Welcome to the 2025 Northeast Regional Acoustics Symposium and Career Workshop

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

April 22nd and 23rd, 2025

Holloway Commons Building, Piscataqua Room

SCHEDULE AT A GLANCE

Tuesday, April 22nd (Symposium)

8:30-9:15: Registration and Coffee (provided)
9:15-9:30: Introductions and Welcome Address by Elizabeth S. Chilton, President of the University of New Hampshire
9:30-10:30: Keynote Speaker, Dr. Ilene Busch-Vishniac
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. Lauren Freeman
14:30-14:45: Break
14:45-16:15: Oral Presentations
16:15-16:30: Break
16:30-17:30: Poster Session
17:45 - End: Optional social at Clark's American Bistro, 48 Main Street, Durham (Cash/card bar and food, light snacks provided)

Wednesday, April 23rd (Career Workshop)

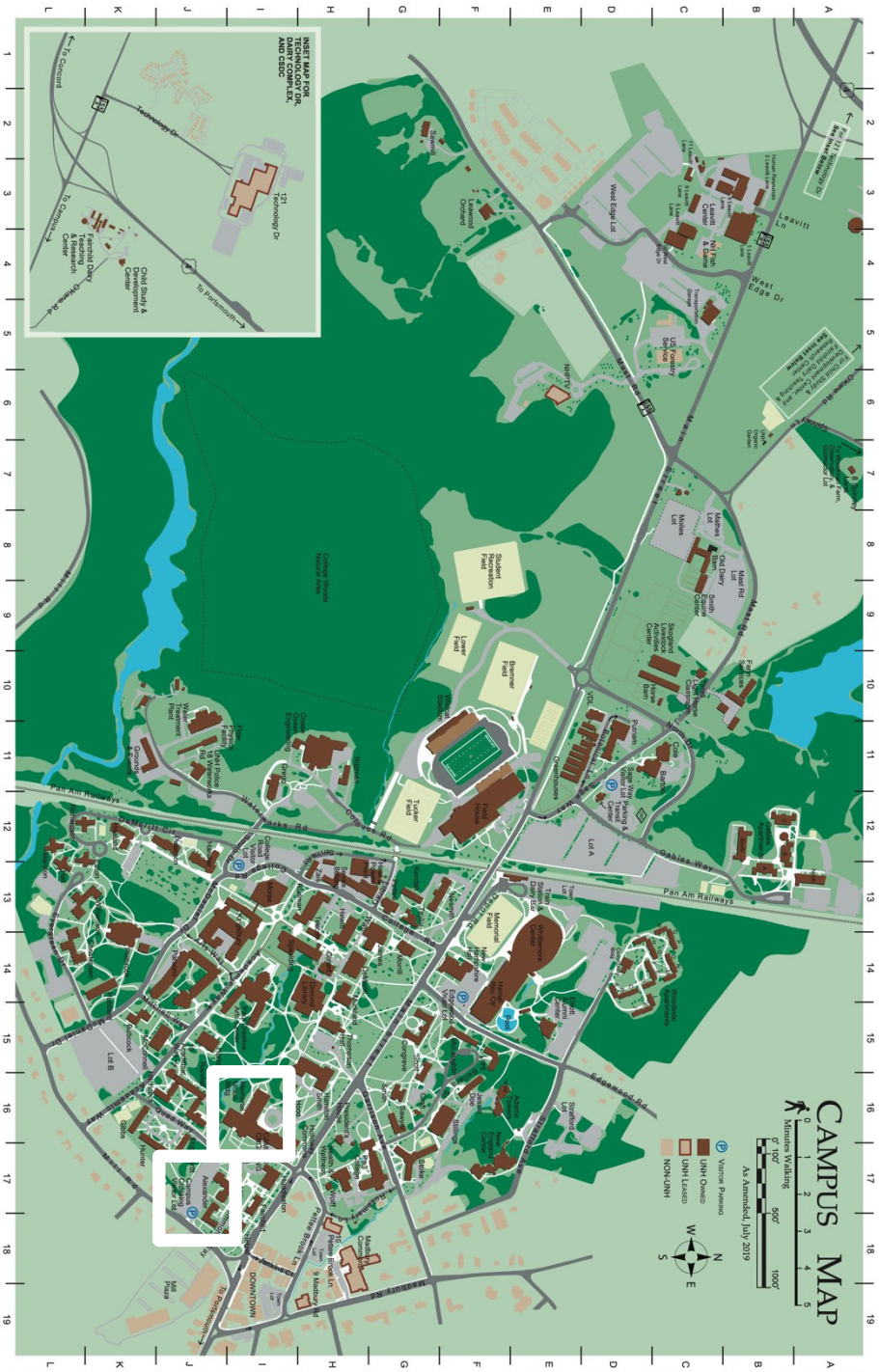
8:30-9:00: Registration and Coffee (provided)
9:00-9:05: Introductions
9:05-10:15: Career Representative Introductions
10:15-10:30: Break
10:30-12:00: Career Table Round Robins
12:00- 13:00: Lunch (Provided) and Closing Address
13:00-14:00: Optional tour of Chase Ocean Engineering Building

PARKING

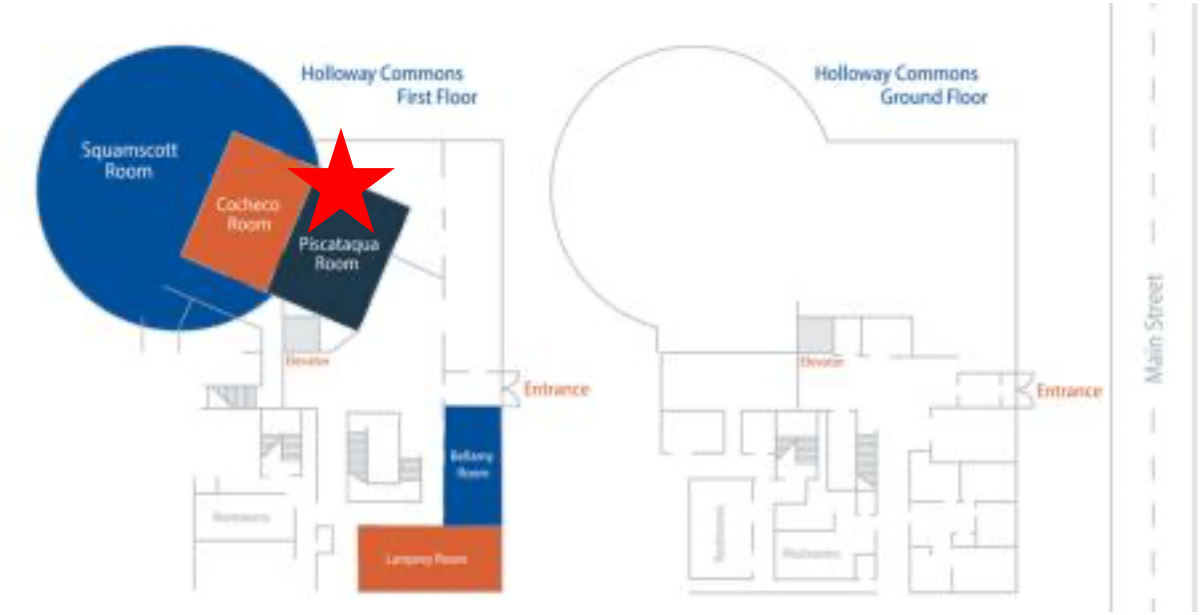
All workshop participants can park at no cost to you at the Campus Crossing Visitor Lot (Formerly known as "Mill Road Visitor Lot", or "C-Lot."). The lot is located at Mill Road across from the Durham Market Place plaza (set GPS for 8 Mill Road).

Your parking code is **8450**. 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	Keynote 1: Ilene Busch-Vishniac, Beogrin Consulting	Keynote: Lung Sounds in Respiratory Diagnosis
10:45-11:00	Jen Miksis-Olds, University of New Hampshire	A cabled ocean acoustic array in the Gulf of Maine
11:00-11:15	Carolin Nieder, Woods Hole Oceanographic Institution	Pile driving noise impacts hearing abilities of summer flounder (*Paralichthys dentatus*)
11:15- 11:30	Jay McEntee, Biodiversity Research Institute	The potential for novel insights in bioacoustics from explainable AI (XAI)
11:30-11:45	Elizabeth Weidner, University of Connecticut	Studying changes at the ice-ocean interface: Applying broadband acoustic methods to the high-latitude glacial fjord systems
11:45-12:00	Xavier Mouy, Woods Hole Oceanographic Institution	Looking for the elusive fish farts: Can we monitor Atlantic herring in the Gulf of Maine with passive acoustics?
13:30-14:30	Keynote 2: Lauren Freeman, Naval Undersea Warfare Center	Keynote: Observational Ocean Acoustics as a Window to the Anthropocene
14:45-15:00	Charles Berg, Naval Undersea Warfare Center	Acoustic rain monitoring in the Northeast Pacific: A comparison between two sites
15:00-15:15	Sierra Jarriel, Woods Hole Oceanographic Institution	Pile driving sound induces altered respiration rates of summer flounder (*Paralichthys dentatus*)
15:15-15:30	Michelle Fournet, University of New Hampshire	Acoustic Signatures and Vocal Plasticity in Humpback Whale (*Megaptera novaeangliae*) Contact Calls
15:30-15:45	Sujay Balebail, University of New Hampshire	The Role of the Swim Bladder in Resolving Directional Hearing Ambiguity in a Vocal Fish
15:45-16:00	Marie Zahn, California Institute of Technology	Accurate species classification of Arctic toothed whale echolocation clicks using one-third octave ratios
16:00-16:15	Ian Jones, University of New Hampshire	Particle motion polarization of offshore fish vocalizations versus ambient and boat noise

Posters at-a-glance

Poster	Name	Poster Title
1	Michele Adams, University of New Hampshire	Ontogeny of vocalizations in Adélie penguin (*Pygoscelis adeliae*) chicks from West Antarctica
2	Dana Adcock, Syracuse University	Behavioral Context of Male North Atlantic Fin Whale (*Balaenoptera physalus*) Acoustics
3	Nadege Aoki, Woods Hole Oceanographic Institution	Harnessing long-term soundscape recordings to assess noise pollution trends in marine protected areas: a COVID-19 case study
4	Maia Austin, University of Vermont	Effects of Sympatry and Mixed Species Encounters on the Acoustic Repertoires of Guiana and Bottlenose Dolphins
5	Daryll Carlson, University of New Hampshire	Species Distribution Modeling of Baleen Whales in the Northwest Atlantic
6	Valerie Eddington, University of New Hampshire	Using acoustics to monitor population size and breeding phenology of colonial seabirds
7	Danielle Fradet, University of New Hampshire	Acoustics indices track discrete stages of Adélie penguin breeding phenology
8	Isabella Garfield, Northeast Fisheries Science Center, NOAA	Adopting open-science practices for Passive Acoustic Monitoring efforts
9	Hailey Gilman, University of New Hampshire	High-Frequency Acoustic Characterization of Shelly, Sandy Marine Sediments
10	Laurine Lemercier, Woods Hole Oceanographic Institution	Effects of playback received level on response strength in free-swimming bottlenose dolphins
11	Rachel Lewis, University of New Hampshire	Listening for change: investigating the relationship between phocid breeding ecology and declining sea ice in the Alaskan Arctic
12	Yue Liang, University of New Hampshire	Estimating American bullfrog populations using machine learning and noise reduction techniques
13	Piper MacLean, University of New Hampshire	Shifting Focus: Development of Ecologically Valid Prosody Tasks
14	Haley McCreight, University of New Hampshire	**Exploring Caregiver-Child Prosody and Language Complexity in Naturalistic Museum Interactions**
15	Megan O'Connor, University of Vermont	Social and environmental influences on whistle emission and acoustic structure of bottlenose dolphins (*Tursiops truncatus)* in Bocas del Toro, Panama
16	Frances Oppenheimer, University of Vermont	Using occupancy modeling to examine song change of BSG humpback whales wintering off the Pacific coast of Panama, 2007-2023
17	Cara Rankin, University of Manitoba, Fisheries and Oceans Canada	Can Belugas Hear Your Sonar? Modeling depth sounder sonar propagation within dynamic habitats of the Tarium Niryutait Marine Protected Area

18	Sylvan Ransom, University of New Hampshire	Investigating Elemental-Level Coherence in Multibeam Echosounder Data
19	Annie Smith, Contractor with NOAA Fisheries (Azura Consulting LLC)	One Fish, Two Fish… Who Are You Fish?
20	Peyton Steffek, Scripps Institution of Oceanography (Marine Biology)	Spatiotemporal distribution of dolphins within the Gulf of Maine prior to offshore wind energy development
21	Sophie Strock, Eckerd College	Monitoring Baseline Biological Drivers of Soundscape Characteristics in a Remote Australian Marine Protected Area
22	Amaro Tuninetti, University of New Hampshire	Echolocation behavior of little brown bats (*Myotis lucifugus)* when flying near conspecifics
23	Jessica Veo, University of New Hampshire	Gray seal (*Halichoerus gyrpus)* acoustic behavior at three sites in the Northwest Atlantic
24	Emma VerGow, University of New Hampshire	Characterizing Sei Whale (*Balaenoptera borealis)* Movement Patterns in the Gulf of Maine
25	Dan Zogby, University of New Hampshire	Quantifying the vocal repertoire of the common tern (*Sterna hirundo)*

Tuesday, April 22nd

REGISTRATION AND BREAKFAST: 8:30-9:15

WELCOME ADDRESS, Dr. Elizabeth S. Chilton, President of the University of New Hampshire: 9:15-9:30

KEYNOTE SPEAKER: 9:30-10:30

Dr. Ilene Busch-Vishniac, "Lung Sounds in Respiratory Diagnosis"

Abstract: Many of the world's most common and fatal ailments are lung diseases such as pneumonia, asthma, and tuberculosis. Research has shown that these diseases can be diagnosed from the lung sounds they generate, eliminating the need for wet lab tests and speeding the diagnosis process. To date, a model for pneumonia diagnosis has been developed using machine learning based on a large number of lung sound files and doctor evaluations. Two companies have designed lung sound analysis devices which operate like stethoscopes and indicate whether lung sounds are normal or abnormal. Issues in device design include noise cancellation and separation of the heart sound from the lung sound signal.

Bio: Ilene Busch-Vishniac earned bachelor's degrees in Physics and Math at the University of Rochester, and went on to pursue graduate study in acoustics at MIT's Mechanical Engineering Department, earning a PhD. She went to Bell Labs as a postdoc in the acoustics research department, where she established her long term collaboration with James West, working on electret sensors and actuators. Upon completion of her postdoc, Ilene joined The University of Texas Mechanical Engineering Department, where she climbed the ranks from Assistant Professor to Endowed Chair and extended her work on modeling of electroacoustic sensors and actuators. She left UT Austin to become the Dean of Engineering at Johns Hopkins University, then the Provost and Vice President, Academic at McMaster University, and then the President of the University of Saskatchewan. During this time she also performed research on hospital noise, work that continues in collaboration with Erica Ryherd at the University of Nebraska. Ilene also served as the Chief Innovation Officer and Acting Chief Operating Officer of Sonavi Labs, a startup company headquartered in Baltimore, MD and producing a smart digital stethoscope. She is the recipient of a number of research, teaching and administrative awards including the Silver Medal of the Acoustical Society of America and the Achievement Award of the Society of Women Engineers. She has published 75 papers in archival journals, two books and several book chapters, and holds 11 US patents, one of which was named patent of the year at Bell Labs.

BREAK: 10:30-10:45

ORAL PRESENTATIONS: 10:45-12:00

Oral Presentation, 10:45-11:00

A cabled ocean acoustic array in the Gulf of Maine

Jennifer L. Miksis-Olds, Center for Acoustics Research & Education, University of New Hampshire

It is often noted that we know more about the planets than the processes of our oceans. A network of ocean observatories is improving our knowledge; however, measurements are still relatively scarce and do not provide enough data to validate and refine models of ocean currents, soundscapes, and biological activity. A cabled acoustic array is being deployed in in the coastal waters of the Gulf of Maine to complement existing oceanographic monitoring infrastructure. The system will make measurements of the nearshore environment and shed light on the connections between coastal measurements and the overall Gulf of Maine environment. The system is designed to synoptically collect acoustic, oceanographic, and biogeochemical data, while also remaining flexible enough in design to incorporate new sensors in the future. Measurements made with this ocean asset will serve as a baseline for pattern and trend analyses of changing environmental conditions in an area of high productivity, human use, and species diversity. Public data access will permit researchers at all levels to advance our understanding of Gulf of Maine ocean acoustics and oceanographic processes.

Oral Presentation, 11:00-11:15

Pile driving noise impacts hearing abilities of summer flounder (*Paralichthys dentatus*)

Carolin Nieder*, Youenn Jézéquel, Sierra Jarriel, Amelia Macapia, Andria Salas, Nathan Formel, T. Aran Mooney*
Woods Hole Oceanographic Institution

The summer flounder (Paralichthys dentatus) is a bottom-dwelling flatfish native to the U.S. Atlantic coast. It is important for the commercial fishing industry, generating $30 million annually, while also being popular for recreational anglers. Lacking a swim bladder, flounders rely on particle acceleration rather than sound pressure for hearing. Their habitat overlaps with coastal windfarm sites that employ pile-driving during construction, making flounders vulnerable to impulsive noise generated during pile-driving. Data on how pile-driving noise impacts hearing sensitivity in flounders are lacking. This study employed the auditory evoked potential methods (AEPs) to assess hearing thresholds at 150 Hz before and after exposure to a real-world pile-driving setup. Flounder hearing was measured after one 15-minute sequence of impact pile-driving and five 15-minute sequences of impact pile-driving; hearing was re-tested after a 3-week recovery period. Summer flounders exposed to pile-driving showed an increase in AEP thresholds of 4–7 dB after just one 15-minute sequence of continuous pile-driving. Flounders exposed to five 15-minute sequences showed a similar reduction in sensitivity. After the 3-week recovery, mean hearing sensitivities improved but were still slightly above control levels. These data suggest that flounder hearing abilities can be compromised even after relatively short-duration pile-driving events.

Oral Presentation, 11:15- 11:30

The potential for novel insights in bioacoustics from explainable AI (XAI)

***Jay P. McEntee**, Zubair Faruqui, Mackenzie S. McIntire, Rahul Dubey*
Biodiversity Research Institute, Missouri State University

Explainable AI (XAI) methods seek to interpret the results of complex deep learning models. To date, application of XAI to bioacoustics models has been limited. We sought to apply XAI in a model trained to distinguish between geographic song variants of the songbird Bewick's wren, a song learning species with complex song repertoires. Bewick's wren exhibits a typical pattern of geographic variation found in species complexes of songbirds, where there is great song variation within individuals (repertoires) and within populations (cultures), but where there is nonetheless pronounced variation among geographic variants. Traditional approaches to assess this variation would involve taking numerous spectrographic measurements, and then analyzing these measurements with multivariate statistical methods. In using XAI, we seek new insight into this variation not recoverable by the traditional approaches. We made recordings of Bewick's wrens in the southwestern United States, where we found an abrupt boundary between geographic variants. Recordings of individual songs were trimmed to 5 second clips, converted into spectrogram images, and used to train a deep Convolutional Neural Network for binary classification, achieving an accuracy of 94.5%. To interpret the model's predictions, we used both model-agnostic (LIME, SHAP) and model-specific (DeepLift, Grad-CAM) XAI techniques. We found that Grad-CAM showed the most promise for applying XAI in this case, as it consistently highlighted parts of spectrographs that may represent sounds unique to the different geographic forms of Bewick's Wren. Interestingly, t-SNE plots of embeddings also revealed strong clustering of songs, likely corresponding to the various relatively discrete song forms that comprise individual repertoires, and are acquired via learning as memes. Overall, we have developed evidence that XAI could be powerful in the study of bioacoustics.

Oral Presentation, 11:30-11:45

Studying changes at the ice-ocean interface: Applying broadband acoustic methods to the high-latitude glacial fjord systems

***Elizabeth Weidner**, Grant Deane, Arnaud Le Boyer, Matthew H. Alford, Hari Vishnu, Mandar Chitre, M. Dale Stokes, Oskar Glowacki, Hayden Johnson, and Fiammetta Straneo*
University of Connecticut

High latitude, glaciated fjords are critical environments that link the terminal end of terrestrial ice sheets to the broader ocean. These regions are undergoing complex changes due to accelerated high-latitude warming trends and their complicated dynamics are difficult to monitor given their relative isolation, short field season, and challenging physical setting. Here, we discuss the applicability and utility of broadband active acoustics systems to improve observational capabilities in high latitude fjords through the rapid collection of near-synoptic observations of the water column and quantitative geophysical measurements. Broadband (160-240 kHz) acoustic data was collected in tandem with ground truth measurement in Hornsund fjord in southwest Svalbard in summer of 2023. These data will be used address three topics: 1) variability of the thermohaline structure and mixing across different temporal and spatial scales, 2) identification and characterization of processes in play at dangerous glacier terminus, and 3) remote estimation of dissipation rates associated with mixing. Through these analyses, we

illustrate the potential of broadband echosounders as a relatively low-cost, low-effort addition to field kits, well suited for deployment in high-latitude fjords.

Oral Presentation, 11:45-12:00

Looking for the elusive fish farts: Can we monitor Atlantic herring in the Gulf of Maine with passive acoustics?

***Xavier Mouy**, Cameron Thompson, Samantha Tolken, Tammy Silva, Amanda Holdman, Jessica McCordic, Michael Jech, Jennifer Miksis-Olds, Ian Jones, Jooke Robbins, Laura Howes, Pete DeCola, Alice Stratton, Michael Thompson, Jackie Motyka, Sofie Van Parijs, Leila Hatch*
Woods Hole Oceanographic Institution

Herring (Clupea pallasii and Clupea harengus) produce Fast Repetitive Tick (FRT) sounds by expelling air bubbles in the water through their anal duct. Theoretical and experimental studies have shown that FRT sounds from compact schools of herring have the potential to be detectable up to 1 km away from an acoustic recorder in calm conditions. While FRT sounds have been recorded in the wild in the Northeast Pacific and in the Northeast Atlantic, they have never been detected in the Northwest Atlantic where herring are also present. In this study we investigated whether passive acoustics can be used to detect the presence of Atlantic herring FRT sounds in the Gulf of Maine to help inform fisheries management measures in the region. We examined passive acoustic data collected in the Gulf of Maine since 2014, focusing on the detection of individual FRT sounds, changes in the overall soundscape, and feeding sounds from herring predators. To manage the large dataset, we narrowed down our temporal and spatial search using data from NOAA bottom trawl surveys, long-term echosounder recordings from bottom landers, herring landings from commercial fishing vessel trip reports, visual sightings of whales, and observations of marine mammals feeding on herring.

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

KEYNOTE SPEAKER: 13:30-14:30

Lauren Freeman, "Observational Ocean Acoustics as a Window to the Anthropocene."

Abstract: The Anthropocene is a time of rapid environmental change and usage changes, and study of ambient noise is emerging as one of the most powerful techniques for understanding human impacts on the ocean-climate system. Understanding how marine organisms of all types utilize sound and respond to patterns and anomalies in ambient noise facilitates a transformative understanding of the ocean environment for exploration, discovery, and national defense. This seminar will cover examples of discovering new ambient ocean noise sources and patterns using multidisciplinary approaches. Acoustics studies ranging from long term passive acoustic monitoring to detailed examination of coral reefs and seamounts utilizing directional, custom-built instrumentation will be discussed. Considering ocean acoustics alongside established marine ecology and physical oceanography data sets and methodologies has led to improved characterization of marine biological sound sources; novel utilization of acoustics in marine ecology and oceanography; observations of biological aggregations structuring around and

producing ambient noise sources; and linkages between diel, lunar, and interannual cycles and ambient noise levels. Long-term ambient noise monitoring shows correlations not only with light levels from solar and lunar sources, but ocean temperature as we explore highly dynamic ocean environments. Observational acoustics alongside oceanographic methods offer new opportunities to accelerate ocean exploration and better understand the world around us.

Bio: Dr. Lauren Freeman is NUWC Newport's Senior Oceanographer. She is a dedicated ocean scientist with over 15 years' experience in sea-going research and the recipient of the Navy's Delores Etter Top Scientist award. Originally an oceanographer who developed her acoustics chops once she started working for the Navy, Lauren completed dual BS degrees in Marine Biology and Geology at the University of Miami, followed by a PhD in Oceanography from Scripps Institution of Oceanography, UC San Diego. Her research focus includes understanding ambient noise in the ocean, particularly sounds produced biologically; spatio-temporal variability of biological sound producers and sound scatters; bio-physical interactions in highly dynamic environments; and the interplay between human activities and marine ecosystems. She leverages new and emergent technology to further both ocean exploration and analysis of oceanographic data sets, to improve our understanding of ocean environments and to better inform Naval operations, SONAR performance, and underwater communications

ORAL PRESENTATIONS: 14:30-16:00

Oral Presentation, 14:45-15:00

Acoustic rain monitoring in the Northeast Pacific: A comparison between two sites

Charles Berg, Naval Undersea Warfare Center

Supervised machine learning algorithms can detect ocean rainfall from broadband features in acoustic power spectral densities. In this presentation, acoustic and meteorological data from the Ocean Observatories Initiative's Oregon Shelf and Oregon Offshore stations are used to evaluate how well these supervised algorithms generalize to new locations not seen in training. To establish a performance baseline, a Support Vector Machine rainfall detector was trained and validated at each site independently, yielding a Matthews correlation coefficient (MCC) of 0.715 and 0.751 respectively. Model generalization was then tested by training at one location exclusively and then testing at the other site not used in training. In this configuration, MCC drops to 0.152 and 0.146 respectively. Most of this performance degradation can be attributed to changes in mean ambient level, as when the means of the test predictors are shifted to match the training data, MCC improves to 0.611 and 0.575. Improved performance after equalization suggests that the ability to detect rainfall may generalize well to new locations if shifts in the soundscape or calibration errors are corrected.

Oral Presentation, 15:00-15:15

Pile driving sound induces altered respiration rates of summer flounder (*Paralichthys dentatus*)

Sierra D. Jarriel*, Amelia Macapia, Youenn Jézéquel, Nathan Formel, Seth Cones, Hannah Brewer, John Collins and T. Aran Mooney*
Woods Hole Oceanographic Institution

Pile driving, commonly used to construct large wind turbines offshore, produces high-intensity sounds that propagate though the seafloor and water column. These sounds are thought to affect numerous animals that sense sound pressure, however, far less is known about the impacts on species that lack air-filled cavities for sound detection. One such species is the summer flounder (Paralichthys dentatus), a benthic flatfish that comprises an important fishery overlapping with numerous planned or in-construction wind farms. This in-situ experimental study employed operculum acceleration tags on caged flounder to assess respiration changes through five alternating impact (high-intensity, impulsive) and vibratory (lower-intensity, continuous) hammer sequences during real construction. Flounder exposed to pile driving showed alterations in breathing, including increases in respiration rates compared to baseline during both impact and vibratory hammering compared to their non-exposed counterparts. The heightened operculum pumping was not driven by swimming, but rather an apparent noise-induced stress response. The strength of the respiration change was evaluated in the context of received levels- sound pressure, particle acceleration, and substrate vibration. Fine-scale physiological impacts of pile driving sound on flounder, measured via operculum movements, has not been previously reported, underscoring the need for consideration of this species in offshore wind farm construction.

Oral Presentation, 15:15-15:30

Acoustic Signatures and Vocal Plasticity in Humpback Whale (*Megaptera novaeangliae)* Contact Calls

Michelle E.H. Fournet*, Katherine Payne, and Christine Gabriele*
University of New Hampshire

Humpback whales are among the most acoustically active marine mammals, utilizing sound for social interactions, foraging, and reproductive behaviors. In the light-limited marine environment, vocalizations are critical for maintaining social associations; a silent whale is functionally undetectable by conspecifics. In Alaskan waters, long-term social bonds among humpback whales suggest that acoustic cues play a key role in individual recognition and group cohesion. One such signal, the 'whup' contact call, is produced by males, females, and juveniles and is hypothesized to function in conspecific identification. This study examines whether individual humpback whales exhibit quantifiable vocal signatures within these contact calls, addressing the question: Do humpback whales possess unique vocal identities? Additionally, this research explores the extent of vocal plasticity in these calls, investigating whether humpback whales can dynamically adjust their contact calls under varying environmental conditions. Understanding individual vocal variation and flexibility in call production provides insight into the role of acoustic communication in maintaining social structures within humpback whale populations and sheds light on the resilience of social communication in a rapidly changing ocean.

Oral Presentation, 15:30-15:45

The Role of the Swim Bladder in Resolving Directional Hearing Ambiguity in a Vocal Fish

Sujay Balebail*, Vaibhav Chhaya, Johannes Veith, and Joseph A. Sisneros*
University of New Hampshire

Fish primarily detect sound through particle motion, theoretically introducing a 180-degree ambiguity in determining sound direction. Yet, several fish species exhibit directional hearing, likely aided by sound pressure detection through a swim bladder that scatters sound toward the inner ears. Whether this scattering induces differential otolith motion for opposite sound directions, which is a key requirement for resolving the ambiguity, remains unknown. Using the finite element method, we modeled the effects of the swim bladder on sound-induced otolith motion in the plainfin midshipman fish (Porichthys notatus). At frequencies at or below the fundamental frequency of midshipman mating vocalizations (≤100 Hz), the swim bladder induces elliptical otolith motion with opposite handedness for opposite sound directions. Additionally, otoliths exhibit distinct motion trajectories for non-opposite sound directions at these frequencies. At higher frequencies (200–1000 Hz), otolith motion remains similar across all sound directions when the swim bladder is present. In contrast, without the swim bladder, otoliths move back and forth along the direction of sound propagation, nearly identically for opposite sound directions at all tested frequencies (10–1000 Hz). These findings suggest that the swim bladder helps resolve the 180-degree ambiguity at frequencies relevant to acoustic communication in the plainfin midshipman.

Oral Presentation, 15:45-16:00

Accurate species classification of Arctic toothed whale echolocation clicks using one-third octave ratios

***Marie J. Zahn**, Michael Ladegaard, Malene Simon, Kathleen M. Stafford, Taiki Sakai, Kristin L. Laidre*
California Institute of Technology

Passive acoustic monitoring has been an effective tool to study cetaceans in remote regions of the Arctic. Here, we advance methods to acoustically identify the only two Arctic toothed whales, the beluga (Delphinapterus leucas) and narwhal (Monodon monoceros), using echolocation clicks. Long-term acoustic recordings were analyzed from moorings in Northwest Greenland. Beluga and narwhal echolocation signals were distinguishable using spectrograms where beluga clicks had most energy >30 kHz and narwhal clicks had a sharp lower frequency limit near 20 kHz. Changes in one-third octave levels (TOL) between two pairs of one-third octave bands were compared from over one million click spectra. Narwhal clicks had a steep increase between the 16 and 25 kHz TOL bands that was absent in beluga click spectra. Conversely, beluga clicks had a steep increase between the 25 and 40 kHz TOL bands that was absent in narwhal click spectra. Random Forest classification models built using the 16 to 25 kHz and 25 to 40 kHz TOL ratios accurately predicted the species identity of 100% of acoustic events. Our findings support the use of echolocation TOL ratios in future automated click classifiers for acoustic monitoring of Arctic toothed whales and potentially for other odontocete species.

Oral Presentation, 16:00-16:15

Particle motion polarization of offshore fish vocalizations versus ambient and boat noise

***Ian T. Jones**, Julien Bonnel, and Julien Flamant*
Center for Acoustics Research & Education, University of New Hampshire

Acoustic particle motion is the primary cue for fish hearing and is a vector quantity that contains polarization information (including directionality) relevant to the directional hearing abilities of fishes. Polarization metrics, including ellipse orientation angle, ellipticity angle, and degree of polarization, have been recently applied to describe particle motion polarization in physical acoustical oceanography studies, and have yet to be applied to in situ biological signals. This study harnessed data from a compact orthogonal hydrophone array deployed on the seafloor offshore of Florida (part of the Atlantic Deepwater Ecosystem Observatory Network) to better understand particle motion polarization properties of unidentified fish sounds in relation to those of ambient and boat noise. Quantified properties described bivariate particle motion in a vertical plane formed by a steered source-receiver axis and orthogonal vertical axis. Particle motion of fish sounds had significantly more horizontal orientation than ambient noise and boat noise at the closest point of approach, which were more vertically oriented. Fish sounds had narrower and more temporally stable particle motion ellipses than boat and ambient noise. Applications of the presented analysis framework to fish bioacoustics studies and relevance of specific polarization properties to fish directional hearing and sound localization capacity are discussed.

BREAK

POSTER SESSION: 16:30-17:30

Poster 1:
Michele Adams, *Danielle Fradet, Megan Cimino, Easton White, and Laura Kloepper*
University of New Hampshire

Passive acoustic monitoring (PAM) provides an efficient way to study dense aggregations of vocal animals, but its effectiveness depends on a strong understanding of the species' acoustic ecology—and this study did not employ acoustic indices. Current knowledge of avian behavior and vocal development is largely derived from songbirds (Passeriformes). However, given the considerable behavioral and environmental differences among bird orders, passerine birdsong may not adequately represent the vocal ontogeny of non-passerine birds. Like many colonial nesting seabirds, the Adélie penguin (*Pygoscelis adeliae*) is adapted to noisy and crowded environments, where few visual or spatial cues are available to identify kin among conspecifics. To overcome this, adult *P. adeliae* relies on vocal modulation to recognize mates, and possibly offspring. Although numerous studies have examined mutual vocal modulations in adult *P. adeliae*, much less is known about the vocal repertoire of chicks and how their calls develop over time. This study used the deep learning-based system DeepSqueak to characterize the vocal ontogeny of *P. adeliae* chicks in the West Antarctic Peninsula. Understanding the phenological communication patterns of vocal-dependent seabirds can contribute to broader research on how climate change impacts this important indicator species.

Poster 2: Behavioral Context of Male North Atlantic Fin Whale (*Balaenoptera physalus)* Acoustics
Dana L. Adcock*, Douglas P. Nowacek, and Susan E. Parks*
Syracuse University

Between summer and fall in the western North Atlantic, fin whale (Balaenoptera physalus) breeding hormones rapidly increase on the foraging grounds, yet little is known about behavior during this transition. Over two summers, we deployed 27 IMU biologging tags on fin whales offshore of New York and south of Massachusetts. Through UAV photo identification and PCR on skin samples, we identified 20 males and 1 female, demonstrating a sex-biased sample. We identified one broadband, three low frequency (20 Hz), three higher frequency (40 Hz) call types. One male produced patterned 20 Hz calls known as song. We used distinct kinematic patterns in the movement data to identify dive periods of feeding, exploratory foraging, travel, rest, unknown, and surface behavior. Tagged male dyads were accounted for in our model as they displayed some structural dive synchrony. Low frequency calls were present during feeding dives. These results advance hypotheses of feeding coordination and resource advertisement and offer insight into potential sex segregation.

Poster 3: Harnessing long-term soundscape recordings to assess noise pollution trends in marine protected areas: a COVID-19 case study
***Nadège Aoki**, and T. Aran Mooney, Woods Hole Oceanographic Institution*

Anthropogenic noise from small recreational motorboats is a ubiquitous pollutant in shallow coral reef ecosystems, including within marine protected areas. Chronic exposure to noise has the potential to harm sound-sensitive reef species, but only a few studies have quantified this stressor on reefs. Long-term passive acoustic datasets are valuable assets which can be leveraged to look at spatiotemporal trends in noise pollution and resulting impacts on acoustic ecology over multiyear timescales. Here, we audited long-term acoustic recordings from three different reef sites in the Virgin Islands National Park to compare soundscape conditions before, during, and directly after the imposition of lockdowns associated with the COVID-19 pandemic. The COVID-19 lockdowns provided a unique opportunity to quantify reef soundscape dynamics in the context of greatly reduced noise pollution levels. We found boat noise to be a near-constant stressor at all three reef sites. Notably, while daily incidences of boats dropped significantly during the height of lockdown restrictions in May 2020, activity quickly returned to pre-COVID levels once travel restrictions to the USVI were lifted. This study highlights the utility of long-term acoustic datasets for addressing broad questions in soundscape ecology and underscores the degree to which chronic noise pollution dramatically impacts reef soundscapes.

Poster 4: Effects of Sympatry and Mixed Species Encounters on the Acoustic Repertoires of Guiana and Bottlenose Dolphins
***Maia Austin** and Laura J. May-Collado, University of Vermont*

Dolphins frequently form mixed-species groups, exhibiting complex social behaviors. The Guiana dolphin (Sotalia guianensis) and bottlenose dolphin (Tursiops truncatus) are two species commonly found in these groups. This study compares the vocal repertoires of sympatric Guiana and bottlenose dolphins in Costa Rica to allopatric outgroup populations. We hypothesize that the sympatric population will exhibit higher whistle diversity and lower interspecies differentiation compared to the outgroup, with mixed-species groups in sympatry showing greater diversity than single-species groups. Using machine learning tools (Luscinia and ARTwarp) to analyze whistle composition and diversity, we found that mixed-species groups in Costa Rica exhibit higher diversity than single-species groups. However, there was lower acoustic differentiation between the species in both contexts than was to be expected. These results suggest that vocal communication plays a crucial role in mediating interspecific interactions in mixed-species groups and contribute to understanding how dolphins adapt their communication strategies in complex social environments.

Poster 5: Species Distribution Modeling of Baleen Whales in the Northwest Atlantic
***Daryll Carlson** and Jennifer Miksis-Olds, University of New Hampshire*

Species distribution models (SDMs) relate species presence with environmental variables to fill gaps in knowledge of habitat suitability, making them useful for risk mitigation, management, and predicting the impacts of environmental change. While traditionally SDMs for baleen whales are based on visual sighting data, passive acoustic monitoring (PAM) enables observation of species outside of during surface behaviors. This work will utilize PAM data to develop SDMs

for four baleen whale species in the Northwest Atlantic (NWA): fin, humpback, sei, and North Atlantic right whales. SDMs will be constructed using the NOAA PACM dataset, a multi-contributor project compiling acoustic observations of cetaceans spanning 20 years. Models will undergo both internal evaluation and external evaluation using contemporary acoustic observations collected with UNH CARE's PAM network of acoustic long-term observatory (ALTO) mooring systems. Finally, model outputs will be compared to acoustic population density estimates produced from directional ALTO data to provide meaningful, biological interpretations. The results will provide SDMs that are constructed using robust, multi-decadal data and tested against contemporary data to ensure relevance under current environmental conditions. Developing acoustically based SDMs for baleen whales has the potential to improve the spatiotemporal resolution of these tools and provide new insights to inform management.

Poster 6: Using acoustics to monitor population size and breeding phenology of colonial seabirds

Valerie M. Eddington*, Elizabeth C. Craig, Easton R. White, Laura N. Kloepper*
University of New Hampshire

Migratory seabirds, like common terns (Sterna hirundo) are valuable bioindicators of marine ecosystems but are vulnerable to decline due to climate change and anthropogenic disturbances. Traditional monitoring methods of their dense breeding colonies are often invasive and time-consuming, and traditional passive acoustic approaches are complicated by high call overlap. Efficient, minimally invasive methods are needed to monitor colony size and breeding phenology. In this study, we evaluate the use of acoustic energy as a high-resolution, minimally invasive tool for monitoring trends in population size and breeding phenology in a seabird colony. We deployed 12 AudioMoths across a colony of common terns on Seavey Island, NH during the breeding season (May-August). We compared acoustic energy to in-person observation of nest density and key phenological events. Our results show that spatial trends in acoustic energy align with nest density observations, and temporal patterns in acoustic energy correspond to key phenological markers. Overall, our findings suggest that colony-wide trends in population size and phenology can effectively monitoring using acoustic energy, reducing the need for labor-intensive individual call analyses and minimizing disturbance to the colony.

Poster 7: Acoustic indices track discrete stages of Adélie penguin breeding phenology

Danielle T. Fradet*, Megan A. Cimino, Easton R. White, Laura N. Kloepper*
University of New Hampshire

Contributors to Adélie penguin (Pycoscelis adeliae) breeding phenology patterns reveal a link with environmental variables impacted by climate change. Traditional methods to monitor colony breeding phenology are resource intensive. Passive acoustic monitoring (PAM) is an alternative method that should be explored to help gather large-scale data needed to assess climate impacts on this species. Researchers have used PAM methods, such as vocal activity rate (VAR), to study seabird breeding phenology. However, VAR fails at large colonies due to high call overlap. Acoustic indices, or mathematical summations of a sound distribution, assess the soundscape as a whole and could be a useful alternative. This study assesses the correlation between acoustic indices (acoustic complexity index (ACI), bioacoustic index (BIO), and root-mean-square pressure (RMS)) and Adélie breeding stages (incubation, guard, post-guard, and fledge) across four sub-colonies for one breeding season. General linearized models revealed a

significant relationship between the indices and each breeding stage. BIO experienced slight, but significant, value increases across stages. ACI and RMS pressure experienced increasingly higher values from incubation to guard, and guard to post-guard, and then rapidly declined during fledge. This study represents the first step in building an acoustic workflow to passively monitor Adélie colony breeding phenology.

Poster 8: Adopting open-science practices for Passive Acoustic Monitoring efforts
***Isabella G. P. Garfield**, Rebecca V. Van Hoeck, Sofie M. Van Parijs, Kourtney Burger, Shannon Rankin*
Northeast Fisheries Science Center, NOAA

Transparent information sharing, or 'Open Science', is vital for scientific advancement and is becoming more accepted across the scientific communities. Open science encourages full and free sharing of data, methods, and publications to increase information transparency and accountability within and across science groups. NOAA Fisheries' Passive Acoustic Monitoring (PAM) programs formally adopted this open science philosophy by participating in the Openscapes Initiative, a mentoring program providing a toolbox for data, infrastructure, and workforce modernization using Github. Building on the tools provided by Openscapes, we have taken a multi-faceted approach to implement an open science mindset. This approach includes developing Github lab manuals for improved information sharing, scheduling regular co-working sessions, and leading hands-on Github learning tutorials. Our new open science framework allows streamlined transfer of methodologies between regional groups, with the added benefits of increasing team building across the PAM network and incorporating new Github skills into broader PAM research.

Poster 9: High-Frequency Acoustic Characterization of Shelly, Sandy Marine Sediments
***Hailey Gilman**, Jenna Hare, Gabriel R. Venegas*
University of New Hampshire

Acoustic backscatter is a promising way to remotely sense the seafloor over wide areas. Coupled with physics-based models, seafloor characteristics can be inferred. However, scattering characteristics of seafloor environments with dense concentrations of shell fragments have been shown to deviate significantly from those predicted by idealized scattering models. To better understand these deviations, laboratory investigation of the scattering response of varying densities and distributions of shell hash is warranted. To this end, laboratory backscatter measurements were performed on varying quantities of shell hash retrieved from the Isle of Shoals, NH, underlying degassed medium sand. Twenty sets of measurements were performed to estimate the scattering strength of the varying quantities of shell hash, where each set consisted of concurrent interface roughness and acoustic backscatter measurements. Interface roughness was measured using stereophotogrammetry, and acoustic backscatter was measured with a calibrated 200 kHz split-beam echosounder at angles of incidence between 0° to 50°. Preliminary data will be presented. Work sponsored by ONR award N000142312819.

Poster 10: Effects of playback received level on response strength in free-swimming bottlenose dolphins

***Laurine Lemercier**, Frants Jensen, Vincent Janik, Katie McHugh, Peter Tyack, Randall Wells, Laela Sayigh*
Woods Hole Oceanographic Institution

Playback experiments are a valuable tool for studying the functions of animal communication signals. However, little attention has been paid to potential effects of received level (RL) on response strength. In order to examine this, we analyzed playback experiments of various natural whistle types to common bottlenose dolphins (Tursiops truncatus) wearing digital acoustic tags (DTAGs) in Sarasota Bay, Florida. Dolphins were exposed to three broad categories of whistle stimuli: 1) familiar (their own signature whistle, or that of a close relative or associate); 2) unfamiliar (whistles recorded from a different population); and 3) non-signature (whistles of unknown function, recorded from within the Sarasota community). We quantified the overall dynamic body acceleration (ODBA) before and after playback for 39 trials to 17 different individuals. ODBA was found to significantly increase overall immediately following playback (Kruskal-Wallis test, $chi2 = 11.3$, $p\text{-value} < 0.05$, $df = 1$), and the increase was greater for playbacks with higher (120-138.5 dB) RLs than for those with RLs less than 120 dB, regardless of stimulus type (Tukey HSD, $p\text{-value} = 0.002$). Thus, RL is an important variable to take into account when interpreting responses to playbacks by free-swimming dolphins.

Poster 11: Listening for change: investigating the relationship between phocid breeding ecology and declining sea ice in the Alaskan Arctic

***Rachel E. Lewis**, Dr. Michelle Fournet, Dr. Andrew Von Duyke*
University of New Hampshire

Sea ice in the Alaskan Arctic is rapidly declining due to climate change. One implication of this is degraded habitat for ice seals, which includes bearded seals (Erignathus barbatus) and ringed seals (Pusa hispida). Both species require sea ice for reproduction and declines in ice habitat may negatively impact these subsistence species. Because reproduction in ice seals is facilitated acoustically, passive acoustic monitoring can be used to assess shifts in breeding behavior in association with shifting ice conditions. Bearded seals produce a “chorus” concomitant with ice breakup that signals the start of the breeding season. We hypothesize that with earlier break-up and reduced breeding habitat, the bearded seal chorus in the Alaskan Arctic will start earlier, last longer, and significantly alter the ambient soundscape. Breeding vocalizations of ice seal species were historically staggered due to differences in preferred ice habitat. As the timing of the bearded seal chorus shifts, increased acoustic overlap in ice seal vocalizations may lead to acoustic competition between species; bearded seals may become a source of biological noise under a climate change ice regime. To investigate the implications of shifting sea-ice, we are using acoustic data from 1985-2025 to assess shifts in (1) the phenology of bearded seal choruses (2) contributions of bearded seals to ambient soundscapes and (3) acoustic overlap between species.

Poster 12: Estimating American bullfrog populations using machine learning and noise reduction techniques

***Yue Liang**, Nicholas J. Kirsch, Laura Kloepper*
University of New Hampshire

American bullfrogs pose a significant threat to local biodiversity because they spread non-native diseases and prey on smaller species. Therefore, being able to monitor their population changes in local habitats is important for effective policymaking and conservation efforts. This study investigates the use of passive acoustic data to estimate precise bullfrog populations in their natural habitats. Spectral features of bullfrog calls were extracted from spectrograms and analyzed using spectral clustering, an unsupervised machine learning method, to group the calls into clusters. Each cluster represents an individual bullfrog and the number of clusters indicates the number of bullfrogs in the dataset. Several noise removal methods were applied before the feature extraction step to ensure accurate frequency representation of bullfrog calls. The proposed method demonstrated high accuracy in estimating bullfrog populations, achieving a mean absolute error (MAE) of 0.85 across 13 field observation cases at seven ponds in 2023. Furthermore, it achieved 100% accuracy in the 2024 dataset when validated against GPS localization ground truth. These results indicate the feasibility of estimating bullfrog populations using acoustic data. The proposed method can be extended to other species, provided the spectral structure of individual calls exhibits differences.

Poster 13: Shifting Focus: Development of Ecologically Valid Prosody Tasks

***Piper MacLean**, Rachel Steindel Burdin, Jill Thorson*
University of New Hampshire

Speech-language pathology needs a clinically relevant, ecologically valid, and easy to use prosodic assessment tool (Diehl & Paul, 2009; Hawthorne & Fischer, 2020). This study evaluates newly developed tasks naturally eliciting contrastive focus and compared performance to that on the Profiling Elements of Prosody in Speech and Communication (PEPS-C; Peppé, 2015). Our aims were to (1) examine construct validity of the naturalistic contrastive focus (NCF) and PEPS-C tasks via perceptual judgments and acoustical analyses using Points, Levels, and Ranges (PoLaR; Ahn et al., 2021) and (2) determine the concurrent and discriminant validity between the two assessments with naïve listener judgements. To date, data from 33 adults have been collected. Sentences containing target words are annotated for prominence, intonational phrase boundaries, turning points of the f0 pitch contour, and pitch ranges using PoLaR, with analyses ongoing. Initial perceptual analyses reveal that adults understand and produce contrastive focus more often during the NCF tasks (M=89-99%, SD=2.5-5%) when compared to the PEPS-C tasks (M=84-89%, SD=10-15%). Next steps examine naïve listener judgments of prominence and naturalness between expressive tasks. These newly developed tasks will aid in the diagnosis and assessment of populations with speech-language disorders.

Poster 14: Exploring Caregiver-Child Prosody and Language Complexity in Naturalistic Museum Interactions

***Haley McCreight**, Jill Thorson*
University of New Hampshire

Child-directed speech (CDS) engages infants and young children using simplified language and exaggerated prosody (Jones et al., 2023). Recent work shows that caregivers adjust speech/language features to cater toward older children as well (Hämäläinen et al., 2018; Shi et al., 2020). Children's museums offer a valuable resource in communities to encourage families to engage and learn together and are natural, ecologically valid settings for data collection. This study examines (1) the relationship between caregiver prosody and caregiver linguistic complexity, hypothesizing that more prosodic variation will correlate with less complex language, and (2) whether adult prosodic patterns and linguistic complexity are reflected in child speech and language during museum exploration, hypothesizing that children whose caregivers use high linguistic complexity and low prosodic variation will have stronger language skills. Twenty-minute audio recordings of exhibit exploration were analyzed for 20 caregiver-child dyads (3-6 years old). Files are transcribed following SALT conventions (SALT, 2023) and acoustically analyzed using Praat (Boersma & Weenink, 2024). Linguistic complexity measures including mean length utterance, subordination index, and type-token ratio are reported. Prosodic measures of wiggliness and spaciousness are extracted to provide data on prosodic variation over time (Wehrle, 2022). Ongoing analyses examine measures to address stated hypotheses.

Poster 15: Social and environmental influences on whistle emission and acoustic structure of bottlenose dolphins (*Tursiops truncatus)* in Bocas del Toro, Panama

***Megan E. O'Connor**, Laura J. May-Collado, Maia Austin*
University of Vermont

Dolphins rely on whistles to facilitate individual recognition and social interactions, making them essential for communication in a dynamic environment. However, emission and structure is influenced by a variety of environmental and social factors. In this study we investigate how behavioral contexts, group composition, whistle parameters and anthropogenic boat presence shape the emission and acoustic structure of whistles in a population of bottlenose dolphins (Tursiops truncatus) in Bocas del Toro, Panama. We apply non-metric multidimensional scaling (NMDS) to explore patterns and grouping in whistle occurrence and emission across sightings, exploring factors including whistle rate, non-linear phenomena, group size, and presence of juveniles or calves. We also utilize principal component analysis (PCA) to identify key acoustic parameters like peak frequency, inband power, and number of inflection points, that may drive variation in whistle composition. Initial results indicate that presence of juveniles and calves has a strong influence on the variation amongst sightings. Understanding the drivers of whistle variation provides insight into how dolphins adapt their communication to in-group dynamics and adjust to environmental differences.

Poster 16: Using occupancy modeling to examine song change of BSG humpback whales wintering off the Pacific coast of Panama, 2007-2023

***Frances Oppenheimer**, Laura May Collado, Therese Donovan*
University of Vermont

Understanding how humpback whale song changes can aid in identifying the features of song and soundscape that are most likely to impact humpback singing activity, as well as instances of interpopulation connectivity via song revolution. Measuring change is challenging - while efforts have been made in this lab to examine unit repertoire over time, that work did not allow for proper estimation of the pace of change of the song due to stark discrepancies in sampling effort, which may have affected unit detection. Occupancy modeling is a method of understanding species distribution in a metapopulation over time and space while accounting for errors and sampling discrepancies. While traditionally used to explain state patterns of physical sites, adjusting an occupancy model so that known units serve as species and individual recording files serve as surveys creates a multi-season, multi-species model that outputs the probability of usage and detection per unit over time and the most influential features of units and recordings in presence and detection. Using units collected from recordings of Breeding Stock G over 17 years, this study demonstrates the plausibility of using occupancy modeling to track presence and absence of song components over time.

Poster 17: Can Belugas Hear Your Sonar? Modeling depth sounder sonar propagation within dynamic habitats of the Tarium Niryutait Marine Protected Area

***Cara L. Rankin**, Kevin C. Scharffenberg, Dustin Whalen, Lisa L. Loseto*
University of Manitoba, Fisheries and Oceans Canada

The Tarium Niryutait Marine Protected Area (TNMPA) in the Mackenzie Estuary serves as an important summer habitat for the Eastern Beaufort Sea (EBS) beluga whales (Delphinapterus leucas). Inuvialuit from Tuktoyaktuk maintain an active role in community-based research and recently initiated a project using consumer-grade sonars (depth sounders) to create bathymetric maps of the area. These sonars have added a new sound source to the TNMPA, raising concerns about their potential impact on the belugas. During the summer of 2024, sonar propagation experiments were done throughout the TNMPA and Tuktoyaktuk Harbor, NT, Canada. Recordings were captured of Lowrance HDS9 sonar across seven sites, testing four frequency settings, to create sound propagation models specific to different habitats and conditions (i.e. water depth, bottom contour, temperature, salinity, and turbidity). Transmission loss varied based on daily fluctuations in salinity, temperature, and turbidity. Average source levels (168 dB re 1 μPa) exceeded the impulsive noise behavioral disturbance threshold. The dynamic estuarine environment provided an ideal setting to generate novel sound propagation measurements for shallow freshwater systems where anthropogenic noise is present. This work provides a basis to investigate potential acoustic disturbance in beluga and implement responsible guidelines for depth sounder use that minimizes noise impact.

Poster 18: Investigating Elemental-Level Coherence in Multibeam Echosounder Data
***Sylvan S. Ransom**, Thomas E. Blanford*
University of New Hampshire

Theoretical models have shown that spatial coherence of seafloor scattering can be sensitive to environmental properties. Observing spatial coherence requires a sonar array with many receivers. In this study, raw, uncalibrated element-level data from an EM 2040 multibeam echosounder used to investigate whether this phenomenon can be seen in observational data. Unlike a typical operation of a multibeam sonar system, this analysis does not use standard beamforming and bottom detection techniques. This poster will describe the initial investigation into the viability of multibeam echosounders for observing spatial coherence, and a series of steps need to precondition the data for analysis. Eventual applications of this work may enhance remote sensing of the seafloor and help predict performance of multibeam sonar systems in real-time.

Poster 19: One Fish, Two Fish… Who Are You Fish?
***Annie Smith**, X. Mouy, S. Van Parijs, R. Van Hoeck*
Azura Consulting LLC, under contract to National Oceanic and Atmospheric Administration

Passive acoustic monitoring is a rapidly growing, non-invasive technique to study and observe marine animals that use sound to communicate. While cetacean acoustics are well cataloged and many signals are identifiable to species, pairing fish species with their respective acoustic signals have not been as extensively documented. Continuing to build a record of known fish calls and choruses advances potential applications of fish bioacoustics and soundscape monitoring for marine conservation and management. The objective of this study is to build a catalog of vocal fish species recorded offshore of Virginia. Multiple species were detected in the April-September deployment period, varying in frequencies, sound level, and timing. In this poster presentation, unknown fish species calls and choruses will be analyzed and characterized in an attempt to identify species active in the area during this period. Building a record of fish contributing to the soundscape is an important step in establishing baseline acoustic levels in a busy marine area.

Poster 20: Spatiotemporal distribution of dolphins within the Gulf of Maine prior to offshore wind energy development
***Peyton Steffek,** Sophie Ferguson, Rose Nolan, Xavier Mouy, Jennifer Miksis-Olds, Bruce Martin, Julien Delarue, Sofie Van Parijs, Amanda Holdman*
Scripps Institution of Oceanography

Dolphin presence in the Gulf of Maine (GOM) has been previously classified as uniform across space and time, with little specification beyond this. With wind energy development planned for the GOM, a deeper understanding of the spatiotemporal distribution of dolphins is imperative. From 2020 to 2023, acoustic recorders (AMARs, Soundtraps, and F-PODs) were deployed in 30 sites throughout the GOM. This study analyzed SoundTrap data for dolphin whistles on an hourly time scale, using the PAMGuard whistle and moan detector along with custom python-based detection-viewing software, Soundscope, for validation. SoundTrap data detections were then compared to dolphin detections from other passive acoustic recorders in the region. Dolphins were detected at all recording locations with varying presence based on region and time

of year. Dolphins were present year-round in offshore GOM, while seasonally present in inshore GOM. For the inshore GOM, presence varied seasonally by location. Along the Southern coastal shelf, dolphin presence peaked in spring and fall, while along the northern coastal shelf, dolphin presence peaked from fall to winter. These results expand on current knowledge of dolphin habitat use and can be used to guide wind energy plans for lowest impact.

Poster 21: Monitoring Baseline Biological Drivers of Soundscape Characteristics in a Remote Australian Marine Protected Area

***Sophie Strock**, Jessica A. McCordic, Natalie Rivero, Sofie Van Parijs*
Eckerd College

A soundscape encompasses the anthropogenic, biological, and geological sounds in an environment and is a valuable tool for assessing ecosystem health. Monitoring and managing soundscapes are crucial to minimizing the negative impacts of human activities. In this study, we investigated the soundscape of Murat Marine Park, a marine protected area (MPA) located in the Great Australian Bight. As a National Park Zone, this MPA allows vessel transit and wildlife viewing but prohibits fishing or other extractive activities. Recorders were deployed from February to May 2020 to assess the park's acoustic environment, capturing sounds up to 24 kHz. Hourly presence of biological sound sources including dolphins, fish, and baleen whales was compared with hybrid millidecade spectra to determine drivers of the soundscape. Our analysis revealed limited vessel presence, with no significant influence on longer-term patterns in the soundscape. These baseline measurements provide a critical foundation for ongoing monitoring and management of Murat Marine Park, supporting efforts to preserve its ecological integrity.

Poster 22: Echolocation behavior of little brown bats (*Myotis lucifugus)* when flying near conspecifics

***Amaro Tuninetti,** Sonja Ahlberg, Laura Kloepper*
University of New Hampshire

Echolocating bats regularly fly and forage within close range (<5 meters) of each other while echolocating, causing individual bats to receive interfering cascades of echo information created by their own echolocation pulses as well as overlapping sounds caused by the echolocation of nearby bats. To investigate how bats adjust their echolocation behavior in response to the presence of acoustic interference caused by conspecifics, we used a synchronized thermal camera and eight-microphone array to record the flight and echolocation behavior of little brown bats (Myotis lucifugus) flying within their hibernaculum cave as they prepared to emerge at dusk. We used the microphone array to perform 3D acoustic localization of individual bats flying alone and in small groups, while the thermal video allowed us to observe movements performed during the inter-pulse intervals. Frequency and temporal parameters were calculated for each identified echolocation pulse, and preliminary analyses indicate that individual little brown bats adjust the timing of their echolocation emissions as a function of the presence of other echolocating bats, primarily by shortening their calls and lengthening their interpulse intervals. These results may yield further insights into how active biosonar systems contend with the presence of interference and ambiguous signals in the environment.

Poster 23: Gray seal (*Halichoerus gyrpus)* acoustic behavior at three sites in the Northwest Atlantic

Jessica Veo, *Michelle Fournet*
University of New Hampshire

Gray seals (Halichoerus grypus) are marine predators, ecosystem sentinels, and year-round residents of the Northwest Atlantic (NWA). Despite mid-19th century anthropogenic population reductions, modern gray seal populations in the NWA are robust. While other phocids acoustically advertise while breeding, little is known about gray seal acoustic behavior in relation to their winter breeding season in the NWA. This study aimed to better understand gray seal acoustic behavior at two breeding sites in the NWA (Monomoy Island, MA and Muskeget Island, MA) and to compare this behavior to a site in which breeding status is unknown (Duck Island, ME). Ten days were randomly selected per site and annotated for 2 hours per day for a total of 20 hours of analysis per site. Each site exhibited similar numbers of total calls (from 1136 calls to 1559 calls) but Muskeget Island had the highest number of roars, which are presumed to be associated with reproduction. Roars appeared to exhibit a strong trend associated with the peak of breeding season (~mid January). Based on these data, there is poor evidence to support that Duck Island, ME is a breeding site. Future work will examine data from each site for the 2024/2025 winter season.

Poster 24: Characterizing Sei Whale (*Balaenoptera borealis)* Movement Patterns in the Gulf of Maine

Emma M. VerGow, *Jennifer L. Miksis-Olds, Bruce Martin*
University of New Hampshire

Sei whales are difficult to visually monitor due to their cryptic presence and lack of breaching; therefore, passive acoustic monitoring is now being used to expand this effort. The fine-scale temporal and spatial movements of sei whales in the Northwest Atlantic are unknown. The present study characterizes sei whale movement patterns related to migration dynamics in the Gulf of Maine. Five bottom-mounted Acoustic Long-Term Observatories landers, each equipped with a tetrahedral array of omni-directional hydrophones, were deployed throughout the Gulf of Maine. A combination of manual analysis and automated detections were used to assess sei whale daily presence and seasonality. Horizontal bearing estimation of detected vocalizations was used to examine sei whale directional movement patterns among sites. Data from 2021-2024 suggests that sei whales are present in spring and late fall/early winter. This effort will contribute to the improvement of regional soundscape modeling, automated detector accuracy, and acoustic density estimation methods.

Poster 25: Quantifying the vocal repertoire of the common tern *(Sterna hirundo)*

Dan S. Zogby, *Valerie M. Eddington, Liz C. Craig, Laura N. Kloepper*
University of New Hampshire

Common terns (Sterna hirundo) are regionally threatened migratory shorebirds that form large breeding colonies during the summer months. They are highly vocal and serve as important bioindicators of marine ecosystems. Historically, acoustic studies on colonial seabirds have

proven difficult due the high amounts of call overlap. This study aims to quantify the vocal repertoire of adult common terns. We deployed 5 AudioMoths to collect acoustic data at a common tern colony on Seavey Island, NH in summer 2023. Unique call types were identified through visual and aural inspection of the spectrogram. For each call, peak frequency (Hz), bandwidth (Hz), and duration (s) were extracted to quantify call characteristics. Statistical analyses consisted of Kruskal-Wallis tests followed by post-hoc Dunn tests. Preliminary results demonstrate that all call types differed significantly by at least one parameter. These results suggest that each call type serves a unique communicatory purpose. These findings present the first comprehensive characterization of the common tern vocal repertoire. It provides crucial baseline knowledge for future acoustic studies that may investigate the vocal behavior of the species to better understand reproductive behavior and generate a more comprehensive understanding of their role as marine ecosystem bioindicators.

Wednesday, April 23rd

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
Jay McEntee	Biodiversity Research Institute
Ian Jones	Center for Acoustics Research and Education, University of New Hampshire
Elizabeth Weidner	University of Connecticut
Jeff Gilbert	Triton Systems
Lauren Freeman	NUWC Newport
Jackie Motyka	NERACOOS
Kaitlin Houle	Normandeau Associates
Laela Sayigh	Woods Hole Oceanographic Institution
Meme Lobecker	Kongsberg Discovery
Dylan Temple	Integer Technologies

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