Welcome to the 2024 Northeast Regional Acoustics Symposium and Career Workshop

Hosted by the Center for Acoustics Research and Education (CARE)
University of New Hampshire

April 25th and 26th, 2024

Holloway Commons Building, Piscataqua Room

SCHEDULE AT A GLANCE

Thursday, April 25th (Symposium)

8:30-9:15: Registration and Breakfast (provided)
9:15-9:30: Introductions and Welcome Address by Harlan Spence, Director of the Institute for the Study of Earth, Oceans and Space at UNH
9:30-10:30: Keynote Speaker, Dr. Gary Elko
10:30-10:45: Break
10:45-12:00: Oral Presentations
12:00-13:30: Lunch (provided) and networking
13:30-14:30: Keynote Speaker, Dr. Laurel Symes
14:30-15:45: Oral Presentations
15:45-16:00: Break
16:00-17:30: Poster Session and Cashless Bar
18:00 - End: Optional social at Tideline Public House, 15 Newmarket Road in Durham

Friday, April 26th (Career Workshop)

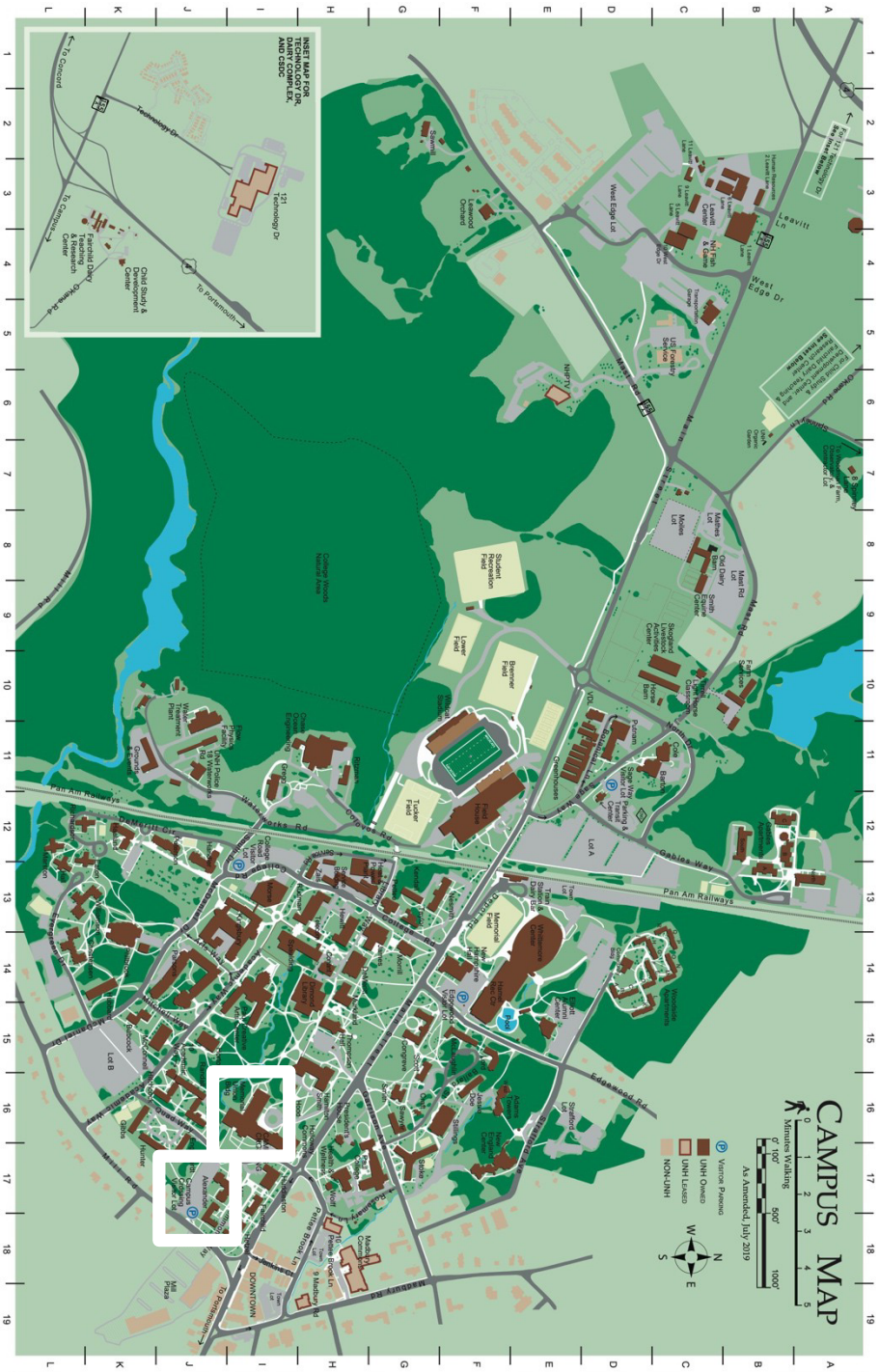
8:30-9:00: Registration and Breakfast (provided)
9:00-9:05: Introductions
9:05-10:15: Career Representative Introductions
10:15-10:30: Break
10:30-12:00: Career Table Round Robins
12:00- 13:00: Lunch (Provided) and Closing Address
13:00-14:00: Optional tour of Chase Ocean Engineering Building

PARKING

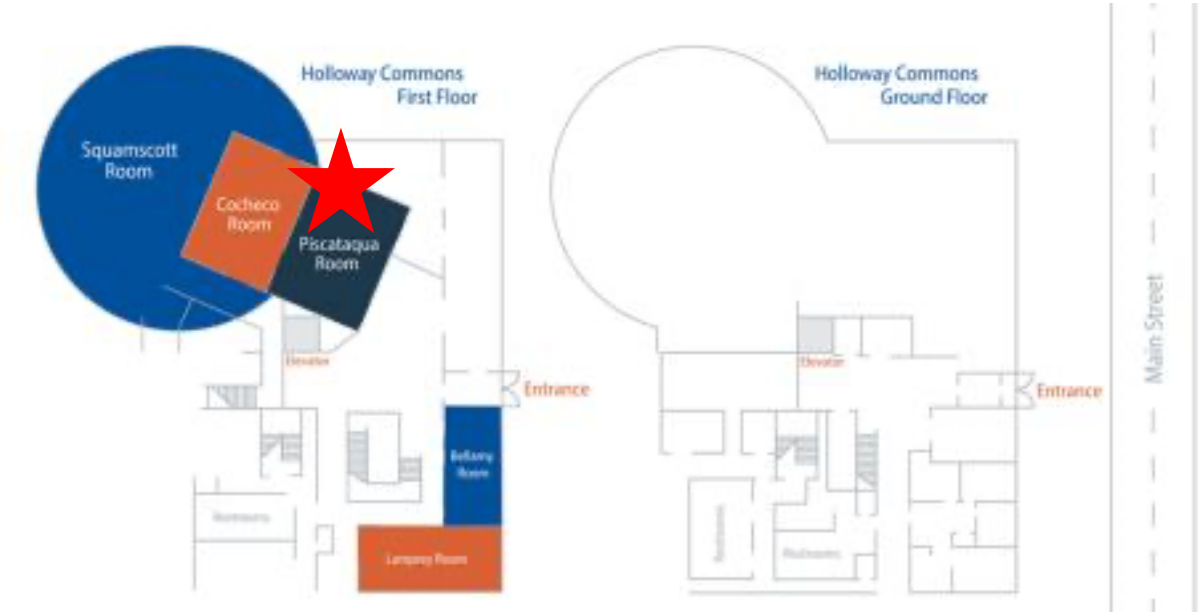
All workshop participants can park at no cost to you at the Campus Crossing Visitor Lot (Formerly known as "Mill Road Visitor Lot", or "C-Lot."). The lot is located at Mill Road across from the Durham Market Place plaza (set GPS for 8 Mill Road).

Your parking code is **3188**. Approach any kiosk in the lot assigned. Press “Coupon” Button enter code provided above and hit enter, the machine will verify the code, once the code is verified, press the green button and receipt will print out. Receipt must be displayed on driver’s side dash face up to avoid ticketing.

CAMPUS MAP (available at: https://www.unh.edu/facilities/resources/campus-maps)



HOLLOWAY COMMONS MAP



Oral Presentations at-a-glance

Time	Name and Affiliation	Oral Presentation Title
9:30-10:30	Gary Elko, mh Acoustics	Keynote: Spherical microphone arrays—from design to application
10:45-11:00	Alan Hunter, University of Bath	Simulation-aided machine learning for underwater acoustic seafloor surveying
11:00-11:15	Renea Briner, NOAA NMFS NEFSC	Regional revelations: Acoustic occurrence patterns of four baleen whale species in the western North Atlantic from 2020-2023
11:15- 11:30	Amaro Tuninetti, University of New Hampshire	Echolocation at high dive speeds: Lessons from free-tailed bats
11:30-11:45	Hana Koilpillai, Passive Acoustics Branch, NOAA NEFSC	North Atlantic Right Whale Acoustic Behavior in the Western North Atlantic
11:45-12:00	Anita Murray, Maine Department of Marine Resources	Maine Department of Marine Resource's Passive Acoustics Program
13:30-14:30	Laurel Symes, Cornell Lab of Ornithology	Keynote: Challenges, opportunities, and horizons in passive acoustic monitoring
14:30-14:45	Daniel Duane, Naval Undersea Warfare Center	Moonlight-driven biological choruses in Hawaiian coral reefs
14:45-15:00	Brian Warren, The Naval Oceanographic Office	The Naval Oceanographic Office (NAVOCEANO) Overview
15:00-15:15	Sophie Ferguson, NOAA NMFS NEFSC	Understanding variability in sperm whale acoustic presence along the US northeast continental shelf
15:15-15:30	Jenna Hare, University of New Hampshire	Temporal variability of seafloor scattering measurements in shallow-water sandy sites
15:30-15:45	Kevin Heaney, Applied Ocean Sciences	Approaches to modeling marine mammal contributions to the soundscape in the Gulf of Maine

Posters at-a-glance

Poster	Name	Poster Title
1	Sevda Abdavinejad Mirkoohi, University at Buffalo, SUNY	Communicative Behavior of the BTBR Mouse Model of Autism Spectrum Disorder
2	Michele Adams, University of New Hampshire	Ontogeny of vocalizations in Adélie penguin (Pygoscelis adeliae) chicks from West Antarctica
3	Sonja Ahlberg, University of New Hampshire	Characteristics of wild moose (Alces alces) vocalizations
4	Lucas Anderson, University of New Hampshire	Density Dependent Calling Behavior in North Pacific Humpback Whales
5	James Bourgeois, University of Massachusetts Dartmouth	Rainfall Estimation from Hydrophone Spectra at Different Depths
6	Olivia Boyan, University of New Hampshire	Effects of Anthropogenic Noise on Bullfrog Calls
7	Joseph Brosseau, University of New Hampshire	The effect of localized disturbance on the acoustic behavior of the common tern (Sterna hirundo)
8	David Campos Anchieta, University of Massachusetts Dartmouth	Passive acoustic source localization of marine mammals in hydrophone array recordings with time-domain beamforming
9	Kaan Cav, University of New Hampshire	Quantifying the Temporal Variability of High-Frequency Acoustic Backscatter from a Shallow Water Sandy Site
10	Simon Clement, PYTHEAS Technology	Experimental testing of a double-octave piezoelectric transducer for large-band underwater communication
11	Rachel Courter, University of New Hampshire	Melody of Speech Assessment in Children
12	Valerie Eddington, University of New Hampshire	Using soundscape to monitor population size and demographics in a dense aggregation of colonial seabirds
13	Danielle Fradet, University of New Hampshire	Using acoustic indices to monitor Adélie penguins in the Western Antarctic Peninsula
14	Reese Fry, Brown University	Social calls of big brown bats in a competitive feeding context
15	Connor Kramer, University of Massachusetts Dartmouth	Investigating Targets to Decrease Detection Probability for Infotaxis Experiments
16	Callyan Lacio, University of New Hampshire	Monitoring population size and phenology of anurans using acoustics
17	Justin Lawless, University of New Hampshire	Investigating Echolocation Behavior of Free-Flying Bats in the Presence of Conspecifics
18	Yue Liang, University of New Hampshire	Automatic detection of cetacean tonal calls based on the spectral entropy technique
19	Grant Milne, University of New Hampshire	Combined passive acoustic and genetic comparison of coastal marine habitats in New England
20	Jill Munger, University of New Hampshire	Echoes of Resilience: Revealing Mangrove Community Structure Through Sounds
21	Rendhy Sapiee, University of Rhode Island	Harnessing the Potential of a Silent Mesopelagic Observation System Integrated with Active Acoustics and Low-Light Imaging
22	Ahmad Syed Sulman, University of Washington Seattle	Development of an OpenFOAM Solver for Hydroacoustic Simulations: An Application for Acoustic Fish Deterrence
23	Jill Thorson, University of New Hampshire	Melody of Speech Assessment in Children
24	Emma VerGow, University of New Hampshire	Characterizing Sei Whale Movement Patterns

Thursday, April 25th

REGISTRATION AND BREAKFAST: 8:30-9:15

WELCOME ADDRESS: 9:15-9:30

KEYNOTE SPEAKER: 9:30-10:30

Dr. Gary Elko, "Spherical microphone arrays—from design to application"

Abstract: The talk will focus on the design and application of higher-order spherical microphone arrays (HOA) that decompose the sound field into spherical harmonic basis components. An advantage of the spherical microphone array design is that it is based on well-known mathematical properties that offer compact and scalable orthonormal representations of the soundfield. Spherical microphone array HOA outputs form the basis of rendering recorded spatial audio signals over several modern spatial audio playback systems used in AR/VR applications and multichannel playback systems. Spherical array HOA outputs are also used in beamforming applications and sound field analysis. The talk will discuss a few of these applications.

Bio: Gary W. Elko started his professional career at AT&T Bell Labs in 1984 after completing his BSEE degree at Cornell and MS and Ph.D. degrees at the Pennsylvania State University. He was a Research Supervisor in the Acoustics Research Department at Bell Labs working on acoustic signal processing solutions for high-quality hands-free speech communication systems. In 2002 he cofounded mh acoustics with other Bell Labs colleagues. mh acoustics works with customers on the design and development of front-end acoustic signal processing algorithms for audio communication products. The company develops and markets the Eigenmike® spherical microphone array for spatial sound field capture. He is a fellow of the Acoustical Society of America and the IEEE. He received the Acoustical Society of America's Silver Medal in Engineering Acoustics in 2012 and the IEEE Signal Processing Society Industrial Innovation Award in 2015. He has more than 60 publications and over 30 patents in acoustic transducers and acoustic signal processing.

BREAK: 10:30-10:45

ORAL PRESENTATIONS: 10:45-12:00

Oral Presentation, 10:45-11:00
Simulation-aided machine learning for underwater acoustic seafloor surveying
Alan Hunter, University of Bath

Underwater acoustic applications of machine learning are challenging due to sparsity, lack of diversity, and uncertain labelling of training data. One way of mitigating this problem is to collect and label more data, but that can be expensive and is unlikely to fully address the issue. A complementary approach is to use simulation for generating synthetic data and augment the machine learning pipeline. This also enables explainability by encoding human knowledge of the underlying physics. This talk will explore case studies in automated image analysis for two related applications in naval mine-hunting and underwater munition dumpsite remediation.

Oral Presentation, 11:00-11:15
North Atlantic Right Whale Acoustic Behavior in the Western North Atlantic
Hana Koilpillai, Passive Acoustics Branch, NOAA NEFSC

Offshore wind energy is rapidly developing in U.S. waters, overlapping with important regions for the critically endangered North Atlantic right whale (NARW). Construction began in the spring of 2023 off Southern New England (SNE) and additional wind energy lease areas are proposed along the entire U.S. East Coast. Long-term passive acoustic monitoring allows for the assessment of NARW acoustic behavior and presence before, during, and after pile driving activities. A data-driven understanding of NARW upcalling behavior is presented here to help inform effective monitoring and mitigation measures throughout part of their range. Bottom-mounted acoustic recorders were deployed at 32 sites across 4 regions (Mid-Atlantic, SNE, Stellwagen Bank National Marine Sanctuary (SBNMS), and offshore Gulf of Maine) from February 2021 to February 2024. Analyses of daily acoustic presence showed year-round occurrence in SNE with seasonal acoustic peaks in the Mid-Atlantic (December-February), SBNMS (January-April), and the Gulf of Maine (May-June). Results also demonstrated how long NARWs remain at each site following a day with a confirmed upcall detection (i.e., persistence) and the likelihood of re-detecting acoustically active NARWs again after the first detection (i.e., reoccurrence). Within SNE, on average, NARWs persisted 95% for 10 days and reoccurred again within 11 days. One site from each region was manually annotated for upcalls to further explore acoustic behavior and diel trends. Results revealed an overall lack of diel trends, as upcalls were distributed throughout the day when NARWs were acoustically present. These results provide support for monitoring for the NARW, a species with variable acoustic behavior, over longer time periods prior to construction activities to ensure detection of an upcalling NARW.

Oral Presentation, 11:15- 11:30

Echolocation at high dive speeds: Lessons from free-tailed bats

Amaro Tuninetti, University of New Hampshire

The roost reentry behavior of free-tailed bats (genus *Tadarida*) is one of the most dramatic examples of high-speed flight and echolocation behavior. After foraging, bats will return to their roosts from high altitudes, diving towards their goal at steep angles and reaching speeds as high as 44 m/s (98.4 mph). To investigate these bats' echolocation behavior, we used synchronized camera arrays and ultrasonic recordings to record wild Mexican free-tailed bats (*Tadarida brasiliensis*) as they returned to their cave roost in southern New Mexico. We reconstructed the 3D trajectories and biosonar behavior of 26 bats as they returned to their roost and analyzed how the bats' echolocation varied as a function of height and velocity, as well as how reception of echoes influenced their flight behavior. We found that bats reached speeds as high as 22.4 m/s and experienced g forces as high as 9 g. Additionally, bats utilized a relatively stereotyped echolocation and flight pattern as they descended, likely a strategy made necessary by the high speeds at which bats are navigating.

Oral Presentation, 11:30-11:45

Understanding variability in sperm whale acoustic presence along the US northeast continental shelf

Sophie Ferguson, NOAA NMFS NEFSC

Sperm whales (Physeter macrocephalus), classified as Endangered, are an apex predator known to inhabit the world's deep oceans. Within the western North Atlantic Ocean, southern New England (SNE) and the Gulf of Maine (GOM) are recognized as seasonal habitats for sperm whales; however, their distribution across these areas is poorly understood. As US offshore wind energy areas are rapidly developing across these seasonal sperm whale habitats, it is important to gain a better understanding of the sperm whale's distribution. Passive acoustic recorders (SoundTraps; sampling at 48 or 64 kHz) were deployed across the offshore GOM, Stellwagen Bank National Marine Sanctuary (SBNMS), and SNE. Baseline data from seven sites were analyzed between May 2022 to 2023 for daily acoustic presence of sperm whales. A detector was run in Matlab (2016b) using the Triton program to identify sperm whale clicks, which were then manually verified using the detEdit program. Preliminary results confirm the variability of sperm whale presence by site, region and season along the northeast continental shelf. Highest presence was recorded in the offshore GOM with acoustic detections on 30-50% of days analyzed per month between July and October 2022. SNE showed presence year-round, with a maximum of 16% days present in July 2023. Detection rates were much lower in SBNMS and showed no seasonality, suggesting that they are not frequently foraging within this area. Sperm whales were frequently present in shallow waters, which can also overlap with areas being developed for wind energy. Further multiyear investigation of sperm whale presence will help to guide and improve understanding of their movements and behavior within this region.

Oral Presentation, 11:45-12:00

Maine Department of Marine Resource's Passive Acoustics Program
Anita Murray, Maine Department of Marine Resources

The Passive Acoustic Program at Maine Department of Marine Resources has several past, current, and future passive acoustic monitoring (PAM) projects. These projects occur off the coast of Maine in both the inshore (or state waters) as well as the offshore (or federal waters). I will review the details of our PAM moorings, past current and future PAM projects, and the goals of each project.

LUNCH AND NETWORKING: 12:00-13:30 (Provided)

KEYNOTE SPEAKER: 13:30-14:30

Laurel Symes, "Challenges, opportunities, and horizons in passive acoustic monitoring."

Abstract: Terrestrial passive acoustic monitoring has made rapid advances in the past decade, beginning with advances in hardware and followed by advances in analysis approaches, particularly machine learning based approaches. Rapid technological changes have opened new horizons and raised new challenges for the field. I will discuss some of the challenges and opportunities, including sampling strategies, the development of machine learning models for diverse taxa and integrating passive acoustic data and other survey types. In addition, I will discuss considerations for data sharing and collaboration, and strategies for supporting capacity development to facilitate the use of passive acoustic monitoring in conservation globally.

Bio: Laurel Symes is the Assistant Director of the K. Lisa Yang Center for Conservation Bioacoustics at the Cornell Lab of Ornithology, where she conducts research across a range of temperate and tropical environments. In the Northeastern United States, she and collaborators engage in the passive acoustic monitoring of birds and bats with the goal of understanding how habitat variation and management affect species distribution and interactions. She has a particular interest in the methodological considerations for implementing passive acoustic monitoring and automated signal detection.More broadly, she works at the intersection of ecology, evolution, conservation, and technical development and conducts research across a variety of taxa, including insects, frogs, bats, and birds. At the Yang Center, she coordinates the tropical biology research program, working with teams in Central and South America, Central Africa, and Southeast Asia to develop research approaches and tools that span tropical terrestrial habitats. She also works with the Yang Center capacity building team to develop introductory and advanced training materials and courses, provide intensive professional mentorship and training, and maximize the accessibility and effectiveness of acoustic tools for research and conservation

ORAL PRESENTATIONS: 14:30-15:45

Oral Presentation, 14:30-14:45
Moonlight-driven biological choruses in Hawaiian coral reefs
Daniel Duane, Naval Undersea Warfare Center

Sounds from fish and invertebrates in coral reefs can create persistent cacophonies that can be recorded for ecosystem monitoring, including during nighttime hours where visual surveys are typically not feasible. Here we use soundscape measurements in Hawaii to demonstrate that multiple coral reef communities are rapidly responsive to shifts in nighttime ambient light, with sustained changes in biological sound between moonrise and moonset. High frequency pulse train sounds from fish (0.5-1.5 kHz) are found to increase during moonlight hours, while low frequency fish vocalizations (0.1-0.3 kHz) and invertebrate sounds (2-20 kHz) are found to decrease during moonlight hours. These discoveries suggest that the rising and setting of the moon triggers regular shifts in coral reef ecosystem interactions. Future acoustic monitoring of reef health may be improved by comparing soundscapes during moonlight and non-moonlight hours, which may provide early indicators of shifts in the relative abundance of separate reef communities.

Oral Presentation, 14:45-15:00
The Naval Oceanographic Office (NAVOCEANO) Overview
Brian Warren, The Naval Oceanographic Office

The Naval Oceanographic Office (NAVOCEANO) is responsible for providing oceanographic products and services to all elements of the Department of Defense (DoD). From data collection through production and analysis, NAVOCEANO provides the warfighter the best available knowledge of the maritime battlespace. This includes tailored oceanographic, hydrographic, bathymetric, geophysical, and acoustic products and services to DoD customers worldwide that aid in safe navigation and effective mission planning.

Oral Presentation, 15:00-15:15
Regional revelations: Acoustic occurrence patterns of four baleen whale species in the western North Atlantic from 2020-2023
Renea Briner, NOAA NMFS NEFSC

Passive acoustic monitoring efforts have rapidly expanded in recent years, increasing spatial and temporal data coverage in the western North Atlantic Ocean. The ensuing long-term dataset can be used to investigate large-scale acoustic occurrence patterns of endangered baleen whale species, including North Atlantic right, sei, fin, and blue whales. In this study, four years of data (January 2020-September 2023) collected on bottom-mounted hydrophones were analyzed using an automated detection software and manually verified to examine the daily acoustic presence of each species across five regions (Mid-Atlantic, Southern New England (SNE), Stellwagen Bank National Marine Sanctuary (SBNMS), coastal Gulf of Maine (GOM), and northern Georges Bank (GB)). North Atlantic right whales were acoustically present year-round in SNE, sporadically in coastal GOM, and seasonally in the Mid-Atlantic (November-March), SBNMS (October-April), and GB (April-May). Sei whales were acoustically present year-round in SNE,

SBNMS, and GB, with detections peaking in early spring (February-April) in SNE and in both the spring (March-May) and fall (September-December) in SBNMS and GB. Few verified sei calls were observed in the Mid-Atlantic and coastal GOM. Fin whales were also acoustically present year-round in SBNMS and GB, with decreased detections in the summer (May-June). In the Mid-Atlantic, SNE, and coastal GOM, fin vocalizations followed a similar overall presence trend as SBNMS and GB, but at lower levels, resulting in few detections in the summer months. Finally, blue whales were acoustically present in GB during the winter (November-January), with intermittent detections in other regions. These results will be compared to published acoustic occurrence patterns from 2004-2014, highlighting baleen whale movements and distribution shifts over time. Furthermore, findings will emphasize current regions that require protection from anthropogenic impacts, such as offshore wind energy development, shipping, and fishing gear.

Oral Presentation, 15:15-15:30

Temporal variability of seafloor scattering measurements in shallow-water sandy sites

Jenna Hare, Center for Acoustics Research and Education (CARE), University of New Hampshire

In the ocean, the performance of active sonar systems used for object detection and seafloor characterization can be affected when the acoustic properties of the seafloor change due to near-bottom hydrodynamics and biological activity. Determining the dominant environmental mechanisms and corresponding time scales that regulate seafloor scattering will increase our understanding of the performance of these remote-sensing applications. To this end, a high-frequency active acoustic system (operating at 38 kHz, 70 kHz and 200 kHz), a wave-sensing CTD, and a stereo camera were deployed on the seafloor in a series of experiments lasting from two weeks to five months (2020-2021). The transducers were located at approximately 2 m above the seafloor and were oriented at 20 degrees grazing angle with respect to the seafloor. Seafloor scattering measurements were obtained in two shallow water locations in New Hampshire, USA: a wave-dominated site (Star Island) and a tidal current dominated site (New Castle). Seafloor elevation obtained from the phase differences recorded by the 70 kHz split-beam transducer was used to compute grazing angle. Daily and weekly trends in mean scattered levels and the mechanisms causing their temporal variability are discussed. There was generally little variation in scattering strength at New Castle, consistent with the lack of storms during these deployments, compared to Star Island, where variations of up to 8 dB were observed. The measurements are also compared to the small-slope approximation model where seafloor roughness estimates were obtained using stereophotogrammetry. These results will increase our understanding of the interaction between high-frequency sound and the ocean floor, leading to improved remote-sensing techniques for object detection and seafloor monitoring.

Oral Presentation, 15:30-15:45

Approaches to modeling marine mammal contributions to the soundscape in the Gulf of Maine

Kevin Heaney, Applied Ocean Sciences

Advances have been made over the past 10 years to model soundscapes in regional and marginal seas. The primary emphasis has been on the computation of shipping noise levels and their relation to the wind levels. In order to begin to understand impacts on marine animals' approaches using the excess noise (shipping level minus wind level) are beginning to be evaluated. What happens when marine mammals are contributing a significant percentage of the soundscape energy. Can we model this? Are there approaches to processing the data that can inform the choice of the "natural background"? Modeling and data analysis from the Gulf of Maine will be presented.

BREAK 15:45-16:00

POSTER SESSION: 16:00-17:30

Poster 1: Communicative Behavior of the BTBR Mouse Model of Autism Spectrum Disorder

Sevda Abdavinejad Mirkoohi, University at Buffalo, SUNY

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder affecting both children and adults, with many of them requiring lifelong support of some kind. There are no consistent biological markers for ASD, and the diagnosis is currently based on behavioral symptoms of early-appearing abnormal social interactions with communication impairment, and aberrant repetitive sensory-motor behaviors. Although the exact causes of ASD have not yet been fully uncovered, a substantial body of data supports the role of genetic factors in the etiology of autism, inspiring the ongoing preclinical studies on rodent models to investigate the possible genetic factors. Mice are highly effective models for studying neurodevelopmental disorders characterized by abnormal social behaviors. Because they produce Ultrasonic Vocalizations (USVs) with many features similar to human speech, they have been proposed as a model for investigating neurodevelopmental disorders characterized by impairments in social communication, including ASD. BTBR T+ Itpr3tf/J (BTBR) is an inbred mouse strain that displays social abnormalities, communication deficits, and repetitive behaviors analogous to the behavioral symptoms of ASD. Here, we investigate the USVs of BTBR mice in response to long and short term social experiences in both female and male mice for the first time. Male and female BTBR mice produce USVs which vary in features and proportions produced after social experiences compared to wild-type controls. These results add to the understanding of the BTBR mouse model for humans with ASD.

Poster 2: Ontogeny of vocalizations in Adélie penguin (*Pygoscelis adeliae*) chicks from West Antarctica

Michele Adams, University of New Hampshire

Acoustic indices are an efficient method for monitoring dense aggregations of vocal animals but require understanding the acoustic ecology of the species under examination. The present understanding of avian behavior and vocal development is primarily derived from the research of songbirds (Passeriformes). However, given that behavior and environment can differ greatly among bird orders, passerine birdsong may be insufficient to define the vocal ontogeny of non-passerine birds. Like many colonial nesting seabirds, the Adélie penguin (*Pygoscelis adeliae*) is adapted to loud and congested environments with limited cues to identify kinship within aggregations of conspecifics. In addition to physical or geographical cues to identify offspring, adult *P. adeliae* rely on vocal modulation. Numerous studies have been conducted on mutual vocal modulations in mature *P. adeliae*, but limited research has explored the vocal repertoire of the chicks and how their vocalizations evolve over time. Using the deep learning-based system, DeepSqueak, this study characterized the vocal ontogeny of *P. adeliae* chicks in the West Antarctic Peninsula to aid in autonomously tracking their age. Understanding the phenological communication patterns of vocal-dependent seabirds can help measure the impact of climate change on this indicator species through non-invasive methods.

Poster 3: Characteristics of wild moose (*Alces alces*) vocalizations
Sonja Ahlberg, University of New Hampshire

Moose are a popular wildlife species in New Hampshire, yet they are difficult to study in the wild. Passive acoustic monitoring could be a valuable tool for studying moose and informing their management. Moose are sexually dimorphic, and previous acoustic studies suggest that the age and sex of individuals may be expressed in the components of their vocalizations. Videos taken by the public and uploaded to the internet represent an untapped resource for studying the acoustics of this elusive species. Using the audio extracted from videos posted on YouTube, we were able to quantify and compare the characteristics of moose vocalizations by age and sex class. We found that peak frequency, center frequency, bandwidth, and duration were significantly different across bulls, cows, and calves. Overall, bulls produce the lowest frequency calls, followed by cows and then calves, whose calls are highest in frequency. Calves produce calls with the broadest bandwidth, and cows produce calls with the longest duration. These acoustic indices are important for building the framework for a passive acoustic detector that can be used to monitor this species. This study also demonstrates the role that public videos and community science can play in bioacoustics research.

Poster 4: Density Dependent Calling Behavior in North Pacific Humpback Whales
Lucas Anderson, University of New Hampshire

Animal density can define factors such as mating success, food acquisition, and communication. Inferring animal density from vocal rates is an important tool for estimating abundance and space use in difficult to study species, including marine mammals. The goal of this project was to determine if there is a relationship between density and call rate in southeast Alaskan humpback whales. For this purpose, passive acoustic monitoring data were combined with visual observations gathered near Juneau, Alaska over 2 summers (2019, 2022). Visual observations were used to determine the number of whales and their distance from the observers, allowing for density (whales/km^2) to be calculated. There were 98 total 10-minute surveys that took place over 34 days, with a range of 1 to 53 whales per survey. Call rate and density exhibited a negative logarithmic relationship; for every one unit increase in density call rates decreased by 42.5% (95% CI 31%-59%). Understanding the changes in humpback whale call rates associated with density has potential to improve monitoring practices and conservation efforts.

Poster 5: Rainfall Estimation from Hydrophone Spectra at Different Depths
James Bourgeois, University of Massachusetts Dartmouth

Berg (2023) successfully estimated rainfall from broadband acoustic spectra recorded by a shallow-water hydrophone at 1 meter depth. This was accomplished by first detecting the rain with a binary Support Vector Machine, followed by a Linear Minimum Mean-Squared Error regression to estimate the rain rates from the acoustic spectra. This project estimates the rainfall with linear regression from the broadband spectra from both a shallow hydrophone at 1 meter depth and a second hydrophone at a depth of 7 meters. This approach compares rainfall estimates from the spectra of each individual hydrophone to determine which hydrophone depth contains more information about the rain rate, and compares these rainfall estimates with a rainfall

estimate produced by the combined spectra of both hydrophones to determine whether the hydrophones record different information about the rain. The approach computes a LMMSE regression from 5-minute rainy PSDs to estimated rain accumulation in each 5-minute window, training the regression with rain gauge measurements in 5-minute intervals. [Supported by ONR/MUST program]

Poster 6: Effects of Anthropogenic Noise on Bullfrog Calls

Olivia Boyan, University of New Hampshire

Loud sources of anthropogenic noise pose a threat to many animals' ability to communicate. The effects of anthropogenic noise for several anuran species have been investigated; however, there is a lack of research on this topic for American Bullfrogs (*Rana castebiana/ Lithobates catesbeianus*). During their mating season, sexually mature male bullfrogs attract females by producing low-frequency calls from their territories. Many sources of anthropogenic noise such as trains and cars also produce low-frequency noises that can mask the calls of bullfrogs. For this study, recordings from three ponds in New Hampshire were analyzed to see how the frequency (Hz) of the bullfrog calls changed before, during, and after an event of anthropogenic noise. The sites chosen varied between high, medium, and low anthropogenic noise levels. This study aims to identify call changes in response to low-frequency anthropogenic noise, which could greatly impact their reproductive success.

Poster 7: The effect of localized disturbance on the acoustic behavior of the common tern (*Sterna hirundo*)

Joseph Brosseau, University of New Hampshire

The common tern (*Sterna hirundo*) is a migratory species of shorebird that breeds in colonies of thousands of individuals in North America. Traditional methods for surveying these shorebirds are visual based, and can introduce investigator disturbance to the colonies, which is known to adversely affect the health of the colony and effectiveness of the surveys. In this study, we assessed the impact of investigator disturbance on the acoustic behavior of a dense colony of common terns using passive acoustic monitoring. We predicted the colony would exhibit a graded antipredator response. Specifically, we hypothesized an increase in acoustic energy as distance to investigator disturbance decreased. Additionally, we hypothesized that the increase in acoustic energy would coincide with a shift in dominant frequencies, resulting from a change in vocalization types, as distance to investigator disturbance decreased. We found human disturbance to result in a significant increase in acoustic energy when disturbances were within 20 meters of recording units, and a stronger graded response within 10 meters. However, we found no significant shift in dominant frequencies in response to distance to investigator disturbance, although this does not rule out a shift in vocalization types in response to disturbance. Future research focusing on call type analysis could support or refute a potential shift in vocalization types. Our findings provide a framework for assessing the behavioral impact of disturbance on colonies and support the presence of a graded alarm call system in common terns. By understanding the impact human disturbance has on a population, future acoustic studies can use this information to reduce their impacts on their focal populations.

Poster 8: Passive acoustic source localization of marine mammals in hydrophone array recordings with time-domain beamforming

David Campos Anchieta, University of Massachusetts Dartmouth

Hydrophone arrays add a spatial dimension to underwater acoustic recordings, allowing both background noise attenuation and sound source localization. To infer the location of loud far-field sources relative to the array, time-domain passive beamforming compensates for the angle-dependent time shift between signal arrivals at each hydrophone. This research tests broadband time-domain beamforming to obtain spatial information about the locations of sperm whale clicks recorded on a NOAA towed hydrophone linear array dataset recorded in the Summer of 2016. The high sampling rate of the recording allows the formation of many beams. The proposed algorithm identified the whale clicks, as well as their likely angle of arrival, by determining the steering angle maximizing the average output power of the time-domain beamformer. The relatively low computational complexity of the time-domain beamformer makes it more suitable for real-time applications when compared to parallel implementation of many frequency-domain beamformers.

Poster 9: Quantifying the Temporal Variability of High-Frequency Acoustic Backscatter from a Shallow Water Sandy Site

Kaan Cav, University of New Hampshire

Active sonar systems are used for many remote sensing applications such as hydrography, seafloor characterization, and target detection. Previous work has focused on the dependence of scattering strength (SS) on sediment type, grazing angle, and frequency, however the temporal variability of SS has not been studied as extensively. Our research aims to quantify the dependence of SS on environmental factors occurring on time scales of multiple months. Because the dominant contributors to SS are surface roughness and volume heterogeneity, environmental drivers that affect these elements of the seabed are of most interest. Near bed hydrodynamics caused by storms are an example of environmental drivers that could affect the seabed. Two datasets spanning the winter of 2022-23 and the winter of 2023-24 were analyzed. Hourly data were acquired using a 2 m tall tripod sitting on the seabed at the mouth of the Piscataqua River (NH, USA) at a shallow water, sandy site. The tripod was equipped with three transducers operating at 70 kHz, 200 kHz, and 333 kHz; all of which faced a patch of seafloor ranging from 4.2 m to 13.2 m from the tripod. There was also a CTD attached to the tripod to provide environmental measurements of temperature, salinity, conductivity of the water, and significant wave height for storm detection. Moreover, surveys using a ship-based 70 kHz transducer on a multi-angle mount were conducted monthly throughout the winters to allow comparisons to the SS results from the tripod. The ship-based measurements were conducted once a month, allowing for temporal SS analysis at both a wider range of grazing angles and a larger spatial coverage. Estimates of SS and mechanisms driving its variability from both the vessel and tripod data will be discussed.

Poster 10: Experimental testing of a double-octave piezoelectric transducer for large-band underwater communication
Simon Clement, PYTHEAS Technology

In recent years, the field of underwater communication has mainly seen advances in signal processing, assuming hardware has mostly reached its peak capabilities. However, both hydrophones and projectors still see major developments, and a new, compact transducer developed for large-band underwater communication is presented here. The reasons for its development and application cases are detailed in the introduction: this compact transducer (450g, 60x60x60mm) was particularly developed to be used on AUVs, where compacity and light weight are critical. Then, a description of the transducer is given, and the experimental setup used to validate its performances is presented, including the test conditions and instrumentation used. The test results are then analyzed, showing a hemispherical directivity over a bandwidth of two octaves: 15kHz to 60kHz. To conclude, development perspectives are given, as well as potential modifications to bring to this transducer to reach different frequency ranges.

Poster 11: Melody of Speech Assessment in Children
Rachel Courter, University of New Hampshire

Clinical assessment of prosodic skills is essential when investigating linguistic and affective abilities. Prosodic elements include speech melody (intonation), phrasing distinctions, phrase level accentuation, lexical stress, affect, tempo, and rhythm. Prosody can be described as a hierarchy which allows for various prosodic skills, such as lexical stress, to be investigated independently. To identify a child who is displaying receptive or expressive prosodic deficits, which potentially impact language skills, an assessment tool for clinical settings must be developed. Speech language pathologists (SLPs) often rely on perceptual skills to identify speech disorders, as there is no agreed upon prosodic assessment for evaluation. The Profiling Elements of Prosody in Speech-Communication (PEPS-C) is the most comprehensive assessment, but is not widely used due to length, administration issues, lack of normative data, and no acoustic counterpart to the perceptual analysis. To improve the assessment of linguistic skills, the Naturalistic Lexical Stress (NLS) subtests were developed to elicit lexical stress in a more natural and spontaneous interaction. The NLS expressive subtest controls for effects such as uncertainty contours (sounds like a question) and phrase final lengthening (last word in an utterance has a longer duration). The NLS receptive subtest assesses orthographic English word pairs which can be represented and recognized by children and adults. These word pairs differ in meaning based on stress. Thirteen typically developing children, one diagnosed with childhood apraxia of speech (CAS), and seven children identified with a phonological impairment aged 5-11 were recruited to complete the PEPS-C and NLS tasks. Results from the receptive tasks were automatically scored by the PEPS-C program and the examiner. Expressive tasks are assessed perceptually and acoustically. The normalized pairwise variability index (nPVI) was measured using fundamental frequency (PVI-f0), duration (PVI-duration), and intensity (PVI-intensity). Acoustic analyses are ongoing and will be presented.

Poster 12: Using soundscape to monitor population size and demographics in a dense aggregation of colonial seabirds

Valerie Eddington, University of New Hampshire

Migratory seabirds are vulnerable to decline due to climate change and anthropogenic disturbances. Common terns (*Sterna hirundo*) are highly-vocal colonial seabirds that serve as bioindicators of their foraging grounds throughout their migratory range. Historically, monitoring colonial seabirds is invasive and time-consuming, and traditional acoustic approaches are complicated by high amounts of call overlap. Monitoring colony size and breeding phenology is crucial to implementing effective management decisions. However, methods are needed to do so efficiently and with minimal disturbance. In this study, we demonstrate that population size and demographics can be assessed acoustically through changes in acoustic energy across varying temporal scales. To do this, we compared acoustic energy to in-person observations of nest density and chick-hatching. We found that trends in acoustic energy align with observations of nest density, and the distribution of acoustic energy across frequency bands is indicative of colony demographics and corresponding phenological events. Overall, our findings suggest that colony-wide trends in population size and breeding phenology can be monitored via acoustic energy without the time-consuming analysis of individual calls.

Poster 13: Using acoustic indices to monitor Adélie penguins in the Western Antarctic Peninsula

Danielle Fradet, University of New Hampshire

Adélie penguins (*Pygoscelis adeliae*) are bioindicators for the rapidly changing Antarctic environment, making understanding their population dynamics and behavior of high research priority. However, collecting detailed population data throughout the breeding season on many colonies is difficult due to Antarctica's harsh conditions and remote location. The colonial breeding ecology of Adélie penguins has led to the evolution of a highly vocal species with individualized calls, making them well-suited for passive acoustic monitoring (PAM) with autonomous recording. PAM units can potentially provide an easily deployable and scalable way to collect fine-scale data on population estimates and breeding phenology. Here I present a framework for using acoustic indices to monitor phenology of dense penguin colonies even under high wind conditions. I evaluate the relationship between acoustic indices such as RMSamplitude and penguin colony size between distinct breeding stages (incubation, guard, crèche, and fledge) on Torgersen and Humble Islands in the Western Antarctic Peninsula with an automated pipeline implemented in R. Using PAM to interpret penguin vocalizations for population size and breeding phenology estimates could lead to the development of a real-time remote monitoring system over a large spatial footprint, revealing Adélie penguin responses to climate change.

Poster 14: Social calls of big brown bats in a competitive feeding context
Reese Fry, Brown University

Big brown bats (*Eptesicus fuscus*) are highly vocal animals. Their use of echolocation calls for orientation and foraging has been widely studied. Less is known about the acoustic characteristics of their social calls and the behavioral context in which these calls are employed. We designed an experiment to test the hypothesis that a particular social call, labeled as a frequency-modulated bout or FMB, is specific to competitive feeding situations involving male, but not female, bats. Pairs of bats (male-male, male-female, female-female) were presented with and allowed to capture a single dangling food item (mealworm). During these trials, we recorded all of their vocalizations and noted which of the two bats captured the mealworm. Sound files were analyzed using Raven Pro and Adobe Audition, and calls classified as echolocation or non-echolocation (social) calls based on call duration, frequency content, and shape of the waveform. We found that male-male pairs emitted significantly more social calls than female-female pairs. FMB calls were solely emitted by males, occurring in both male-male and male-female pairs. These calls are distinguished by their duration (8-12ms) and harmonic structure (2-3). They were emitted in bouts containing 3-5 calls, and immediately followed by a series of echolocation calls. Females did give social calls, but these were longer in duration and less common than male FMB calls. These findings corroborate previous studies indicating the unique association of FMB calls with male big brown bats.

Poster 15: Investigating Targets to Decrease Detection Probability for Infotaxis Experiments
Connor Kramer, University of Massachusetts Dartmouth

Abigail Fabian [nee Keith] (2022) found that the infotaxis search algorithm, as described by Vergassola (2007), prevails in the presence of missed detections when compared to other common search algorithms such as Maximum A Posteriori (MAP). Her simulations found that with a 70% probability of detection, infotaxis was 100% faster than MAP. Attempts to replicate this success in physical experiments proved challenging as the HC-SR04 ultrasonic sensor was too effective to have 70% detection on existing Lego targets. We've investigated alternate targets, finding that curved objects at carefully selected distances can reduce probability of detection by altering the effective surface area and angle of reflected energy. Using wooden dowels of different diameters at increasing distances, tests have shown that the probability of detection can be reduced to 41 and 57.5%. Similar experiments with a golf ball found a probability of detection as low as 78%, extremely close to the ideal value of 70% reported by Fabian. Physical experiments can duplicate Fabian's simulations with these targets and the iRobot Create 2. The robot will be tasked with locating one of these objects in a 1D linear test space, doing so using both MAP and infotaxis to test Fabian's results in a real-world experiment. [Supported by ONR MURI program]

Poster 16: Monitoring population size and phenology of anurans using acoustics
Callyan Lacio, University of New Hampshire

As a species that lives at the land/water interface, the American bullfrog (*Rana catesbeiana/Lithobates catesbeianus*) serve as a bioindicator in many habitats, yet also invasive in many locations. Due to challenges with traditional monitoring approaches, there is a lack of fine-scale population and phenological data for bullfrogs. Passive acoustic monitoring (PAM) can provide a low-cost alternative with high-resolution data for monitoring vocal animals. Sexually mature male bullfrogs attract mates by calling from exclusive territories. These vocalizations can be used to explore bullfrog behavior, population size, and phenology. We describe the analysis framework and initial results from an project monitoring the vocal behavior of frogs in 25 ponds in southeastern New Hampshire during the reproductive season using acoustic arrays. By using an acoustic energy index (RMS amplitude), we can estimate numbers of frogs in ponds, determine timing of reproduction, and even document anthropogenic disturbance. Our results can lead to future uses of PAM to monitor population size and phenology and develop reliable long-term management and conservation strategies.

Poster 17: Investigating Echolocation Behavior of Free-Flying Bats in the Presence of Conspecifics
Justin Lawless, University of New Hampshire

Echolocating bats can live in colonies numbering tens or hundreds of thousands of individuals. In addition to this, bats often roost in constrained environments like caves or tree crevices, meaning their habitats are often physically and acoustically crowded with other vocalizing bats. Echolocating bats use acoustic echoes to perceive their environment, raising the question of how they are able to operate in these contexts of extreme spatial and acoustic clutter. By observing bat echolocation calls and measuring relevant acoustic parameters, we can gain a further understanding of how they modulate their sensory behavior and travel through crowded environments. Using synchronized thermal video and ultrasonic acoustic data collected from Aeolus Cave in Vermont, we observed spatial and vocal behavior of little brown bats (*Myotis lucifugus*) flying freely inside the cave. We wanted to observe in this study how bat vocalizations may differ when a bat is alone, following another bat, or around three or more bats. Based on the analyzed thermal video data, instances where a bat was observed to fit one of these three criteria was termed an event. Ultrasonic acoustic data were synchronized and analyzed through Audacity and RavenPro 1.6 software. Using the amplitude detector and the band limited energy detector in RavenPro, we identified individual echolocation calls observed during corresponding behaviors seen on video. Then, we quantified and compared the number of detected calls in between each event type to determine if and how bats alter their vocalization rate when in the company of other echolocating bats.

Poster 18: Automatic detection of cetacean tonal calls based on the spectral entropy technique

Yue Liang, University of New Hampshire

Hydrophones are deployed throughout the ocean to perform passive acoustic monitoring. This technique is a powerful tool for cetacean sound detection due to its advantage of being able to collect data overnight, year-round, and in inclement weather. However, hundreds of terabytes of data produced each year pose a significant challenge for data analysis. The aim of this study was to investigate the use of entropy-based techniques to achieve automatic detection of cetacean tonal calls in passive acoustic data. A weighted spectral entropy technique was developed to alleviate the impact of underwater noise in detection tasks, and an automatic detector was developed for the detection of cetacean tonal calls. The detector includes an adaptive band-pass filter, a time-frequency domain transform, and a likelihood ratio test for determining the optimal detection threshold. The weighted spectral entropy technique was assessed with synthetic data, and the proposed detector was assessed with a real-world dataset. The results indicated that the proposed method outperformed other state-of-the-art techniques when evaluated with various types of low signal-to-noise ratio tonal signals.

Poster 19: Combined passive acoustic and genetic comparison of coastal marine habitats in New England

Grant Milne, University of New Hampshire

Passive acoustic monitoring has been combined with environmental genetic methods in previous studies to detect target organisms. However, no existing research has employed metagenomics concurrent with passive acoustic monitoring of soundscapes for comparison of marine habitats. The present study used both approaches simultaneously for holistic observation of marine habitats to reveal information beyond using either technique independently. Water samples for metabarcoding (three primer sets) were collected during periods of passive acoustic monitoring from three different marine habitats, each at four different geographic locations along the New Hampshire/Maine coastlines. Multivariate analyses were used to differentiate among habitat types and geographic locations by analyzing acoustic metrics generated using the Soundscape Code and metagenomic taxonomic assignments. Passive acoustic monitoring provided insight into environmental features that were not observable with metagenomics, especially anthropogenic activity and geophysical processes, whereas metagenomics provided a more complete picture of the biological composition of habitats through detection of organisms that were not actively producing sound. This enables simultaneous evaluation of biological and functional connectivity of marine habitats by detecting what organisms are present and their contributions to the soundscape. In future, genetic and acoustic indicators will be used for prediction of substrate characteristics and sound sources to model acoustic propagation environments.

Poster 20: Echoes of Resilience: Revealing Mangrove Community Structure Through Sounds

Jill Munger, University of New Hampshire

Mangrove forests provide critical ecosystem services for island nations including erosion control, carbon sequestration, and acting as critical habitat. Increasingly, restoration efforts are needed to support mangrove ecosystems threatened by climate change associated storm events. The Virgin Islands (UK) are actively working to address the extensive damage inflicted on its mangroves by two extreme storm events in 2017, but the nature and structure of biological changes during restoration are poorly understood. Shifts in animal behavior are often the first quantifiable indication of ecological change, providing the unique opportunity to serve as an early sign of environmental degradation or recovery. This study investigates mangrove ecosystem function in Virgin Islands (UK) through sound-producing behaviors of the community including birds, fish, and invertebrates. We deployed autonomous acoustic recorders at two terrestrial and four marine sites classified as recovered, recovering, and not recovered using satellite imagery. Dominant sounds were classified at each site into biologically relevant categories to see if the number of sound types varies across recovery stages. A neural network model will automate signal class detection over the entire dataset, significantly reducing manual data analysis time. We will evaluate mangrove restoration efforts and the response of ecological communities by exploring 1) How do changes in mangrove ecosystem function impact acoustic community structure? and 2) how do behaviors of sonic animals change as mangroves recover from storm damage? This research examines the dynamic acoustic behaviors of animals within the mangrove forest, providing critical feedback for managers amidst ongoing restoration efforts and contributing to broader efforts aimed at enhancing the resilience of coastal communities.

Poster 21: Harnessing the Potential of a Silent Mesopelagic Observation System Integrated with Active Acoustics and Low-Light Imaging

Rendhy Sapiee, University of Rhode Island

Over six decades, extensive research has delved into the intricate interactions between marine animals and oceanographic sampling equipment, recognizing the impactful influence of light and sound emissions on mobile fauna behavior during surveys. Anthropogenic sound, light, and hydrodynamic forces from sampling equipment have been referred to as sources of disturbances that may impact quantitative observations in the twilight zone. However, much of the mechanisms of these disturbances and the complex interactions of these stimuli with these deep-sea animals are not well understood. To study this further, we developed a custom tethered mesopelagic observation system rated up to 1000 m with an emphasis on producing minimum sound, dimmable lights, and a very low-light sensitive camera that allows us to conduct surveys in real-time. By employing multi-frequency broadband active acoustics (Simrad EK80 38, 70, and 200 kHz) and low-light imaging, our goal is to sample the mesopelagic unobtrusively. The system consists of a battery powered active heave compensation winch tethered to our payload that is also battery powered, which significantly reduces our sound footprint during surveys. We performed our first experiment in Bermuda on May 2023, where we dynamically adjusted light intensity to track changes in acoustic backscatter to observe potential changes in behavior of animals. While our experiment had several technical problems, we were able to successfully gather data and present initial findings. This study reviews the system setup, data processing, initial findings, and concluding with future study goals.

Poster 22: Development of an OpenFOAM Solver for Hydroacoustic Simulations: An Application for Acoustic Fish Deterrence
Ahmad Syed Sulman, University of Washington Seattle

The project aims to avert the spread of invasive species using targeted sound frequency interventions, exploiting their distinct hearing ranges. An opensource OpenFOAM-based acoustics solver is developed with an emphasis on a homogeneous case without flow noise. The chosen method entails utilizing the transfer function to establish a link between the response and an excitation signal. The authors isolated the transfer function by employing a known test signal and its measured response. The unit impulse, represented by the Sinc function, is chosen because of its uniform frequency response. Fourier analysis became instrumental in assessing OpenFOAM numerical schemes, comparing their effects against analytical solutions to determine spatial and temporal resolution requirements. Maintaining a 5 percent maximum error limit, hydroacoustic requirements surpass typical CFD standards, with preliminary 2D testing preceding 3D simulations featuring a 500Hz Sinc signal for acoustic wave equation. The time step emerges as a dominant factor in results accuracy, while mesh size exhibits curious independence. Tests within lock geometry under varying reflective conditions demonstrate improved frequency behavior, albeit with errors increasing at distances from the source. Frequency responses and pressure levels were state-of-the-art, urging future exploration of higher-order schemes for model enhancement. The implementation of the transfer function promises deeper insights into system behavior. Advanced data analysis techniques ascertained the acoustic sound pressure levels within the spatial domain. In the frontier of underwater modeling acoustics, wavelet and short fourier transformation methods determine the robustness of probe results, revealing chaotic areas of the channel geometry more accentuated with transient and sudden pressure variations. Considering true reflective conditions and a free surface model refines our understanding and underwater modeling poses a bigger challenge to use right boundary conditions (BCs). Thus, study addressed this through ray tracing method to determine a close rendition of acoustic pressure fields underwater accounting for sophisticated BCs.

Poster 23: Melody of Speech Assessment in Children
Jill Thorson, University of New Hampshire

Clinical assessment of prosodic skills is essential when investigating linguistic and affective abilities. Prosodic elements include speech melody (intonation), phrasing distinctions, phrase level accentuation, lexical stress, affect, tempo, and rhythm. Prosody can be described as a hierarchy which allows for various prosodic skills, such as lexical stress, to be investigated independently. To identify a child who is displaying receptive or expressive prosodic deficits, which potentially impact language skills, an assessment tool for clinical settings must be developed. Speech language pathologists (SLPs) often rely on perceptual skills to identify speech disorders, as there is no agreed upon prosodic assessment for evaluation. The Profiling Elements of Prosody in Speech-Communication (PEPS-C) is the most comprehensive assessment, but is not widely used due to length, administration issues, lack of normative data, and no acoustic counterpart to the perceptual analysis. To improve the assessment of linguistic skills, the Naturalistic Lexical Stress (NLS) subtests were developed to elicit lexical stress in a more natural and spontaneous interaction. The NLS expressive subtest controls for effects such as

uncertainty contours (sounds like a question) and phrase final lengthening (last word in an utterance has a longer duration). The NLS receptive subtest assesses orthographic English word pairs which can be represented and recognized by children and adults. These word pairs differ in meaning based on stress. Thirteen typically developing children, one diagnosed with childhood apraxia of speech (CAS), and seven children identified with a phonological impairment aged 5-11 were recruited to complete the PEPS-C and NLS tasks. Results from the receptive tasks were automatically scored by the PEPS-C program and the examiner. Expressive tasks are assessed perceptually and acoustically. The normalized pairwise variability index (nPVI) was measured using fundamental frequency (PVI-f0), duration (PVI-duration), and intensity (PVI-intensity). Acoustic analyses are ongoing and will be presented.

Poster 24: Characterizing Sei Whale Movement Patterns

Emma VerGow, University of New Hampshire

Sei whales were targeted during commercial whaling in the 1950-1960s around Atlantic Canada, and the population has not fully recovered since; thus, they are protected under the Endangered Species Act and considered depleted under the Marine Mammal Protection Act. As understanding of the migration dynamics and distribution of sei whales in the North Atlantic Ocean is still limited, it is difficult to assess potential changes in their behavior or population size. Sei whales are difficult to visually monitor due to their cryptic presence and lack of breaching. Passive acoustic monitoring (PAM) is now being used to expand sei whale monitoring efforts. PAM recorders collect data over long durations in poor visual conditions. Recent passive acoustic data indicates that sei whales forage in the Gulf of Maine and on the Scotian Shelf. The timing and motivation of sei whale presence in the Gulf of Maine is unknown. This study aims to characterize the trends in sei whale (*Balaneoptera borealis*) movement patterns related to migration dynamics. Sei whale vocal presence and spatial movements will be determined from acoustic detections through analyzing seasonal abundance and assessing directional bearings. Five Acoustic Long-Term Observatories (ALTO) landers equipped with a tetrahedral array of omni-directional hydrophones, Conductivity, Temperature, and Dissolved Oxygen sensors (CT-O), and a multi-frequency scientific echosounder system were deployed across the Gulf of Maine. The greatest predictors of sei whale movement behavior will be identified through their vocal presence and spatial movements. The predictor variables include biotic factors (prey abundance, primary and secondary productivity) and abiotic factors (SST, bathymetry, distance from shore, and wind). This effort will demonstrate the value of using directional information from PAM recordings to determine spatial movements and abundances of sei whales in the Gulf of Maine, in order to further comprehend the migration dynamics in the Atlantic Ocean.

Thursday, April 25th

REGISTRATION AND BREAKFAST: 8:30-9:15

WELCOME ADDRESS: 9:00-9:05

CAREER REPRESENTATIVE INTRODUCTIONS: 9:05-10:15

Career Representative Speaking Order

Name	Affiliation
Susan Balcirak	Naval Undersea Warfare Center, Newport
Gary Elko	mh acoustics
Michelle Fournet	University of New Hampshire
Kevin Heaney	Applied Ocean Sciences
Merra Howe	Biodiversity Research Institute
Meme Lobecker	Kongsberg Discovery
Brian Warren	The Naval Oceanographic Office
Austin Lowery	The Naval Oceanographic Office
Joel MacAuslan	Speech Technology and Applied Research Corp.
Jess McCordic	NOAA Northeast Fisheries Science Center
Anita Murray	Maine Department of Marine Resources
Jamie O'Brien	Normandeau Associates, Inc.
Crystal Tanguay	Naval Undersea Warfare Center
Robin Tyner	Sonalysts Inc. (Tentative)
???	NERACOOS (Tentative)

BREAK: 10:15-10:30

CAREER TABLE ROUND ROBINS: 10:30-12:00

LUNCH AND NETWORKING: 12:00-13:00 (Provided)

OPTIONAL TOUR OF CHASE OCEAN ENGINEERING BUILDING: 13:00-14:00