supervised by Prof. Phil Hammond). Both topics were then combined during her PhD (2012, University of St Andrews), which focussed on cetacean density estimation using acoustic data (supervised by Dr. Len Thomas and Prof. John Harwood). Her thesis work comprised a variety of case studies, in collaboration with Scripps Institution of Oceanography (UC San Diego), the Cornell Lab of Ornithology (Cornell University) and the Instituto Dom Luiz (University of Lisbon). Subsequent post-doc projects have focussed on investigating cost-effective approaches to cetacean density estimation using acoustic data, by exploring existing opportunistic datasets and new technologies. Projects have included exploring cetacean density estimation using Ocean Bottom Seismometers (funded by the US Office of Naval Research); assessing the capability of a Waveglider for long term monitoring of both noise and marine mammals (funded by the UK Research Council & Department for Environment, Food and Rural Affairs); investigating large scale density estimation of blue and fin whales using non-standard density estimation methods (funded by ONR) and developing a framework for ocean glider-based acoustic density estimation (also funded by ONR).

Dorian Houser (dorian.houser@nmmpfoundation.org)

Dorian S. Houser received his B.A. (summa cum laude) in biology from Coker College (1992) and his Ph.D. from the University of California, Santa Cruz (1998). He served as a National Research Council postdoctoral associate at the U.S. Navy Marine Mammal Program from 1998-2001. In 2000, Dorian formed the scientific consultation company, “Biomimetica,” which he operated until 2010. In 2009, he joined the National Marine Mammal Foundation (NMMF). He currently serves as the director of NMMF's Biologic and Bioacoustic Research Program. This program strives to understand the overall biology of marine mammals with the goal of improving species conservation. A focus of the program is to determine the potential for humans to impact marine mammals, particularly with respect to sound producing activities. Dorian’s interests include the diving, auditory, stress, and metabolic physiology of marine mammals and their use of bioacoustics, particularly with respect to hearing capabilities and dolphin biosonar. He is the recipient of the R. Bruce Lindsay Award from the Acoustical Society of America (ASA), co- recipient of the Strategic Environmental Research and Development “Project of the Year” award, serves as the Chair of the ASA Committee on Standards for S3/SC1 (Animal Bioacoustics), and is an adjunct professor at Sonoma State University. He has published over 120 peer-reviewed scientific articles and book chapters on marine mammals.

Jens C. Koblitz (Jens.Koblitz@bioacousticsnetwork.org)

Jens Koblitz is a postdoc in the Department of Collective Behaviour at the Max Planck Institute for Ornithology and at the University of Constance, Germany. He is fascinated by echolocation of bats and toothed whales and his research combines fundamental research on the use of biosonar and acoustic monitoring. He studied biology in Constance, southern Germany and Guelph, Canada and did his master's thesis and PhD in Tübingen, southern Germany. For four years he worked at the German Oceanographic Museum in Stralsund on the SAMBAH project "counting porpoises in the Baltic Sea using sound". In 2015 he founded the BioAcoustics Network, a group of scientist studying the sounds of animals and has been a postdoc at TelAviv University until recently. He has carried out research projects on bats and or toothed whales in Mexico, Azores, Switzerland, Germany, Denmark, Greenland, Norway and Iceland. Jens likes technology as much as he is interested in animals and his projects allow him to combine these two interests. He has been using large arrays of receivers to first localize a vocalizing animal and then measure source parameters of the emitted signal. More recently he has equipped bats with acoustic recorders and motion sensors to study vocalization and movement of these fascinating animals in the field.

Jennifer L. Miksis-Olds (J.MiksisOlds@unh.edu)

Dr. Jennifer L. Miksis-Olds is the Associate Director of Research and Research Professor in the School of Marine Science & Ocean Engineering at the University of New Hampshire, also holding a research position in the 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 new NOPP 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)

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 a 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 forty 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 loud sound is about to arrive.

Susan E. Parks (sparks@syr.edu) @ParksLabSU (Twitter)

Susan E. Parks is an Associate Professor in Biology at 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 Academy of Science and an Associate Editor for the journal Marine Mammal Science.

Aaron Rice (arice@cornell.edu)
Dr. Aaron N. Rice is a Research Scientist at the Bioacoustics Research Program (BRP) at Cornell University. His research focuses on the evolution, ecology, and function of sound production in fishes, but is broadly trained in organismal biology. This background in fish biology brings an interdisciplinary and taxonomically diverse perspective to BRP's studies of whales and marine ocean environments. He leads the research efforts focused on bioacoustic and ecological analyses of marine animals in diverse projects ranging from the U.S. Atlantic Coast (from Maine to Florida), Africa, Philippines, Gulf of Mexico, Australia, and Arctic waters. In 2014, he was awarded the Partners in Conservation Award from the U.S. Department of Interior for using bioacoustic approaches in protected species' population assessments. While most of his research efforts are on fish and whales, he has current grants and previous bioacoustics publications on birds, amphibians, rodents, and soundscapes. The diversity of skills and perspectives of staff at BRP allow for an interdisciplinary approach spanning biology, ecology and engineering to answer bioacoustic questions. Aaron has a B.S. from Davison College, a Master's from the Boston University Marine Program, a Ph.D. from the University of Chicago, and did his postdoc at Cornell.

Peter L. Tyack (plt@st-andrews.ac.uk)
Peter Tyack is a Professor of Marine Mammal Biology at the University of St Andrews. His research focuses on behavioral ecology, especially acoustic communication and social behavior in marine mammals. He has studied the role of vocal learning in reproductive advertisement in baleen whales and individually distinctive contact calls in toothed whales, and echolocation in deep diving toothed whales. He has developed new methods to sample behavior continuously from marine mammals, including the development of sound-and-orientation recording tags, and has used these to study communication and echolocation. During his field work recording sounds of whales, he noticed that anthropogenic sound is ubiquitous in the ocean, and he developed concern that anthropogenic sounds could disturb marine mammals. He has developed a series of studies on responses to anthropogenic sounds, including effects of oil exploration on baleen and sperm whales, and the effects of naval sonar on toothed whales. Tyack graduated *summa cum laude* in Biology from Harvard College and his PhD is in Animal Behavior from Rockefeller University. His PhD advisor was Donald Griffin, an early pioneer of studying animal sonar and animal awareness. He is an author of more than 100 peer reviewed scientific publications, served on 3 National Research Council Committees on the effects of sound on marine mammals, and is an author of 3 reports published by the National Academy Press and an editor of 2 books on animal behavior. He chaired a committee of the US National Academy of Sciences Ocean

Studies Board which wrote a 2017 report on “Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals.” He has served on the US Federal Advisory Committee on Acoustic Impacts on Marine Mammals, and testified to Congress and advised many non-governmental groups and government agencies on this topic.

Joseph D. Warren (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. SeaBASS 2018 comes in a busy stretch of fieldwork for me with: coral reef passive acoustics in Fiji (January), blue whale foraging study in Chile (Feb-Mar), Philippines sardine survey (May), ADEON bottom lander redeployment cruise (June), and I leave the dock for a New York bight offshore fish survey two days after this course ends. I also published my first passive acoustics paper (lead author is a recent Master’s student in my lab and SeaBASS alum: Colin Wirth) this year on the use of an artificial reef off the coast of NY as a foraging habitat for bottlenose dolphins.