PSAW III March 28-30, 2023 Miami, Florida

NOAA FISHERIES

Workshop Program

Third Protected Species Assessment Workshop (PSAW III)

Hosted by the Southeast Fisheries Science Center

Organized and Sponsored by the Office of Science and Technology

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Protected Species Assessment Workshop III

March 28 - 30, 2023
Miami, Florida

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Overview

In 2015, NOAA Fisheries Protected Resources Board began supporting a biennial workshop focusing on protected species assessments similar to the National Stock Assessment Workshop and the National Habitat Assessment Workshops. These workshops, hereafter referred to as Protected Species Assessment Workshops (PSAW), bring scientists together to share data, methods, technologies, and establish best practices in protected species assessment science. PSAWs focus on assessment science related to all protected species including corals, sturgeon, elasmobranchs, marine mammals, sea turtles, sea birds, salmon, and other invertebrate and vertebrate taxa that are protected by law and under NOAA Fisheries jurisdiction. The Office of Science and Technology (OST) organizes each PSAW, along with steering committee members from NOAA Fisheries HQ, OPR, science centers and regional offices. Although the theme of each PSAW varies, they all provide an opportunity for exchange across disciplines with the goal of fostering collaboration among scientists from different programs within NOAA Fisheries as well as external collaborators.

The theme for PSAW III is Incorporating Novel Data, New Analytical Approaches, and Increasing Anthropogenic Impacts in Protected Species Assessments and is being hosted by the Southeast Fisheries Science Center (SEFSC) at Florida International University (FIU) in Miami, Florida. The three day workshop on March 28-30, 2023 includes keynote speakers, plenary talks, oral and poster presentations, and group/panel discussions. Due to COVID delays and travel restrictions, the main workshop was postponed until spring 2023, although virtual training sessions were held in 2022. Nine training sessions were offered with over 300 registrants from NOAA Fisheries and other NOAA Line Offices as well as academic and external partner organizations. A special thank you to those who volunteered to share their knowledge and expertise on a variety of topics related to assessment science.

Recognizing the need to educate and engage the next generation of protected species assessment scientists, this year's PSAW includes a student and diversity, equity, and inclusion focused half-day (Session 1) co-hosted by FIU that: (1) introduces students to protected species and the importance of assessments in formulating management actions that support the recovery of vulnerable species, (2) shares student internship and scholarship opportunities with NOAA Fisheries, and (3) provides a platform for students to directly engage with agency scientists and managers, discuss related career options and receive tips on resume and job application preparation.

Assessments are the core science products used to inform management of protected species. Significant advances are occurring at each NOAA Fisheries Science Center and region and PSAW III is an exciting opportunity to share these advancements and form collaborations to enhance NOAA Fisheries' ability to adapt and formulate new approaches that ultimately aid in the conservation of protected species. Welcome to PSAW III!

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Workshop Agenda

The overall theme for PSAW III is Incorporating Novel Data, New Analytical Approaches and Increasing Anthropogenic Impacts in Protected Species Assessments. The workshop will take place over three days:

- Day 1 - Optional Student Outreach/DEI Half-Day: Introduction to Protected Species Assessments & Opportunities at NOAA Fisheries (Co-hosted by FIU)
- Day 2 - Novel Data Types ('Omics & Acoustics) and Climate Change
- Day 3 - New Analytical Approaches and Impacts from Marine Development

*Please note that PSAW III is adhering to all Safer Federal Workforce principles and guidance related to COVID-19. For additional information, see the NOAA Office of Human Capital Services COVID-19 website. For detailed information on recommended protection and prevention actions, please see the CDC website. Masks are available at the registration table for those who would like one and hand sanitizer is stationed throughout the venue. We are also using an optional color coding system for those that are interested in indicating their social distancing comfort level. More information can be found on the last page of the program and at the registration desk.

Tuesday March 28th - Day 1, Session 1: Optional Student Outreach/DEI Half-Day: Introduction to Protected Species Assessments & Opportunities at NOAA Fisheries (Co-hosted by FIU)

Venue: Florida International University, Marine Science Building, Biscayne Bay Campus
Webinar Link via Zoom: *(NOAA attendees must use zoom via their web browser)*
https://fiu.zoom.us/j/92232371310?pwd=czdVb2w0UXZjQnhSdW5jb1pobW5EUT09
Meeting ID: 922 3237 1310, Passcode: BM5KGi
Find your local number: https://fiu.zoom.us/u/acaqM5UYqX
When: 1pm-5pm

This student-focused/DEI optional half-day (afternoon) is co-hosted by FIU and will include presentations and discussions on various aspects of NOAA Fisheries' protected species assessment process with undergraduate and graduate students from FIU and other nearby academic institutions. All interested participants are welcome and we hope that researchers and managers will consider sharing their contributions to the assessment process, from survey design to implementing management and recovery plans. We will also discuss student internship and scholarship opportunities at NOAA Fisheries and have agency scientists, managers, and affiliates available to answer questions and discuss a wide variety of marine focused career options, including those at NOAA Fisheries. We have prepared an information packet on the opportunities and resources we will highlight during this session.

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Tuesday March 28th - Day 1, Session 1: Optional Student Outreach/DEI Half-Day Continued

1:00 - 1:15 pm	**Registration**
1:15 - 1:30 pm	**Welcome Remarks** *Lesley Stokes, Southeast Fisheries Science Center (SEFSC), Marine Mammal Turtle Division, Research Fisheries Biologist* *Jeremy Kiszka, FIU, Institute of Environment and Department of Biological Sciences, Assistant Professor*
1:30-1:40 pm	**Introduction to NOAA & NOAA Fisheries**
1:40 - 2:00 pm	**Introduction to Protected Species Assessments** *Eric Patterson, on detail to Office of Science & Technology (OST), Assessment & Monitoring Division, Acting Assessment Branch Chief (Permanent Position: Office of Protected Resources (OPR), Marine Mammal and Sea Turtle Conservation Division, Cetacean and Pinniped Conservation Lead)*
2:00 - 3:10 pm	**Student Opportunities at NOAA Fisheries & Other Career Resources** *Natasha White & Peter Roohr, NOAA Department of Education* *Erin McMichael, ECS in support of Office of Science & Technology, Protected Species Science Program, Research Associate*
3:10 - 3:20 pm	**My Experience as a Hollings and Lapenta Scholar** *(Emily Speciale, NEFSC)*
3:20 - 3:40 pm	**Break** *(Please bring your own mug and/or reusable water bottle)*
3:40-4:55 PM	**Panel/Round Table Discussion with NOAA Fisheries Experts** *Lesley Stokes - Moderator (SEFSC)* *Jenny Litz - (SEFSC, Marine Mammal & Turtle Division, Marine Mammal Branch Chief)* *Joe Pfaller (SEFSC, Marine Mammal & Turtle Division, Turtle Branch Chief)* *Kristan Blackhart (OST, National [Fish] Stock Assessment Program Lead)* *Genevieve Davis (NEFSC, Passive Acoustic Research Group, Research Acoustician)* *Alex Curtis (SWFSC, Marine Mammal & Turtle Division, Research Biologist)* *Yvonne Barkley (PIFSC, Cetacean Acoustics Postdoctoral Researcher)* *Cullen Hauck (NEFSC - Hollings Scholar)* *Emily Speciale (NEFSC - Hollings Scholar)*
4:55-5:00 pm	**Closing Remarks & Adjourn**

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Wednesday March 29th - Day 2, Main Workshop - Opening Remarks & Keynote Speaker

Venue: Kovens Conference Center (2nd Floor), Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=m158e0ad66e0680feae2a34bff16ddc86
Meeting number (access code): 2762 626 9783 / Meeting password: 6wVQ3BwR3Ht
Join by Phone: 415-527-5035
When: 8:00am-9:25am

8:00 - 8:30 am	**Registration & Poster Set-Up**
8:30 - 8:35 am	**Welcome Remarks** *Mridula Srinivasan* *Director, Marine Mammal & Turtle Division, Southeast Fisheries Science Center, on detail as Special Advisor to the Office of the Assistant Secretary of Commerce for Environmental Observation and Prediction (ASEOP)*
8:35 - 8:45 am	**Opening Remarks - SEFSC** *Clay Porch* *Director, Southeast Fisheries Science Center*
8:45 - 8:55 am	**Opening Remarks - OST** *Evan Howell* *Director, Office of Science & Technology*
8:55 - 9:25 am	**Keynote Speaker** *Ved Chirayath, Ph.D* *Vetlesen Endowed Professor of Earth Sciences* *Director, Aircraft Center for Earth Studies (ACES)* *UM RSMAS, Department of Ocean Science*

Wednesday March 29th - Day 2, Session 2: Novel Data Types - 'Omics and Acoustics

Co-Chairs: Genevieve Davis (NEFSC), Julie Scheurer (ARO)

Venue: Kovens Conference Center, Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=m158e0ad66e0680feae2a34bff16ddc86
Meeting number (access code): 2762 626 9783, Meeting password: 6wVQ3BwR3Ht
Join by Phone: 1-415-527-5035
When: 9:25am - 12:45pm

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Wednesday March 29th - Day 2, Session 2: Novel Data Types - 'Omics and Acoustics Continued

Protected species assessments increasingly rely on incorporating novel data types to enhance assessment capabilities, answer key science and management questions, and fill in data gaps. This session focuses on integrating data from 'omics and acoustics in assessments, particularly to quantify abundance and distribution and monitor changes that occur. We will discuss recent advances that have contributed to an increasing reliance on acoustic data and highlight the use of acoustics to assess anthropogenic impacts such as ocean noise. Contributors are also invited to highlight the use of 'omics in current and future assessments and discuss benefits and challenges associated with 'omics. Lastly, we welcome contributions on integrating 'omics and acoustics into analytical models.

9:25 - 9:30 am	**Session Remarks** *Co-Chairs: Genevieve Davis (NEFSC), Julie Scheurer (ARO)*
9:30 - 9:45 am	Integrating environmental DNA tools into protected species management *Nicole Phillips (University of Southern Mississippi)*
9:45 - 10:00 am	From the common to the rare with environmental DNA: eDNA for marine assessments of hake, whales, and corals *Krista Nichols (NWFSC)*
10:00 - 10:15 am	Acoustic localization of false killer whale (*Pseudorca crassidens*) subgroups in the Hawaiian archipelago *Pina Gruden (Cooperative Institute for Marine and Atmospheric Research, Research Corporation of the University of Hawai'i)*
10:15 - 10:30 am	Modeling sperm whale distribution using visual and passive acoustic data *Yvonne Barkley (Cooperative Institute for Marine and Atmospheric Research, Research Corporation of the University of Hawai'i at PIFSC)*
10:30 - 10:45 am	**Break** *(Please bring your own mug and/or reusable water bottle)*
10:45 - 11:00 am	Using a deep neural network to classify echolocation clicks and identify biogeographic patterns of Pacific white-sided dolphins *Michaela Alksne (Scripps Institution of Oceanography)*
11:00 - 11:15 am	Passive acoustic monitoring for stock assessment: Rice's whales in the Gulf of Mexico *Melissa Soldevilla (SEFSC)*
11:15 - 11:30 am	An interactive machine learning toolkit for classifying impulsive signals in passive acoustic recordings *Melissa Soldevilla (SEFSC)*

Wednesday March 29th - Day 2, Session 2: Novel Data Types - 'Omics and Acoustics Continued

11:30 -11:45 am	Passive acoustic localization and tracking of Rice's whales (*Balaenoptera ricei*) in the northeastern Gulf of Mexico *Ludovic Tenorio-Hallé (CIMAS, University of Miami RSMAS at SEFSC)*
11:45 am - 12:00 pm	Diving behavior of beaked whales in the Gulf of Mexico inferred from three-dimensional acoustic tracking using near-seafloor sensors *Héloïse Frouin-Mouy, (Cooperative Programs for the Advancement of Earth System Science, University Corporation for Atmospheric Research at SEFSC)*
12:00 - 12:45 pm	**Discussion: 'Omics & Acoustics**
12:45 - 2:15 pm	**Lunch** (In-House) **& Poster Session*** (1:45-2:15pm)

Although posters will be displayed throughout Day 2 and 3 of the workshop, poster authors will be available in the poster area during this time to discuss their work and answer questions.

Wednesday March 29th - Day 2, Session 3: Climate Change Impacts

Co-Chairs: Caroline Good (OPR), Nancy Friday (AFSC)

Venue: Kovens Conference Center (2nd Floor), Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=m588dea959648559882bc20bc2bcc9e45
Meeting number (access code): 2762 357 1335 / Meeting password: pDaPeEKX923
Join by Phone: 415-527-5035
When: 2:15pm - 5:00pm/5:30pm

Changing ocean and climate conditions are affecting protected species in a variety of ways. Changes in distribution, abundance, and composition have already been reported for some marine species. In addition, impacts from climate change are projected to continue into the future and in many cases are expected to become more extreme. This session will include oral presentations as well as a panel discussion that address a range of topics examining the role and effects of climate change on protected species assessments, including: (1) knowledge gaps that interfere with management's ability to make informed decisions, (2) advanced technology and/or tools that can help to fill key data gaps and the considerations associated with their use, and (3) cross-discipline efforts to improve climate impact analyses and protected species assessments to inform conservation and management decisions.

2:15 - 2:20 pm	**Session Remarks** *Co-Chairs: Caroline Good (OPR), Nancy Friday (AFSC)*
2:20 - 2:40 pm	Addressing climate change impacts on protected resources: the PR Climate Initiative *Shannon Bettridge (OPR)*

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Wednesday March 29th - Day 2, Session 3: Climate Change Impacts Continued

2:40 - 2:55 pm	NOAA Climate, Ecosystems and Fisheries Initiative: An end-to-end decision support system for climate ready resource management *Kirstin Holsman (AFSC)*
2:55 - 3:10 pm	Incorporating environmental factors and climate into fish stock assessments *Kristan Blackhart (OST)*
3:10 - 3:25 pm	Marine mammal and sea turtle climate vulnerability assessments within research and management frameworks *Matthew Lettrich (ECS Federal in support of OST)*
3:25 - 3:45 pm	**Break** *(Please bring your own mug and/or reusable water bottle)*
3:45 - 5:00 pm	**Panel Discussion** *Shannon Bettridge & Dori Dick (OPR)* *Matt Lettrich (ECS Federal in support of OST)* *Chris Sasso (SEFSC)* *Paul Conn & Brett McClintock (AFSC)* *Kirstin Holsman (AFSC)*
5:00 pm	**Wrap Up - Day 1**
5:30 pm	**Adjourn**

***Optional informal social gathering to follow at 6pm at BarTaco**
2906 NE 207th St, Aventura, FL 33180 (across the street from host hotel); ph: 305-614-8226

Thursday March 30th - Day 3 Opening Remarks & Keynote Speaker

Venue: Kovens Conference Center (2nd Floor), Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=mf24cd9a52f6b4bd34b083278c93d737e
Meeting number (access code): 2760 007 2004 / Meeting password: gsPppDZS734
Join by Phone: 415-527-5035
When: 8:00am-8:35am

8:00 - 8:05 am	**Updates & Logistics**
8:05 -8:35 am	**Keynote Speaker** **Michael Heithaus, Ph.D.** *Executive Dean of the College of Arts, Sciences & Education, Professor* *Department of Biology, FIU*

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Thursday March 30th - Day 3, Session 4: New Analytical Approaches to Abundance and Risk Assessment of Marine Protected Species

Co-Chairs: Alex Curtis (SWFSC), Chris Jordan (NWFSC)

Venue: Kovens Conference Center (2nd Floor), Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=mf24cd9a52f6b4bd34b083278c93d737e
Meeting number (access code): 2760 007 2004 / Meeting password: gsPppDZS734
Join by Phone: 415-527-5035
When: 8:35am - 12:15pm

Innovation and adaptation of analytical methods are a key avenue for improving estimates of abundance and risk for protected species assessments, particularly given finite resources and capabilities for data collection. Investigators are invited to share analytical advances that integrate multiple data sources or types, support data-limited assessment, reduce bias, better characterize uncertainty, or increase efficiency. Contributions may span a range of shared challenges, such as accounting for unobserved or unobservable bycatch, accommodating variable distributions and dynamics of populations, attributing impacts to component populations in mixed stock situations, or evaluating the tradeoffs for automating analyses, to name a few.

8:35 - 8:40 am	**Session Remarks** *Co-Chairs: Alex Curtis (SWFSC), Chris Jordan (NWFSC)*
8:40 - 9:10 am	**Plenary Speaker** NOAA Fisheries Open Science and the 2023 Year of Open Science (YOOS23) *Eli Holmes (NWFSC)*
9:10 - 9:25 am	Using the NOAA Fisheries Integrated Toolbox to advance open science for protected species *Kathryn Doering (OST)*
9:25 - 9:40 am	Forecasting bycatch hotspots using multivariate random forest machine learning *Kelly Soluri (University of Miami)*
9:40- 9:55 am	Life history and climate change matter *Joan Browder (SEFSC)*
9:55 - 10:10 am	Management strategy evaluation (MSE) for protected species *Cassidy Peterson (SEFSC)*
10:10 - 10:25 am	A one-dimensional spatial capture-recapture model to estimate abundance of a coastally distributed population *K. Alexandra Curtis (SWFSC)*
10:25 - 10:40 am	**Break** *(Please bring your own mug and/or reusable water bottle)*

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Thursday March 30th - Day 3, Session 4: New Analytical Approaches Continued

10:40 - 10:55 am	Incorporating telemetry data into mark-recapture analysis: case study of false killer whale (*Pseudorca crassidens*) abundance estimation in the Main Hawaiian Islands *Janelle Badger (PIFSC)*
10:55 - 11:00 am	Series Introduction - Modeling species distributions with diverse data sources: research from AFSC's National Protected Resources Toolbox initiative project *Paul Conn (AFSC)*
11:00 - 11:15 am	Presentation 1 - Integrated modeling of bearded seal densities *Paul Conn (AFSC)*
11:15 - 11:30am	Presentation 2 - The multistate Langevin diffusion: integrating multiple data types for inferring behavior-specific habitat selection and utilization distributions *Brett McClintock (AFSC)*
11:30 -11:45 am	Presentation 3 - A computationally flexible approach to population-level inference and data integration *Devin Johnson (PIFSC)*
11:45 - 12:15 am	**Discussion: New Analytical Approaches**
12:15 - 1:15 pm	**Lunch** (In-House)

Thursday March 30th - Day 3, Session 5: Incorporating New and Increasing Impacts from Marine Development

Co-Chairs: Lesley Stokes (SEFSC), Erin McMichael (ECS Federal in support of OST)

Venue: Kovens Conference Center (2nd Floor), Florida International University, Biscayne Bay Campus
Webinar Link via Webex:
https://noaanmfs-meets.webex.com/noaanmfs-meets/j.php?MTID=m38661c56c06dd27dbd7bce96aa2bc0c2
Meeting number (access code): 2763 288 9141 / Meeting password: 3c9A83XUVJJ
Join By Phone: 1-415-527-5035
When: 1:15pm - 4:20pm

Protected species are facing unprecedented impacts from new and increasing marine development activities. Incorporating these impacts (both direct and cascading) is crucial to the conservation and recovery of imperiled species. This session focuses on impacts from non-fisheries sectors such as offshore wind development, and oil spill response. Contributors are invited to share their experiences with addressing science and management

Thursday March 30th - Day 3, Session 5: Impacts from Marine Development Continued

needs. This session will include a panel discussion on a variety of topics, including what data are lacking both regionally and nationally, what additional assessments are needed, and if we have the necessary tools to meet these needs. We will also focus on the interface of where science and management meet and discuss if we have the science we need to successfully manage and prioritize protected species restoration efforts (e.g., Deep Water Horizon).

1:15 - 1:20 pm	**Session Remarks** *Co-Chairs: Lesley Stokes (SEFSC), Erin McMichael (ECS Federal in support of OST)*
1:20 - 1:50 pm	**Plenary Speaker** *Lance Garrison (SEFSC)*
1:50 - 2:10 pm	Modeling protected species distributions and habitats to inform siting and management of pioneering ocean industries *Nicholas Farmer (SERO)*
2:10 - 2:25 pm	Movements of leatherback sea turtles (*Dermochelys coriacea*) suggest new foraging locations and interactions with offshore wind farms along the Atlantic Coast of the United States *Mitchell Rider (University of Miami, RSMAS)*
2:25 - 2:40 pm	Understanding oil spill effects on sea turtles: lessons learned and persistent challenges *Brian Stacy (OPR)*
2:40 - 2:55 pm	Diving deeper into the oil spill: potential shifts in habitat use and foraging ecology of sperm whales after the Deepwater Horizon oil spill *Clarissa Teixeira (Oregon State University)*
2:55 - 3:10 pm	**Break** *(Please bring your own mug and/or reusable water bottle)*
3:10 - 4:10 pm	**Panel Discussion** *Mridula Srinivasan (SEFSC)* *Lance Garrison (SEFSC)* *Nick Farmer (SERO)* *Nick SIsson (GARFO)* *Brian Stacy (OPR)* *Dennis Klemm (SERO)*
4:10 - 5:00 pm	**Wrap Up - Day 2 & PSAW III** **Ideas for PSAW IV in 2025** **Closing Remarks** - *Patrick Lynch (OST), John Walter (SEFSC)*
5:00 pm	**Adjourn Workshop**

Session 6: Poster Session

Chair: Julie Scheurer (ARO)

List of Posters & Presenter (In alphabetical order by presenter's last name)

Assessing patterns of courtship at suspected grouper spawning aggregations using passive acoustics
Zoie Bright (Hollings Scholar, NEFSC)

NOAA Fisheries National Seabird Program: 5-Year Strategic Plan update
Joan Browder (SEFSC)

Quantifying detection areas of Rice's whale calls in the Gulf of Mexico using sound propagation modeling
Ashley Cook (CIMAS, University of Miami RSMAS at SEFSC)

International partnership for the restoration of coral reefs in the Arrecife de Puerto Morelos National Park (APMNP), Mexico
Marina Garmendia (Nova Southeastern University)

Using passive acoustics to study endangered baleen whales off the coast of Senegal
Cullen Hauck (Hollings Scholar, NEFSC)

Advances in acoustic telemetry informs on habitat use, movement ecology, and commercial fisheries bycatch risk of endangered smalltooth sawfish
Andrea Kroetz (CIMAS, University of Miami RSMAS at SEFSC)

Monitoring and restoration of ESA-listed coral species on Florida Reefs
Mark Ladd (SEFSC)

Foraging ecology of Common dolphins (*Delphinus delphis*) in the Northwest Atlantic
Alexander Reulbach (Hollings Scholar, NEFSC)

Using eDNA to measure marine vertebrate diversity from Cape Cod to Cape Hatteras, USA
Emily Speciale (Hollings Scholar, NEFSC)

Examining fine-scale population genetic structure of common bottlenose dolphins (*Tursiops truncatus*) in North Carolina using next-generation RAD-seq data
Nicole Vollmer (CIMAS, University of Miami RSMAS at SEFSC)

Environmental DNA assay for detection of the rare Rice's whale in the Gulf of Mexico
Lynsey Wilcox (SEFSC)

Analyzing trends in U.S. Commercial Fisheries bycatch and evaluating solutions to global bycatch problems
(OST)

NOAA Fisheries Distribution Mapping and Analysis Portal (DISMAP): Visualizing changing distributions
(OST)

Keynote Speakers

Photo Credit: Rebecca Hale, National Geographic

Invited Speaker: Ved Chirayath, Ph.D.
Vetlesen Professor of Earth Sciences, Director of the Aircraft Center for Earth Studies, University of Miami RSMAS

Dr. Ved Chirayath is the Vetlesen Professor of Earth Sciences and Director of the Aircraft Center for Earth Studies (ACES) at University of Miami's Rosenstiel School. He is the founder and former director of the Laboratory for Advanced Sensing at NASA Silicon Valley and a National Geographic Explorer. Chirayath invented NASA MiDAR, fluid lensing, and the first plasma-actuated aircraft and is authoring a new textbook on remote sensing planetary change. Chirayath was formerly a fashion and celebrity photographer in Moscow and discovered an extra-solar planet in high-school. In 2021, Chirayath was one of 30 finalists selected from over 12,000 applicants for NASA's Astronaut Candidate Class of '21. Chirayath received his BSc, MSc, and PhD in Physics, Astrophysics, and Aeronautics & Astronautics from Stanford University after five years studying theoretical physics at Moscow State University in Russia.

Invited Speaker: Michael Heithaus, Ph.D.
Executive Dean of the College of Arts, Sciences & Education (CASE), Professor Department of Biological Sciences, Florida International University

As a marine ecologist, Heithaus specializes in predator-prey interactions and the ecological importance of sharks and other large marine species. His research leverages a number of cutting-edge technologies, including drones and animal-borne cameras, to unravel the mysterious lives of hard-to-study marine creatures. His work in Shark Bay Australia is the most detailed study of the ecological role of sharks in the world. Working with several prominent non-governmental organizations, it has been used as the underpinning for affecting positive policy changes. He has authored or co-authored more than 200 peer-reviewed journal articles and book chapters and co-edited five books on the biology of sharks and their relatives. He also has co-written two high school science textbooks and is an author on national K-8 science programs.

Prior to joining FIU, Heithaus was a scientist at Mote Marine Laboratory's Center for Shark Research. He also worked with National Geographic's Remote Imaging Department where he conducted studies using their "Crittercam." Heithaus has been involved in the production of more than a dozen natural history documentaries, including many featured on National Geographic's Shark Fest as well as Shark Week. He also hosted a National Geographic Channel television series. He has dedicated his career to bringing the excitement of scientific exploration and discovery to audiences of all ages. He received a B.A. in Biology from Oberlin College in 1995 and completed his Ph.D. at Simon Fraser University in 2001.

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Miami, Florida

Venue

Florida International University - Biscayne Bay Campus
3000 N.E. 151st Street, North Miami, FL 33181-3000

Marine Science Building Seminar Room

Optional Day 1 (March 28th) - Marine Science Building Seminar Room

Kovens Conference Center

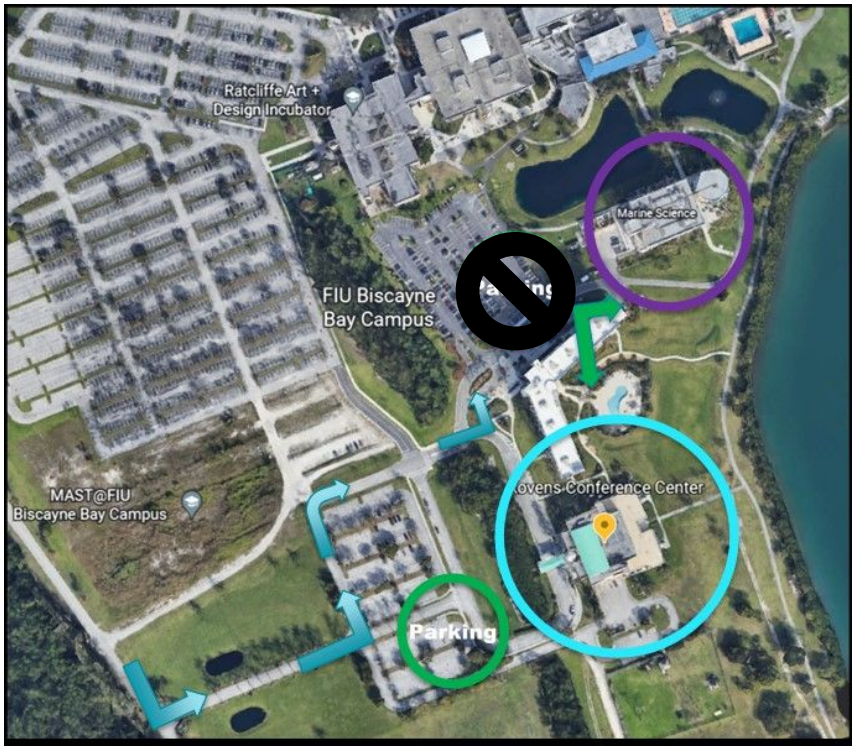
Day 2 and 3 (March 29-30) - Kovens Conference Center second floor
https://kovens.fiu.edu/

Internet Access

WiFi is available during the Main Workshop at the Kovens Conference Center
WiFi Network: PSAW2023
Password: R1cesWhale!

Parking & Map

FIU Parking: Workshop participants must park in Lot 5. **You must register your vehicle or download PayByPhone Parking app for iPhone and Google Play and use access code 20033 for $3.25/day parking rate.** We encouraging carpooling to and from the venue. If you are interested in carpooling please provide your information here. Link to register your vehicle: https://fiu.nupark.com/v2/portal/eventregister/52072bec-03df-432f-8b7e-741150340090#/events/registration/



Abstracts

Session 2: Novel Data Types - 'Omics and Acoustics

Integrating environmental DNA tools into protected species management

Nicole Phillips[1], Ryan Lehman[1], Emma Humphreys[1], Annmarie Fearing[1], Jill Hendon[1], John Carlson[2], Ruth Carmichael[3], and Gregg Poulakis[4]
[1]University of Southern Mississippi, [2]NMFS/SEFSC, [3]University of South Alabama, [4]Florida Fish and Wildlife Conservation Commission

Environmental DNA (eDNA) is a powerful genetic technique with a wide range of applications, including filling data gaps on the distribution, ecology, and population biology of aquatic species, and serving as a monitoring and enforcement tool. The greater sensitivity of eDNA approaches, when compared to more traditional methodologies, makes them more cost-effective for studies of threatened and endangered species, which are often difficult to directly observe. Despite the benefits and practical applications of eDNA data, widespread adoption of these techniques as standard practice in studies of protected marine species, and the integration of resultant data into conservation planning, has been slow. This is partly due to concerns over data validity and interpretation, lack of expertise and access to advanced technology, and uncertainty in how such data should be used in species management. The use of highly sensitive Droplet Digital™ PCR technology in eDNA studies increases the probability of detecting rare target DNA from water samples and provides precise quantification estimates, maximizing the utility of these data. When combined with a foundation in basic research, validation studies, and rigorous quality controls, resultant data from eDNA studies are highly robust and reliable. Here, we discuss how highly advanced eDNA approaches are being used to assess the re-occurrence of Smalltooth Sawfish, *Pristis pectinata*, in historically occupied habitats in U.S. waters, and as a tool to monitor the presence and abundance of the West Indian Manatee, *Trichechus manatus*, in the northern Gulf of Mexico. Employing these eDNA tools will enhance species management, particularly for rare marine species.

From the common to the rare with environmental DNA: eDNA for marine assessments of hake, whales, and corals

Krista Nichols, Ole Shelton, Kim Parsons, and Meredith Everett
NMFS/NWFSC

All species inevitably leave genetic traces in their environments, and the resulting environmental DNA (eDNA) reflects the species present in a given space and time. It remains unclear whether eDNA signals can provide quantitative metrics of abundance on which human livelihoods or conservation successes depend. Here, we report the results of a large eDNA ocean survey(spanning 86,000 km2 to depths of 500m) to understand the abundance and distribution of Pacific hake (*Merluccius productus*), the target of the largest finfish fishery along the west coast of the United States. We sampled eDNA in parallel with a traditional acoustic-trawl survey to assess the value of eDNA surveys at a scale relevant to fisheries management. Despite local differences, the two methods yield comparable information about the broad-scale spatial distribution and abundance. Furthermore, we find depth and spatial patterns of eDNA closely correspond to acoustic-trawl estimates for hake. We demonstrate the power and efficacy of eDNA sampling for estimating abundance and distribution and move the analysis of eDNA data beyond sample-to-sample comparisons to management relevant scales. We highlight the value of eDNA for quantitative applications, particularly in data- or resource-limited contexts, and discuss current projects using similar eDNA approaches to understand the distribution of protected species (marine mammals, deep sea corals and sponges) using both species-specific and metabarcoding methodologies.

Acoustic localization of false killer whale (*Pseudorca crassidens*) subgroups in the Hawaiian archipelago

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Information from passive acoustic data can often be useful for complementing visual-based abundance estimation and monitoring efforts, especially with elusive species. This study focuses on false killer whales (*Pseudorca crassidens*) in the Hawaiian archipelago, where three distinct populations of this species can be found, one of which is at high risk of extinction. These animals have been a focus of extensive research effort over the years, and as part of this effort ship-based visual and acoustic surveys have been carried out. Due to their elusive behavior, dispersed aggregations of subgroups over large areas, and potential attraction to the research vessel, biases can be introduced to visual-based abundance estimates. Towed hydrophone arrays are used to aid the monitoring efforts, and often result in many additional encounters beyond what may be seen by the visual team alone. Efficient signal processing methods are needed to localize subgroups using the towed array data to aid in a joint visual-acoustic density estimate or one based on acoustic detections alone. In this study we discuss an automated approach developed to localize multiple subgroups of false killer whales using towed hydrophone arrays. The framework provides an efficient and objective way to localize based on both whistles and clicks among missed and false detections, and is applicable to other species. The presented framework can thus aid future cetacean monitoring and assessment efforts.

Modeling sperm whale distribution using visual and passive acoustic data

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Sperm whales (*Physeter macrocephalus*) are a deep-diving cetacean species protected in U.S. waters. Generally, sperm whale data collected during line-transect surveys include visual observations of whales at the surface and passive acoustic data of vocalizing whales at depth. Current sperm whale population assessments only use visual observations to estimate abundance and examine distribution. However, passive acoustic data contributes additional data points as well as demographic and behavioral information to improve population assessments. Species distribution models (SDMs) provide an analytical structure to incorporate visual and passive acoustic data and include behavioral information when examining sperm whale distribution patterns. We used a generalized additive modeling framework to develop SDMs using both data types with biologically relevant environmental variables to model the distribution of foraging and non-foraging whale groups throughout the Hawaiian Archipelago. The SDMs predicted higher densities of foraging groups in the Archipelago's northwestern region and north of the main Hawaiian Islands of Maui and Hawai'i. Non-foraging groups were predicted to be more uniformly distributed throughout the Archipelago. The best variables for predicting foraging whales included location, temperature at 584 m depth, surface chlorophyll, and the standard deviation of sea surface height, while location and depth predicted non-foraging whales. Additionally, work is underway to evaluate sperm whale acoustic cue rates that may be incorporated into a modified version of the SDMs for acoustic density estimates of sperm whales. Overall, this study contributes methods that incorporate visual observations, passive acoustic data, and contextual information to further our understanding of cetacean distribution patterns.

Using a deep neural network to classify echolocation clicks and identify biogeographic patterns of Pacific white-sided dolphins

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Pacific white-sided dolphins are small delphinids whose distribution spans the northern Pacific Ocean from the Gulf of California to the Sea of Japan. Two genetically distinct stocks overlap along the west coast of North America. However, they are visually indistinguishable and the degree of spatial overlap remains unknown. Here, we use a deep neural network to show that the stocks are acoustically distinct. Previous studies described two different echolocation click types associated with Pacific white-

sided dolphins and hypothesized that they were stock-specific. Our neural network was trained to classify the type A and B clicks based on spectral and temporal properties as described in previous studies. The neural network enabled us to analyze passive acoustic recordings from sites between the Gulf of California and the Gulf of Alaska over multiple years to investigate possible stock-specific trends. The latitudinal occurrence pattern of the two click types supports the stock-specific hypothesis: type A clicks continue to associate with the northern stock distribution, and type B clicks with the southern stock distribution. At long-term monitoring sites in the Southern California Bight, type B clicks were increasingly present during periods of warm water anomalies. This pattern may be an early indicator of future biogeographic shifts in the distribution of Pacific white-sided dolphins and demonstrates the utility of long-term passive acoustic monitoring. The neural network classification method presented here is a novel technique for analyzing passive acoustic data and may be especially useful for studying species that are visually inconspicuous but acoustically distinguishable.

Passive acoustic monitoring for stock assessment: Rice's whales in the Gulf of Mexico

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The newly recognized Rice's whale (*Balaenoptera ricei)* is one of the most endangered marine mammal species worldwide. This species faces a high risk of extinction due to its very small population size and limited distribution in the highly industrialized Gulf of Mexico waters. Fundamental questions about where, when, how often, and why the whales occupy certain habitats need answering to recover this species and protect its habitat. To address these questions, we have developed a multi-scale passive acoustic monitoring program throughout the Gulf of Mexico. These efforts include a focused ship-based Rice's whale ecology study conducted from 2018-2019, with directional sonobuoys deployed to validate species' call types, document call rates, and estimate detection distances. Using this information, we've deployed a long-term moored HARP in their core habitat for 8 years to understand seasonal and interannual occupancy, providing evidence of near-constant year-round occurrence with some seasonal and interannual variability in call detections. During 2021, we deployed a sparse Soundtrap array throughout the core habitat to investigate seasonal movements and spatiotemporal call density patterns. Exploration of their potential broader distribution and frequency of occurrence beyond their core habitat using moored HARPs along the shelf-break shows that they regularly use waters of the northwestern Gulf and produce different call types in this region. Current studies expand this work to the southern shelf-break and deep waters of the Gulf. Combined, these passive acoustic studies provide crucial and timely information for developing critical habitat and recovery plans to save one of the most endangered whales.

An interactive machine learning toolkit for classifying impulsive signals in passive acoustic recordings

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A typical wide-bandwidth passive acoustic seafloor sensor can record tens of millions of impulsive signals produced by biological, anthropogenic, and physical sources each year. Sources include echolocating toothed whales, snapping shrimp, ship propeller cavitation, echosounders, and weather. The volume and variety of detections make manual classification by human analysts unmanageable without in-depth knowledge of the overall acoustic context of each monitoring location. We developed an interactive machine learning toolkit for efficiently detecting and classifying short, highly-variable impulsive signals in large passive acoustic datasets. Modules include a configurable event detector, an unsupervised clustering module for identifying dominant signal categories, a deep learning unit for learning and applying event classes, and a graphical user interface for viewing, correcting and evaluating detectors and classifiers. The goal of the toolkit is to facilitate classification of individual signals to species in very large PAM datasets across sensor types and monitoring locations, and to improve quantitative assessment of these sources. These tools are discussed and illustrated through a series of recent applications ranging from classification of impulsive signals in a half-petabyte passive acoustic dataset collected in the Gulf of Mexico, to identification of fish choruses in

the Channel Islands. Due to their elusive behavior, dispersed aggregations of subgroups over large areas, and potential attraction to the research vessel, biases can be introduced to visual-based abundance estimates. Towed hydrophone arrays are used to aid the monitoring efforts, and often result in many additional encounters beyond what may be seen by the visual team alone. Efficient signal processing methods are needed to localize subgroups using the towed array data to aid in a joint visual-acoustic density estimate or one based on acoustic detections alone. In this study we discuss an automated approach developed to localize multiple subgroups of false killer whales using towed hydrophone arrays. The framework provides an efficient and objective way to localize based on both whistles and clicks among missed and false detections, and is applicable to other species. The presented framework can thus aid future cetacean monitoring and assessment efforts.

Passive acoustic localization and tracking of Rice's whales (*Balaenoptera ricei*) in the northeastern Gulf of Mexico

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In recent years, passive acoustic monitoring has seen substantial advancements as a tool for complementing traditional marine mammal stock assessment methods, benefiting in particular from its ability to cover spatiotemporal scales that would be impractical to achieve using current ship-based or aerial visual surveys. As part of an ongoing project to study the endangered Rice's whale (*Balaenoptera ricei*), moored stations equipped with low-cost passive acoustic recorders have been near-continuously deployed at various sites within the species' core habitat in the northeastern Gulf of Mexico since May 2021. While detecting Rice's whale calls in these data readily provides valuable insight into the species spatiotemporal distribution, estimating whale density requires a better understanding of the species acoustic behavior. Here, we present a method for 2D localization and tracking of vocalizing whales in this dataset. The two key components of this approach are (1) the use of opportunistic sound sources to time-synchronize data across sites given the high clock-drift of these low-cost recorders and (2) the implementation of automated techniques for tracking multiple animals simultaneously amid clutter and missed detections. Analyses of the first four months of data shows promising results for characterizing Rice's whale's acoustic behavior within the context of density estimation.

Diving behavior of beaked whales in the Gulf of Mexico inferred from three-dimensional acoustic tracking using near-seafloor sensors

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The Gulf of Mexico (GOM) is a semi-enclosed large marine ecosystem inhabited by at least 20 cetacean species including several species of beaked whales. Because these long-diving, cryptic species produce high amplitude species-specific echolocation signals regularly throughout their foraging dives, passive acoustic density estimation may be especially effective for them. A critical component of the distance-sampling approach for density is estimating the probability of detecting an acoustic signal given an animal's distance from an acoustic recorder. Accurate detection probability estimation requires detailed population-specific information on subsurface behavior of both individuals and groups of animals. Passive acoustic tracking, an alternative tool to tagging, can be used to study the diving behavior of beaked whales and provides the ability to characterize key aspects of their echolocation clicks, including source levels and beam widths. In the GOM, in 2019 one 4-channel HARP was deployed at Mississippi Canyon (MC) and in 2020 two 4-channel HARPs were deployed at Green Canyon (GC). Echolocation pulses from Cuvier's and Gervais' beaked whales detected on both sensors at GC were used to localize individuals in three-dimensions to estimate distances, study the diving behavior and characterize the signals. Horizontal detection range, received level and estimated source level distributions from localized encounters were compared with a model estimating detection probability using both diving behavior and signal production. At MC (single HARP), detection angles were combined with the distribution of echolocation depths established at GC, making it possible to infer the distribution of detection distances for both species at this site.

Session 3 : Climate Change Impacts

Addressing climate change impacts on protected resources: the PR Climate Initiative
Shannon Bettridge and Dori Dick
NMFS/OPR

Climate change is an ecosystem threat to all species with widespread impacts across all of NMFS' jurisdiction; yet, not all species or regions are being impacted or will be impacted similarly. Our best chance of success is to take actions that will ensure protected species and their habitats remain as integral parts of coastal and ocean ecosystems. We need to be able to adaptively manage our resources in response to climate change and we require science information at the appropriate space and time scales. To address this need, over the last decade the Office of Protected Resources prioritized funding and resources to work on climate change related issues via the PR Climate Initiative. This initiative uses a "climate-smart" approach through the intentional and deliberate consideration of climate change to promote strategies to enable adaptation and resilience of protected species and their habitats to climate-related changes. This presentation will highlight some of the past work of the Initiative and provide an overview of the Strategic Framework developed to guide on-going and future Protected Resources climate activities. It will also explain how the PR Climate Initiative relates to the CEFI and other NOAA efforts.

NOAA Climate, Ecosystems and Fisheries Initiative: An end-to-end decision support system for climate ready resource management
Kirstin Holsman[1] and Roger Griffis[2]
[1]NMFS/AFSC, [2]NMFS/OST

Climate variability and change are significantly impacting marine and coastal ecosystems - and the many people, businesses and communities that depend upon them. These changes affect every part of NOAA Fisheries' mission from protected resources conservation to fisheries management. To effectively prepare for and respond to these changes, decision makers need robust information on likely future conditions and best options for resilience and adaptation. The NOAA Climate, Ecosystems and Fisheries Initiative (CEFI) calls for developing a nation-wide integrated ocean modeling and decision support system to meet these needs. The CEFI System is designed to provide decision-makers at national, regional and local levels with a consistent flow of actionable information to reduce impacts and increase resilience. The System will use state-of-the-art climate, ocean and ecosystem modeling to provide robust future scenarios across multiple timeframes, and actionable advice for climate-informed decision-making. The CEFI System is composed of five inter-linked components that ensure operational delivery of information, services, and feedback for sustained performance and innovation: (1) Regional ocean modeling that provides state-of-the-art ocean forecasts and projections for use in developing climate-informed management advice; (2) Information Hub to provide easy access to model output and other information; (3) Decision Support Teams at each Fisheries Science Center to transform ocean projections into useful products and advice for climate-informed resource management; (4) Decision maker capacity to use climate-informed advice in decision making; (5) Targeted observations and research for continuous validation, innovation and improvement of the system.

Incorporating climate and ecosystem information into fish stock assessments
Kristan Blackhart (NMFS/OST)

Climate-based impacts can have major impacts on fish populations and their ecosystems, the fisheries that rely on them, and the science and management processes built around them. Understanding these impacts and incorporating them into existing assessment processes is a major challenge. Significant computing and modeling advancements have been made in recent years, but to take advantage of these and continue to advance our understanding requires enormous amounts of empirical data inputs and research investments. Despite many challenges, some notable progress has been made in considering climate and ecosystem factors in the fish assessment process. During this talk, I will begin with a 'fish stock assessment 101' discussion, pointing out where climate and ecosystem factors can be incorporated to inform the process. Next, I will provide a summary of the extent that climate and ecosystem factors are currently being incorporated in fish stock assessments. Then, I will close by providing some case studies of how climate and ecosystem factors are being used to inform fish assessments for both data-limited and data-rich stocks.

Marine mammal and sea turtle climate vulnerability assessments within research and management frameworks
Matthew Lettrich (ECS Federal in support of OST)

NOAA Fisheries led the development and implementation of marine mammal and sea turtle climate vulnerability assessments (CVAs), in addition to CVAs for marine fish, marine invertebrates, and salmon. These CVAs provide a baseline understanding of which NMFS-managed populations are vulnerable to climate change, and which life history traits and climate factors drive that vulnerability. The CVA frameworks combine sensitivity/adaptive capacity based on life history traits with exposure based on projected climate and ocean conditions to calculate a climate vulnerability score and relative vulnerability index. These assessments provide managers and researchers with information about climate sensitivity, exposure, and vulnerability at the population-level and summarize results at the regional level to highlight species and populations that are most vulnerable to climate change. This information can be used to focus conservation and management decision-making, inform scenario planning exercises to help identify management actions, identify populations that would most benefit from advanced climate change modeling exercises, and present hypotheses for researchers to test for future study. Incorporating CVA results into future conservation and research life cycles will require additional planning and outreach to ensure the findings are used effectively and appropriately. Here, we explore how CVA results have contributed to conservation and research planning to date (e.g., for marine fishes, invertebrates, and salmon). Marine mammal and sea turtle managers and researchers can find inspiration and guidance in how these other CVAs are being used to support decision making and spur the advancement of our understanding of how climate change impacts marine populations.

Session 4: New Analytical Approaches to Abundance and Risk Assessments

Plenary Talk: NOAA Fisheries Open Science and the 2023 Year of Open Science (YOOS23)
Eli Holmes[1], Mari Williams[1,] Diana Dishman[2], Katie Barnas[1], and Chris Jordan[1]
[1]NMFS/NWFSC, [2]NMFS/WCRO

The White House Office of Science and Technology Policy launched 2023 as the Year of Open Science (YOOS23). The goal of YOOS23 is to “advance national open science policy, provide access to the results of the nation’s taxpayer-supported research, accelerate discovery and innovation, promote public trust, and drive more equitable outcomes” funded by new investments at the federal level. YOOS23 is a culmination of efforts by federal agencies with key drivers being NASA’s Transform to Open Science Initiative and NOAA’s Data Strategic Action Plan. NMFS Open Science supports scientists and decision-makers within NMFS in fulfilling NOAA’s Open Science and Open Data mandates and participating in YOOS23. This involves actively supporting staff in adopting reproducible workflows that improve the delivery of timely, transparent, and accessible data-driven science and decision-making. Such transformation calls for both increased collaboration across offices and regions towards shared scientific data science tasks and expanded support of open science, open data, and open source communities within NMFS. One of the ways that NMFS Open Science has been doing this over the last 2 years is Openscapes Champions cohorts, an 8-week series which helps teams document their current project workflows, re-imagine these using modern reproducible and robust processes, and then begin moving forward toward change. I will show an example using a team who work on the PNW salmonid Viability Reports and Status Reviews. Over the next 3 years, NMFS Open Science will be expanding the Openscapes program but also importantly expanding support for skill development and training opportunities along with expanded technical help and cloud infrastructure access for teams and staff. The core mission of NMFS Open Science is to support staff with empathy, kindness and inclusion to authentically address the (many) barriers NMFS staff face in adopting Open Data and Open Science.

Using the NOAA Fisheries Integrated Toolbox to advance open science for protected species
Kathryn Doering (OST)

Software-based tools are a critical component of the scientific work that NOAA Fisheries scientists do. Many scientists develop and use code for their own work tasks. However, most code is never seen except by the primary author or work group, even though these tools may be applicable to other groups. The NOAA Fisheries Integrated Toolbox (FIT) aims to promote sharing of software solutions within the agency to reduce duplication, enhance workflows, and improve scientific results. This presentation will introduce the latest features of the FIT and highlight what is currently available in the toolbox with a focus on tools relevant

for protected species science. In addition, this presentation will cover how to share tools via the toolbox. Through the FIT, we can advance open science at NOAA Fisheries together and improve the quality of our science-based products.

Forecasting bycatch hotspots using multivariate random forest machine learning
Kelly Soluri and Elizabeth Babcock
University of Miami

The incidental take of nontargeted species, known as bycatch, has shown to have negative long-term effects on marine ecosystems and their dependent populations by accidentally catching or killing top predators, fauna with slow reproductive capacity, spawning individuals, and endangered species. Predicting areas of concentrated bycatch rates has the potential for better understanding of correlated variables in bycatch as well as informing avoidance strategies to mitigate it. Random Forest (RF) models have been shown to be an exceptional tool in classification and regression for forecasting problems due to its powerful predictive capability in ensemble nonparametric learning and imputing missing data. Whereas, single species bycatch analyses usually use generative
additive models (GAMs) to model nonlinear relationships, a random forest is more flexible and powerful to viewing bycatch hotspots as a multispecies problem with a larger range of variables. Using more modern statistical methods to investigate fisheries research, this study identifies bycatch hotspots in the Gulf of Mexico and the taxonomic and trait-based compositions of these areas. It investigates the correlation of biological traits, environmental conditions, and bycatch density as predictor variables to better model where these bycatch hotspots may occur in the Gulf by building a random forest to predict catch per unit effort of bycatch to select for hotspots.

Life history and climate change matter
Yan Jiao[1], Can Zhou[1], Rujia Bi[1], and Joan Browder[2]
[1]Virginia Polytechnic Institute and State University, [2]NMFS/SEFSC

Seabird bycatch and mortality are long-time conservation concerns. NOAA\SEFSC's Pelagic Observer Program (POP) has monitored the US Atlantic pelagic longline (PLL) fishery since 1992, providing opportunities to study PLL seabird bycatch in an area of high seabird diversity. A Virginia Tech-SEFSC collaboration assesses bycatch annually and addresses important ecological and fisheries questions such as where and when does high bycatch risk (hot spot) occur. Do they vary over years? How might bycatch risk vary among species? Major challenges included the high percentage of zero observations in POP seabird bycatch, only 50% identified to species level, and the already low abundance of endangered seabirds in this region, reducing likelihood of documenting rare species captures should they occur. We present our recent study progress and show how we are overcoming obstacles and answering important ecological questions through advanced quantitative methods with a methodologies developed by our team that evolved over time. Evolution of methods led to a Bayesian spatial-temporal random effect model to study climate effects and species-specific state space Bayesian models to study the bycatch risk effect from species attributes, space-time variables, and species associations. Our study found that the mid-Atlantic bight and neighboring south Atlantic bight and Northeast coast areas impose high bycatch risk, but hot spots vary among years related to climate changes. Bycatch risk varies among species, and ecological traits can improve bycatch estimation and provide species-specific risk analysis for all potentially affected seabird species in this region.

Management strategy evaluation (MSE) for protected species
Cassidy Peterson[1], Melissa Cook[1], Jennifer Lee[2], Joseph Pfaller[1], Susan Piacenza[3], Paul Richards[1], Christopher Sasso[1], and John Walter III[1]
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Management strategy evaluation (MSE) is a framework, pioneered by the International Whaling Commission (IWC) beginning in 1974, in which the full management or conservation process is tested through closed-loop simulation. The management or conservation procedures include specification of (1) data collection and quality, (2) species assessment, (3) control rules that dictate how conservation protocols adapt to changing population status, and (4) the implementation of conservation protocols. Conservation procedures are applied to a suite of operating models, each representing a unique hypothesis of the current and

future dynamics of the population. Conservation procedure performance is measured based on the conservation objectives of the population, identified by stakeholder input and/or from existing information (e.g., species management plans). Because MSEs thoroughly address each component of the conservation process, MSEs can be used to measure the impact of:

- Data collection protocols, including sampling methods, design, data quality, and development of novel data collection schemes;
- Species assessment methods and specifications, including model and/or non-model-based methods of determining population status;
- The control rules that adjust conservation measures and/or the type of conservation measures (e.g., limit bycatch, implement closed areas);
- Whether conservation procedures are robust to uncertainties in the population, both current (e.g., uncertain life history parameters, level of anthropogenic interactions) and future (e.g., impacts of marine development and climate change).

MSEs can also help us to prioritize future research by identifying which uncertainties have the greatest impact on conservation success. With this presentation, we discuss MSEs and the value they can bring to protected species.

A one-dimensional spatial capture-recapture model to estimate abundance of a coastally distributed population

K. Alexandra Curtis[1], John Calambokidis[2], Katherina Audley[3], Melvin Castaneda[4], Joëlle De Weerdt[5], Andrea Jacqueline García Chávez[3], Frank Garita[6], Pamela Martínez-Loustalot[7], Christian Daniel Ortega Ortiz[8], Jose D. Palacios-Alfaro[6], Betzi Pérez[6], Ester Quintana-Rizzo[9], Raúl Ramírez Barragan[3], Nicola Ransome[4,10], Kristin Rasmussen[6], Jorge Urbán R.[7], Francisco Villegas Zurita[11], Kiirsten Flynn[2], Ted Cheeseman[12], Jay Barlow[1], Debbie Steel[13], and Jeffrey Moore[1]
[1]NMFS/SWFSC, [2]Cascadia Research Collective, [3]Whales of Guerrero, [4]Proyecto Megaptera El Salvador, [5]Vrije Universiteit Brussel, and Association ELI-S, [6]Panacetacea, [7]Universidad Autónoma de Baja California Sur, [8]Universidad de Colima, [9]Simmons University, [10]Murdoch University, [11]Universidad del Mar, and Yubarta Ecoturismo, [12]Southern Cross University, and Happywhale, [13]Oregon State University

Many marine mammal populations exhibit some spatial fidelity within their range, leading to individual heterogeneity in capture probability with space that can bias mark-recapture assessment when sampling is uneven in space and time. Humpback whales (*Megaptera novaeangliae*) wintering off Central America and Southern Mexico show evidence of coarse spatial fidelity within this extensive region. Photo-identification effort in this area has been highly variable in time and space. We developed a one-dimensional, closed, spatial capture recapture (SCR) model to estimate the abundance of this coastally distributed population. We explore population estimates resulting from the application of this model, both with and without an effort covariate, to photo-ID data from recent years, including the 2021-2022 winter seasons, for which effort was greatly amplified as part of the SPLASH-2 project to reassess North Pacific humpback whales. Results are compared to equivalent non-spatial mark-recapture estimates. Given high anticipated sex heterogeneity in photo-identification rates in wintering areas, we also developed a method to quantify sex heterogeneity from biopsies taken in the summer feeding areas and photo-ID data from the wintering area and estimate a simulation-based correction factor for the population estimates.

Incorporating telemetry data into mark-recapture analysis: case study of false killer whale (*Pseudorca crassidens*) abundance estimation in the Main Hawaiian Islands

Janelle Badger[1], Devin Johnson[1], Robin Baird[2],Amanda Bradford[1], Erin Oleson[1], and Michaela Kratofil[2]
[1]NMFS/PIFSC, [2]Cascadia Research Collective

Sparse and spatially-biased data collected from monitoring programs of rare or inaccessible species may be difficult to model, standardize across years, and incorporate into a management framework. Integrating data types may provide information to adequately estimate parameters of interest. Currently, surveys for the insular population of false killer whales (*Pseudorca crassidens*) around the main Hawaiian Islands are opportunistic in nature and almost exclusively conducted on leeward sides of the islands where sea conditions are more workable. This sampling bias limits the ability to assess population abundance and trends of this endangered population. Here, we used 23 years (1999–2021) of a longitudinal photo-ID mark-recapture dataset containing 202 known false killer whale individuals, who preferentially associate in four social clusters, along with satellite telemetry data from 44 individuals to fit a quasi-spatial mark-recapture model that uses the information from the telemetry data

to address sampling biases. Utilization distributions (UDs) were estimated from each satellite tag track and then combined into social cluster UDs. The interaction between these UDs and kernel densities of yearly survey efforts was incorporated into a multi-state Jolly-Seber open population model. Simulation experiments indicate that cluster-level space use is adequately defined for the majority of individuals, and that this method can provide more accurate and precise estimates of abundance than conventional models. Future accommodation of additional data types, such as passive acoustics, into this framework can further integration of disparate data sets collected in monitoring programs to enhance our understanding of elusive populations.

Integrated modeling of bearded seal densities
Paul Conn, Brett McClintock, Josh London, Jay Ver Hoef, and Catherine Berchok
NMFS/AFSSC

A variety of data sources provide information on bearded seal abundance and distribution in the Bering, Chukchi, and Beaufort (BCB) Seas. For instance, springtime aerial surveys have produced estimates of abundance and spatial distribution; seals fitted with satellite-linked time-depth recorders provide year-round information about location and habitat preferences; close-kin mark-recapture models fitted to genetic data from Alaska Native subsistence harvests provide total abundance estimates; and passive acoustic detections of bearded seals provide continuous, spatially explicit information on presence/absence of vocalizing seals. In this talk, we describe a modeling framework for combining these data sources to come up with seasonal "best available science" maps of bearded seal density throughout the BCB. In addition to basic scientific interest, such maps should prove useful to managers for calculating takes associated with anthropogenic activities under the MMPA and other goals relative to marine spatial planning. Such maps can be constructed using average habitat conditions or with current habitat covariates under a "nowcasting" framework.

The multistate Langevin diffusion: integrating multiple data types for inferring behavior-specific habitat selection and utilization distributions
Brett McClintock and Michelle Lander
NMFS/AFSC

Animal population studies often use tracking data to quantify space use and habitat selection, but they typically do not account for the different behaviors (e.g., foraging, migrating, nesting) that link life-history requirements to particular habitats. Ignoring behavior limits our ability to understand why animals use certain habitats, and this represents a missed opportunity that can result in erroneous inferences and ineffective management decisions. Despite a clear need and desire, current approaches for extracting these types of inferences from tracking data are limited. We develop a habitat-driven Langevin diffusion for animals that exhibit distinct movement behaviors, thereby providing a novel single-stage statistical method for inferring behavior-specific habitat selection and utilization distributions in continuous time. The model can be customized, fitted, assessed, and simulated using R package momentuHMM. Additional data streams (e.g., dive activity) can be readily integrated to help distinguish movement behaviors with similar horizontal trajectories (e.g., "resting" vs. "foraging"). We highlight some of the potential advantages and challenges of the model through a detailed case study where we integrate Steller sea lion (*Eumetopias jubatus)* location and conductivity data collected in the Aleutian Islands of Alaska. Our model identified distinct movement behavior modes typically associated with this marine central-place forager and, unlike previous analyses of these data, found foraging-type movements to be associated with steeper offshore slopes characteristic of the continental shelf, submarine canyons, and seamounts that are believed to enhance prey concentrations. As certain behaviors are often more relevant to specific conservation or management objectives, practitioners can use our model to help inform the identification and prioritization of important habitats.

A Computationally Flexible Approach to Population-Level Inference and Data Integration
Devin Johnson[1], Brian Brost[2], and Mevin Hooten[3]
[1]NMFS/PIFSC, [2]NMFS/AFSC, [3]University of Texas at Austin

Population-level inference from complex individual models and integration disparate data sets have become increasingly challenging in modern ecological investigation. For example sophisticated biologging technology has necessitated fitting complex

models to individual animals, however, for management and risk assessment we need information at the population level. For other data integration the individual data sets are also complex and bespoke code is often necessary for fitting even when individual models for the separate data sets can be fitted with standard software. In both of these situations, the full model can be formulated as a Bayesian Hierarchical Model (BHM). We demonstrate a multistage method for making inference at all levels of a Bayesian hierarchical model (BHM) using natural data partitions to increase efficiency by allowing computations to take place in parallel form using software that is most appropriate for each data partition. In the second stage, the model results are recombined using normal approximations and meta-analytic techniques. The resulting inference approximates the inference obtained from fitting the full BHM at once. We demonstrate this method by making population-level inference for space-use of false killer whales in the main Hawaiian Islands.

Session 5: Impacts From New and Increasing Marine Development

Plenary Talk: TBD
Lance Garrison
NMFS/SEFSC

Modeling protected species distributions and habitats to inform siting and management of pioneering ocean industries

Nicholas Farmer[1], Jessica Powell[1], Lance Garrison[2], James Morris[3], Jr., Kenneth Riley[4], Melissa Soldevilla[2], Jenny Litz[2], Joel Ortega-Ortiz[5], Gina Rappucci[5], Paul Richards[2], Lisa Wickliffe[6], Jonathan Jossart[6], Jonathan MacKay[6], Alyssa Randall[6], Gretchen Bath[6], Penny Ruvelas[7], Laura Gray[8], Dana Bethea[1], Jennifer Lee[1], Wendy Piniak[8], Robert Hardy[8], Kristen Hart[9], Chris Sasso[2], Lesley Stokes[2], Mariana Steen[10], and Tershara Matthews[10]
[1]NMFS/SERO, [2]NMFS/SEFSC, [3]NOS NCCOS, [4]NMFS/Office of Aquaculture, [5]CIMAS, University of Miami RSMAS at SEFSC, [6]CSS - NOS NCCOS, [7]NMFS/WCRO, [8]NMFS/OPR, [9]USGS, [10]BOEM

Ocean planning provides managers opportunities to evaluate tradeoffs among environmental, social, economic, cultural, and management considerations in the development of place-based activities. Early integration of mobile protected species considerations into ocean planning reduces the likelihood of future resource conflict. Transparency and problem-solving with potential conflicts in mind in the early planning stages can help minimize contention and increase efficiency during permitting, and hopefully also minimize litigation challenges during project design and implementation. Case studies are presented for Gulf of Mexico aquaculture and wind energy planning. To support ocean planning for these large-scale activities, a generalized scoring system for protected species status and trends that facilitates relative comparison between species was developed. The cumulative vulnerability for species whose distributions overlap areas under consideration for leasing was calculated as the product of scores within cells and integrated into the broader ocean planning process. This generalized approach proactively reduced siting conflicts, is directly applicable to other areas under consideration within the U.S., and is transferable to a variety of ocean spatial planning applications.

Movements of leatherback sea turtles (*Dermochelys coriacea*) suggest new foraging locations and interactions with offshore windfarms along the Atlantic Coast of the United States

Mitchell Rider[1], Heather Haas[2], Larisa Avens[3], and Chris Sasso[3]
[1]University of Miami, RSMAS, [2]NMFS/NEFSC, [3]NMFS/SEFSC

Understanding the movement ecology of migratory species is imperative as their large geographic distributions make them susceptible to a myriad of anthropogenic threats. This is especially true for leatherback sea turtles (*Dermochelys coriacea*) that face various threats across all stages of their migration cycle. With the increasing number of offshore windfarms along the Atlantic coastline of the U.S., there is a need to understand the potential overlap between leatherback high-use areas and offshore windfarm leases. Satellite telemetry data from 53 leatherbacks tagged between 2017 and 2022 off the coasts of Massachusetts and North Carolina were analyzed with kernel density estimations and move persistence models to determine space use and behavioral states, respectively, along the U.S. Atlantic coastline. Leatherbacks displayed high use of the Southern

New England (SNE) and Mid-Atlantic Bight (MAB) regions during the summer and fall and were observed to move off the continental shelf into the Gulf Stream during the fall and winter. Move persistence models indicated that leatherbacks were displaying foraging-like behavior in SNE between Nantucket and Long Island Sound and in the MAB between Cape Hatteras, North Carolina, and the mouth of the Chesapeake Bay. In addition to highlighting a previously undocumented foraging area in the MAB, our results indicated considerable overlap between offshore windfarm leases and both leatherback high-use and foraging areas. Continued monitoring of this population is critical to understanding if and how leatherbacks may alter their movement patterns in relation to windfarm implementation and operation.

Understanding oil spill effects on sea turtles: lessons learned and persistent challenges
Brian Stacy
NMFS/OPR

The Deepwater Horizon (DWH) oil spill occurred over a decade ago and spilled an estimated 134 million gallons of oil into the Gulf of Mexico over 3 months. The spill response and subsequent Natural Resource Damage Assessment were the most comprehensive and complex ever conducted for sea turtles. Every life phase of sea turtle was affected, from eggs, hatchlings, and adult females on oiled nesting beaches, to neritic juveniles and adults in foraging areas on the continental shelf, to surface-pelagic juveniles in offshore habitat. Vessel-based wildlife operations guided by aircraft were used to locate oiled Sargassum and convergence zones to rescue and document oiled surface-pelagic juvenile turtles. Aerial surveys were used to sight larger juveniles and adults. All surveys were conducted using methods that allowed extrapolation to estimate abundance of sea turtles within the spill area. Direct observations, including veterinary assessments and field observations, were used to characterize the effects of the spill on sea turtles and were coupled with environmental information, abundance data, and toxicological risk assessment to estimate the numbers of turtles killed by the spill. For shoreline effects, additional losses were quantified based on deterrence of nesting females by response operations and required translocation of eggs from nests under threat from the spill. Losses of sea turtles as a result of the DWH spill ultimately were estimated to have been on the order of thousands to tens of thousands, depending on life stage. Although the DWH oil spill was historic in scale, this spill heightened general awareness of the threats posed by these pollution events to sea turtles and other wildlife, and the importance of timely spill response conducted in a manner that supports damage assessment. Spills that can be especially injurious to sea turtles in terms of magnitude of effect include those that impact nesting beaches during periods of reproductive activity, offshore habitat frequently by small juvenile turtles, and high-use foraging areas. Understanding the impacts of oil spills on sea turtles may require a multifaceted approach that uses a combination of animal survey and tracking methods, health assessment, toxicological studies, and environmental data. Assessments benefit from robust baseline information with which to study possible spill effects; however, such information is often limited or unavailable for many areas impacted by oil spills, particularly in the Gulf of Mexico. There are significant challenges to understanding the effects of oil spills on sea turtles due to their cryptic nature as ocean-going reptiles, complex life histories, long life spans, and slow maturation. Noteworthy examples that would benefit from innovation and additional study include difficulty in estimating sea turtle abundance within response zones and limited understanding of chronic or sublethal effects of oil exposure.

Diving deeper into the oil spill: Potential shifts in habitat use and foraging ecology of sperm whales after the DeepWater Horizon oil spill
Clarissa Teixeira[1], Bruce Mate[1], Ladd Irvine[1], and Genyffer Troina[2]
[1]Oregon State University, [2]University of British Columbia

The 2010 Deepwater Horizon explosion discharged millions of barrels of oil and chemical dispersants in the Gulf of Mexico (GoM). Yet, the long-term consequences on sperm whales (Physeter macrocephalus) inhabiting the GoM remain uncertain. Here, we combine bulk-skin isotopic data obtained from free-ranging sperm whales before (n = 71) and after (n = 30) the oil spill to assess potential shifts in habitat use and diet. Our preliminary analyses suggest that whales foraged in the same areas between these two periods, as indicated by a lack of difference in □13C values, while there appeared to be a potential shift in trophic level, as indicated by significantly higher □15N values after the oil spill. Isotopic mixing models are being implemented to identify any dietary changes between periods. We will then combine these data with individual amino acids, as well as satellite tracking

and diving data from the same individuals. The outcomes of this study have the potential to reveal how sperm whales responded to the oil spill, thereby improving our capacity to predict changes in habitat use related to future environmental disturbances in the GoM. Doing so can help sharpen conservation actions and inform the mitigation and recovery efforts for current and future acute and chronic stressors that might affect sperm whales directly or indirectly through components of their food web, thereby safeguarding their ecological role for years to come.

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Session 6: Poster Session

Assessing patterns of courtship at suspected grouper spawning aggregations using passive acoustics

Zoie Bright[1], Tim Rowell[2]
[1]Hollings Scholar at NEFSC, [2]NMFS/NEFSC

Understanding the spatial and temporal dynamics of grouper spawning aggregations allows for the identification of periods of reproduction, vulnerability, and management priority. Within transient aggregations, regional populations are confined to a small area, which may increase the probability of incidental fishing mortality and disruptions to spawning behaviors and output. As many species of groupers produce courtship associated sounds when aggregated, passive acoustic data collected from December 2021 to February 2022 at Western Dry Rocks in Florida Keys National Marine Sanctuary were analyzed to identify sounds produced by black (*Mycteroperca bonaci*), Nassau (*Epinephelus striatus*), and red grouper (*E. morio*) and infer potential spawning activity. Spectrograms were manually reviewed and targeted sounds, e.g., courtship, non-courtship, non-target species, and vessels, were noted. Grouper sounds were present throughout the dataset, but there were increases in the prevalence of courtship associated sounds around the full moons in the months analyzed, suggesting that the site supports multi-species grouper spawning aggregations during these periods. Vessels were present throughout the study further indicating possible negative interactions between aggregated fishes and fishers despite current regulations that permit fishers to catch and release grouper during spawning periods. Additional work should be conducted to further investigate the entire spawning season and corroborate reproductive activity at the site with ancillary methods. Given the importance of grouper to the ecological and economic stability in the Florida Keys coupled with overlap in vessel activity, additional management options should be considered to ensure undisrupted spawning can be maximized to sustain grouper populations in the region.

NOAA Fisheries National Seabird Program: 5-Year Strategic Plan update

Annette Henry[1], Lee Benaka[2], Joan Browder[3], Shannon Fitzgerald[4], Tom Good[5], Trevor Joyce[6], Mi Ae Kim[7], Ryan Silva[8]
[1]NMFS/SWFSC, National Seabird Program, [2]NMFS/OST, [3]NMFS/SEFSC, [4]NMFS/ AFSC, [5]NMFS/NWFSC, [6]Ocean Associates - SWFSC, [7]NMFS/Office of International Affairs, Trade, and Commerce, [8]NMFS/GARFO

NOAA Fisheries National Seabird Program (NSP) is a cross-cutting group of managers and scientists who work domestically and internationally to protect and conserve seabirds. Our activities are guided by statutes and emerging agency policies and priorities that form the basis for NSP's two overarching goals: 1) Monitor and Mitigate Bycatch, and 2) Promote Seabirds as Ecosystem Indicators. The NSP produced a 5-year Strategic Plan covering years 2020-2024 based on input from NSP representatives, as well as NOAA's National Ocean Service, U.S. Fish and Wildlife Service, Bureau of Ocean Energy Management, and regional fishery management councils. The Plan has five strategic goals:

1. Monitor and estimate seabird bycatch;
2. Mitigate seabird bycatch;
3. Strengthen key partnerships;
4. Promote seabirds in advancing ecosystem-based fisheries management; and
5. Elevate awareness of and support for the NSP.

A steering committee formed in 2020 to implement the Plan has made significant progress toward defining and implementing actions toward the Plan's goals and milestones. This includes following up on new ideas, tracking current projects, collaborating with Federal and State agencies and NGO groups, and maintaining a strong leadership role in international seabird conservation, especially with bycatch. As we complete the third year of the Plan, the steering committee continues to Identify issues pertaining to the conservation of seabirds and advancing best practices to minimize seabird bycatch. We are also looking ahead to a new 5-year strategic plan to guide the work of the NSP beyond 2024.

Quantifying detection areas of Rice's whale calls in the Gulf of Mexico using sound propagation modeling

Ashley Cook[1], Michael Brown[1], Melissa Soldevilla[2], Ludovic Tenorio[1], and Heloise Frouin-Mouy[3]
[1]CIMAS, University of Miami RSMAS at SEFSC, [2]NMFS/SEFSC, [3]Cooperative Programs for the Advancement of Earth System Science, University Corporation for Atmospheric Research at SEFSC

Rice's whales (*Balaenoptera ricei*) are one of the most endangered species with fewer than 100 individuals in their population and a habitat primarily limited to the northeastern Gulf of Mexico. Understanding how they occupy this core habitat throughout the year is crucial to develop recovery actions for their conservation, and fixed passive acoustic monitoring methods are an ideal way to monitor whale occurrence year-round. In 2021, passive acoustic monitoring was extended from 1 site to 18 sites that nearly cover the animals' core habitat to improve understanding of variability in call occurrence and seasonality throughout this area. Ambient noise levels and sound propagation conditions in the ocean vary over time and space, and this variability in the acoustic environment greatly affects the detectability of marine mammal vocalizations. Therefore, to ensure accurate assessment of Rice's whale call occurrence and seasonality across sites, site-specific and time-varying environmental effects must be quantified to account for varying detection areas over space and time. In this study, the open-source parabolic equation acoustic propagation model is used to model transmission loss of Rice's whale long-moan calls and downsweep pulse sequences as a function of range and depth at 15-degree intervals around each recorder in the 18-element array. Relative detection areas are estimated monthly at each site by combining transmission loss, source level data, and ambient noise levels to account for variability in probability of detection throughout the array from May 2021-May 2022. This information will enhance assessment capabilities and fill in data gaps for the Rice's whale.

International partnership for the restoration of coral reefs in the Arrecife de Puerto Morelos National Park (APMNP), Mexico

Marina Garmendia[1], Claudia Padilla[2], and David Gilliam[1]
[1]Nova Southeastern University, [2]Mexican National Fishing Institute (INAPESCA)

The Mesoamerican Reef (MAR) is the second largest coral reef track in the world. The Arrecife de Puerto Morelos National Park (APMNP) has been a MAR marine protected area in Mexico since 1998 and includes over 20 km of coral reef. This study aims to address stony coral decline in APMNP by implementing a coral restoration project using micro-fragmentation techniques. Micro-fragmentation is a recently developed practice consisting of cutting whole coral colonies into ~2 cm fragments, which optimizes growth, increases genetic diversity, and facilitates reproduction. Colonies from *Montastraea cavernosa*, *Orbicella faveolata* and *Orbicella annularis* will be collected in APMNP. These three slow-growing species were greatly impacted by the Stony Coral Tissue Loss Disease (SCTLD) outbreak first reported in the summer of 2018 in the Mexican Caribbean. Collected colonies were micro-fragmented using a diamond band saw and glued onto plugs, for a total of 1440 micro-fragments. Fragments were outplanted into 6 reef sites previously affected by SCTLD using cement bases. Overall survival, growth, and health conditions (predation/disease) will be compared between species and sites. This project is a partnership with Coralisma, a non-profit organization dedicated to the restoration, preservation, and education of coral reefs in the Riviera Maya, the Mexican National Fishing Institute (INAPESCA), and the Coral Reef Restoration Assessment and Monitoring Laboratory (CRRAM) Nova Southeastern University. The goals of this partnership are to promote the exchange of ideas, evaluate the efficacy of micro-fragmentation in the MAR, and to increase the abundance of reef building species as part of restoration efforts.

Using passive acoustics to study endangered baleen whales off the coast of Senegal

Cullen Hauck[1], Danielle Cholewiak[2], and Salvatore Cerchio[3]
[1]Hollings Scholar at NEFSC, [2]NMFS/NEFSC, [3]African Aquatic Conservation Fund

Marine mammals use vocalization as a primary means of interacting with their environment and engaging in social activities such as foraging, intra-group communication, and courtship. Passive acoustic monitoring enables us to study these behaviors as well as species occurrence and distribution using sound received on stationary receivers. Recently, a new monitoring program was initiated in the eastern North Atlantic off the coast of Senegal, an area that may include humpback whales (*Megaptera novaeangliae*) from the endangered Cape Verde/West Africa distinct population segment. Using six months of recordings taken from receivers deployed at the head of the Dakar Canyon, this study seeks to document the distribution of humpback whales and the other baleen whale species in this ecologically critical habitat. Acoustic data were auditorily and visually analyzed in Raven Pro version 1.6.3 using spectrograms showing frequency (0.0 to 500.0 Hz) and amplitude on a temporal scale. Characteristic vocalization signals were identified from prior studies and published literature. The cetacean species that were readily identifiable in the first dataset spanning early June to early November 2021 included humpback, sperm (*Physeter macrocephalus*), blue (*Balaenoptera musculus*), and killer whales (*Orcinus orca).* Furthermore, the presence of other cetacean signals, including possible Omura's (*Balaenoptera omurai*), Bryde's (*Balaenoptera brydei*) whale song, and unidentified small odontocete signals suggest that species diversity exceeds what our current findings reveal. These results stress the importance of West Africa as habitat for large whale species while also underlining the need for more exhaustive studies documenting cetacean stock structure and distribution in the region.

Advances in acoustic telemetry informs on habitat use, movement ecology, and commercial fisheries bycatch risk of endangered smalltooth sawfish

Andrea Kroetz[1], Dean Grubbs[2], and John Carlson[3]
[1]CIMAS, University of Miami RSMAS at SEFSC, [2]Florida State University Coastal and Marine Laboratory,[3]NMFS/SEFSC

At the time of ESA listing in 2003, little was known about smalltooth sawfish ontogenetic shifts in habitat use and movement ecology. Critical Habitat was designated for small juvenile sawfish (<2 m total length), however, it remains to be identified and a recovery priority for larger juveniles (>2m) and adults (>3.4 m). Additionally, accurate assessment of habitat use and any threats associated with the areas they inhabit is needed for all life stages. Acoustic telemetry is a novel way to collect long-term data on habitat use and movement patterns and has been implemented since 2016 with 109 sawfish internally tagged. This technology

has provided fine-scale movement data of small juveniles, indicating they migrate over greater distances than previously documented. Large-scale migrations up both Florida coasts have been observed in larger sawfish and high-use habitats have been identified with potential Critical Habitat implications. Additionally, this technology has allowed for the identification of potential bycatch risk in the shrimp trawling commercial fishery, which has management implications. Acoustic telemetry has significantly improved what we know about sawfish movement and habitat use across life stages and has aided in the identification of threats associated with high-use areas of this endangered species. This presentation addresses the session theme in that acoustic telemetry is a tool being used to address and fill data gaps in monitoring relative abundance, distribution, and habitat use of smalltooth sawfish that has and will continue to inform on key science, management questions, and recovery of the species.

Monitoring and restoration of ESA-listed coral species on Florida Reefs

Mark Ladd[1], Dana Williams[2], Allan Bright[2], Kathryn Grazioso[2], Dylan Orcutt[2], and Sophia Ippolito[2]
[1]NMFS/SEFSC, [2]CIMAS, University of Miami RSMAS at SEFSC

The Coral Research and Assessment Lab has been monitoring the population of Acropora palmata in the Upper Florida Keys since 2004. The main goals of our monitoring program are to (1) quantify changes in the population of A. palmata, (2) identify drivers of population trends, and (3) provide information to inform management on relevant timescales. Here, we document declines in the abundance and genotypic diversity of Florida's Acropora palmata population captured by our long-term monitoring program in the Upper Florida Keys, and the biotic and abiotic drivers behind these dynamics. Second, we focus on our field-based research geared towards supporting the restoration of ESA-listed and other protected coral species, including results from field experiments testing the role of colony density, arrangement, and genotypic diversity on the growth and survival of outplanted A. palmata colonies. Lastly, we showcase our coral spawning work that generates unique genotypes of numerous protected coral species to support population recovery initiatives and allows us to conduct research using our new land-based experimental tank systems.

Foraging ecology of Common dolphins (*Delphinus delphis*) in the Northwest Atlantic

Alexander Reulbach[1] and Frederick Wenzel[2]
[1]Hollings Scholar at NEFSC, [2]NMFS/NEFSC

Despite the protected status and importance of the Common dolphin (*Delphinus delphis*) as a marine predator within the Northwest Atlantic, its foraging ecology is still poorly understood. Common dolphins in this region have historically been located in offshore waters, but warmer water temperatures due to climate change have allowed for an expansion of their range into inshore waters. The present study utilized hard part analysis from the contents of 36 bycaught Common dolphin stomach samples, collected over 28 years (1993-2021), to obtain a greater understanding of their foraging ecology in the region. Depending on where the stomach samples were obtained, they were categorized as either inshore (n = 20) or offshore (n = 16). This division was essential in understanding how differences in habitat results in differences in foraging ecology. Stomach content analysis indicates that cephalopods and small fish species, including Silver hake and Atlantic butterfish, dominate the inshore diet. Myctophids, including Madeira's lanternfish and Bermuda lanternfish, dominate the offshore diet. A wide range of prey species was found within the stomach samples at both the inshore (n = 17) and offshore (n = 15) locations. The significant difference in foraging ecology between locations and the large variety of prey species consumed at both locations suggests that Common dolphins are opportunistic predators. Common dolphin foraging ecology is dictated by variation in the regional composition of abundant prey species. These results allow for targeted management of important prey species to ensure better protection of the Common dolphin within the Northwest Atlantic.

Using eDNA to measure marine vertebrate diversity from Cape Cod to Cape Hatteras USA

Emily Speciale[1], Michael Jech[2], Yuan Liu[2], and Richard McBride[2]
[1]Hollings Scholar at NEFSC, [2]NMFS/NEFSC

Environmental DNA (eDNA) metabarcoding is a novel approach for assessing biodiversity in marine habitats. How much water to collect for eDNA sampling is a fundamental methodological question that may have significant implications for balancing the

identification of all taxa in the sample with the cost/time of filtrating and preparing the sample. In this study, we identified an optimal filtration volume for Niskin bottle sampling when filtering seawater for eDNA multiple species detections using common eDNA mitochondrial markers. Samples were collected from the NOAA Research Vessel Gordon Gunter in fall 2019, which surveyed the continental shelf and slope habitats from North Carolina to Massachusetts. eDNA samples of 1, 2, and 3 L were filtered from various locations at multiple depths. Significant differences in species richness (SR) were found between paired samples of 1 and 2 L ($p = 0.00055$) and 2 and 3 L ($p = 0.0095$). Although SR increased with increased sampling volume from 1 to 3 L, average filtration time also increased, leading us to choose 2 L as the optimal sampling volume. Using 2 L samples, we found that SR and species evenness were significantly correlated to relative depth, with higher SR and Shannon-Wiener Indices near the seabed ($p = 0.0017$; $p = 0.0025$). SR was also significantly correlated to longitude, with SR decreasing further from the coastline ($p = 0.0055$). Furthermore, several protected marine mammals were detected, including three species of baleen whales, at least six species of toothed whales, and two species of seals.

Examining fine-scale population genetic structure of common bottlenose dolphins (*Tursiops truncatus*) in North Carolina using next-generation RAD-seq data

Nicole Vollmer[1], Lynsey Wilcox[2], Antoinette Gorgone[1], Aleta Hohn[1], Andrew Read[3], Eric Zolman[4], and Patricia Rosel[2]
[1]CIMAS, University of Miami RSMAS at SEFSC, [2]NMFS/SEFSC, [3]Duke University Marine Laboratory, [4]National Marine Mammal Foundation

In the waters of North Carolina on the U.S. east coast, four management stocks of common bottlenose dolphins (*Tursiops truncatus*) occur, with delineations largely based on photo-identification and satellite telemetry data. Two stocks remain primarily within estuarine habitats throughout the year, and two inhabit coastal waters and are thought to make broadscale migratory movements in and out of state waters. Thus, the spatio-temporal overlap of these four stocks in NC varies seasonally, creating a complicated stock structure where boundaries are difficult to identify, and the demographic independence among populations is not well-understood. Furthermore, incidental mortality and serious injury of dolphins occurs in some fisheries in NC, but the spatio-temporal overlap makes it difficult to assign mortalities and characterize their impact on each stock. Using biopsy samples from 142 individuals, the genetic population structure of dolphins in these waters was investigated using next-generation molecular sequencing techniques and a reference genome-based alignment. Using a highly informative data set containing over 6,000 single nucleotide polymorphism (SNP) markers, Bayesian structure analysis identified four significantly differentiated populations (overall $FST = 0.03$, $p < 0.0001$). However, the distributions of these populations do not align well with the currently delineated stocks, and genetic data support the presence of three populations in estuarine waters of NC. An improved understanding of the underlying population structure of common bottlenose dolphins in these waters will provide a better characterization of stock distribution and support more accurate assignment of mortality, which is imperative for successful conservation and management of this species.

Environmental DNA assay for detection of the rare Rice's whale in the Gulf of Mexico

Lynsey Wilcox[1], Nicole Vollmer[2], Laura Aichinger Dias[1], Anthony Martinez[1], and Patricia Rosel[1]
[1]NMFS/SEFSC, [2]CIMAS, University of Miami, RSMAS

Rice's whales (*Balaenoptera ricei*) are the only resident baleen whale species in the Gulf of Mexico (GoMx). Most sightings of this whale are in the northeastern GoMx within its core habitat; however, historical whaling records suggest they may have inhabited the north-central GoMx, and recent acoustic and visual observation data have detected this species' presence in the northwestern GoMx. Non-invasive molecular techniques have been successfully developed to detect the presence/absence of other marine species through the use of environmental DNA (eDNA). We therefore evaluated the use of eDNA to detect this rare species to better understand its distribution in the GoMx. We developed and validated a quantitative PCR (qPCR) assay targeting he Rice's whale mitochondrial DNA control region to detect eDNA shed by the whales. Seawater samples collected in or near whale "flukeprints" were positive for Rice's whale eDNA, while control water samples were negative, illustrating the efficacy of the new assay. Using this novel assay, we were also able to compare and optimize various eDNA collection methods such as filter pore size and time of collection. These data will help to refine and improve eDNA collection techniques in the lab and field for many marine mammal species. Future eDNA work on Rice's whales, including combining the newly developed qPCR assay with seawater sampling outside the Rice's whale core habitat, will improve our understanding of the distribution and habitat use of this endangered and elusive species.

Analyzing trends in U.S. Commercial Fisheries bycatch and evaluating solutions to global bycatch problems

Andrea Chan[1] and Lee Benaka[2]
[1]ECS Federal in support of OST, [2]NMFS/OST

Sustainable fisheries management requires that the bycatch of fish and protected species be estimated, tracked, and minimized to the extent practicable. In U.S. commercial fisheries, data on levels of bycatch - or the discarded catch of any living marine resource - is primarily collected by independent fisheries observers on a portion of total fishing trips. NOAA Fisheries is responsible for ensuring adequate data collection for priority bycatch species, and producing bycatch estimates using the best scientific information available. In 2011, NOAA Fisheries published the first edition of the U.S. National Bycatch Report, which contained bycatch estimates for fish and protected species by region (using 2005 data), descriptions of bycatch estimation methods, and quality control metrics. The authors of this report recommended that the agency monitor bycatch trends over time for key fish and protected species groups (which may be stocks, populations, species, or aggregations of multiple species) that have high bycatch levels, special importance to management, and/or have stock status concerns (e.g., all endangered species). While updated bycatch estimates for some of these key stocks have been published regionally or as part of subsequent editions of the National Bycatch Report (including data collected up until 2015), a bycatch trend analysis to demonstrate how well the agency is currently meeting bycatch reduction goals on a national scale is outstanding. In this analysis, bycatch data time series were designated as increasing, stable, or decreasing for key fish, elasmobranch, marine mammal, sea turtle, and seabird stocks from all regions of the U.S. The effectiveness of bycatch reduction measures are also assessed, where appropriate. Lessons learned from successful reductions in bycatch are discussed, and applicability towards remaining high bycatch stocks in the U.S. and internationally are evaluated.

NOAA Fisheries Distribution Mapping and Analysis Portal (DisMAP): visualizing changing distributions

Melissa A Karp[1], Roger Griffis[1], Patrick Lynch[1], Tim Haverland[1], John Kennedy[1], Venkat Sunkara[1], Kevin Craig[2], Elliott Hazen[3], Isaac Kaplan[4], Don Kobayashi[5], Scott Large[6], Wendy Morrison[7], Hassan Moustahfid[8], Malin Pinsky[9], Phoebe Woodworth-Jefcoats[5], and Kristan Blackhart[1]
[1]NMFS/OST, [2]NMFS/SEFSC, [3]NMFS/SWFSC, [4]NMFS/NWFSC, [5]NMFS/PIFSC, [6]NMFS/NEFSC,[7]NMFS/Office of Sustainable Fisheries, [8]NOAA/US Integrated Ocean Observing System, [9]Rutgers University

Marine species are moving in response to climate change, with the impacts reaching far beyond the individual species moving to affect entire ecosystems, fisheries interactions, and coastal economies. Robust information on past, current, and expected future distributions of marine species is critical for effective ecosystem-based management and decision-making in all ocean use sectors. In general, information on species distributions is dispersed across multiple sources and regions and therefore not easily accessible across fisheries governance boundaries. In response to this need, in 2022 NOAA Fisheries launched a new state-of-the-art mapping portal to consolidate information on species distributions into one easily accessible, interactive portal called the Distribution Mapping and Analysis Portal (DisMAP). The current version of the portal displays data from fishery-independent surveys for six US regions (Northeast, Southeast, Gulf of Mexico, West Coast, Hawaii, and Alaska) and includes a map viewer and graphing capabilities to explore the distributions of over 900 marine fish and invertebrate species caught during the surveys. The portal is being developed in phases, with plans for future releases to include additional data types, model outputs, and functionalities. The interactive website will improve data sharing and collaboration, help fisheries managers and the fishing industry better plan for and respond to changes, and increase overall knowledge of species distributions. User-friendly tools like this play a critical role in decision-making for a climate-ready future.

Travel Guide

Accomodations

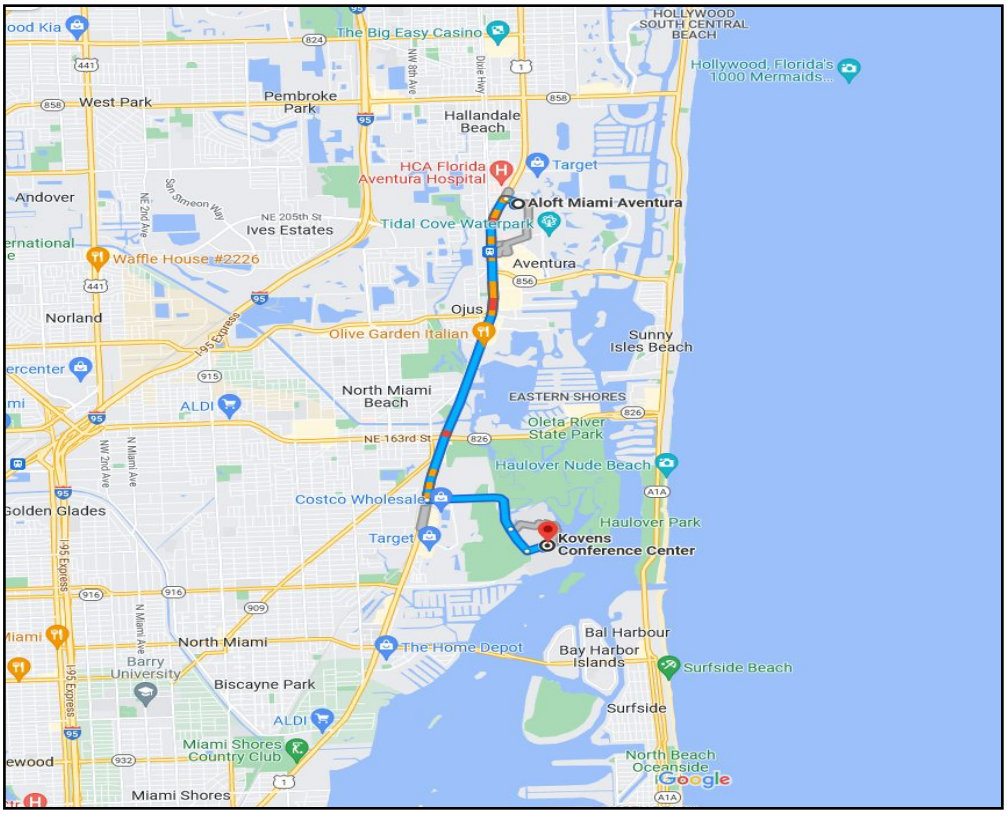
Host Hotel - Aloft Miami Aventura

2910 NE 207th Street, Aventura, Florida, USA, 33180
Use meeting online registration portal or reference NOAA PSAW group for negotiated rate of $209/night.
Please note that the hotel charges an additional $20/day for parking.

Other nearby hotels include AC Hotel Miami Aventura and Hilton Aventura Miami.

Transportation

Directions to venue: https://kovens.fiu.edu/location/
Miami International Airport (MIA) – 18.5 miles from hotel
Fort Lauderdale-Hollywood International Airport (FLL) – 12.2 miles from hotel
Airport shuttle - Super Shuttle Express - https://www.supershuttle.com/
From Aloft Hotel to Kovens Center - 5.6 miles (~20 min), ~$40 taxi, ~$15 Uber



Area Attractions

Oleta River State Park https://www.floridastateparks.org/OletaRiver (5 mi)
Mountain biking, kayaking, SUP paddle boarding, snorkeling, fishing pier, beach

Oleta River Outdoor Center https://oletariveroutdoors.com/ (6 mi)
Guided and self-guided tours and rentals: kayaks, canoes, SUP paddle boards, and mountain bikes

Hollywood Beach Broadwalk
https://www.visitlauderdale.com/listing/hollywood-oceanfront-broadwalk/2457/ (5 mi)
Historic 2.5 mile boardwalk with restaurants, shops, and parks

Local Beaches

Sunny Isles Beach Collins Ave. - 157th St. to 193rd St., Sunny Isles Beach

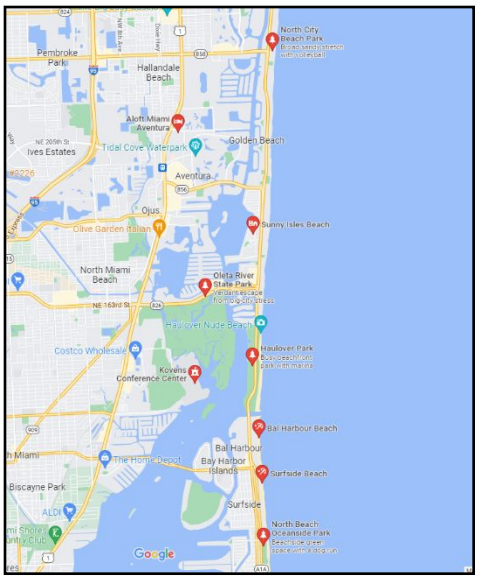
Oleta River State Park 3400 NE 163rd St., North Miami Beach

Haulover Beach 10800 Collins Ave., Miami Beach

Bal Harbour Beach Collins Ave. - 96th St. to Haulover Inlet, Bal Harbour

Surfside Beach 9301 Collins Ave., Surfside, FL 33154

North Beach Oceanside Park 8328 Collins Ave, Miami Beach



Miami Attractions

Southeast Fisheries Science Center (22 mi)
https://www.fisheries.noaa.gov/about/southeast-fisheries-science-center

South Beach (20 mi) https://www.visitflorida.com/places-to-go/southeast/south-beach/

Miami Beach Botanical Garden (20 mi) https://mbgarden.org/

Fairchild Tropical Botanic Garden (25 mi) https://fairchildgarden.org/

Vizcaya Museum and Gardens (20 mi) https://vizcaya.org/, Historic estate with garden

Frost Museum of Science (18 mi) https://www.frostscience.org/

Area Restaurants

Asiatiko
https://www.asiatikomiami.com/ $$$-$$$$ (0.1 mi from hotel) (Japanese)
12-3:30 pm; 6:00-11:00 pm (closed Friday)
2906 NE 207th St Aventura Park Square, Aventura, FL 33180-1470

bartaco
https://bartaco.com/ $$ (0.1 mi) (tacos/rice bowls, V/Vg)
11:30 am – midnight;
2906 NE 207th Street, Aventura, FL 33180

Casa D'Angelo Ristorante
https://www.casa-d-angelo.com/aventura $$$$ (0.1 mi) (Italian, Vg)
11:30am to 10:00pm;
2906 NE 207th St, Aventura, FL 33180-1470

Sushi Mas Aventura
https://www.sushimas.com/ $ (0.1 mi) (Sushi, Vg)
11AM to 11PM;
2980 Ne 207th St, Aventura Aventura Park Square, Miami, FL 33180-1457

Ruth's Chris Steakhouse
4PM to 10PM
https://www.ruthschris.com/ $$$$ (0.1 mi) (Steakhouse)
2980 NE 207th St Suite #108, Aventura, FL 33180

Delicious Raw
https://delraw.com/ $ (0.1 mi) (Juice bar, bowls, healthy, V)
7:00 am – 9:00 pm;
2980 NE 207th St Suite 110, Aventura, FL 33180-1457

The Fresh Carrot Aventura
https://www.carrotaventura.com/ $-$$ (0.1 mi) (sandwiches, burgers, etc, V/Vg)
10:00 am – 8:00 pm;
2920 Northeast 207th Street Suite 106, Aventura, FL 33180

Pura Vida Aventura
https://www.puravidamiami.com/ $$ (0.1 mi) (sandwiches, bowls, salads, V/Vg)
7:00 am - 8:00 pm;
2980 NE 207th St Ste 110, Aventura, FL 33180-1459

Starbucks
$$ (0.1 mi)
7:00 am – 6:00 pm
2980 NE 207th St Aventura, FL 33180

Flyfuel Food Co.
https://eatflyfuel.com/ $-$$ (0.2 mi) (wraps, sandwiches, pizzas, V/Vg)
10:00 am – 8:00 pm;
20804 Biscayne Blvd, Aventura, FL 33180

Sicilian Oven Wood Fired Pizzas
https://www.sicilianoven.com/ $$-$$$ (0.5 mi) (pizza, V/Vg)
11:30 am – 10:00 pm;
20475 Biscayne Blvd Unit 1802, Aventura, FL 33180-1550

Barrio Latino Restaurant
https://www.barriolatinorestaurant.com/ $$ -$$$ (0.4 mi) (Latin, Cuban, Vg/GF)
11:30 am – 10:00 pm;
20475 Biscayne Blvd Promenade Shops, Aventura, FL 33180-1550

Area Restaurants - Continued

Pollo Tropical
https://www.pollotropical.com/ $ (0.4 mi)
(Caribbean fast food, V/Vg)
20403 Biscayne Blvd, Aventura, FL 33180

PANI Bistro
https://welovepani.com/ $$ (at Aventura Mall) (0.8 mi) (Argentinean, South American, V/Vg)
10 am- 10 pm;
19501 Biscayne Blvd Suite 940, Aventura, FL 33180

Divieto Ristorante
https://www.divietoristorante.com/menu $$-$$$ (1 mi) (Italian, V/Vg/GF)
12:00 pm – 11:00 pm;
19575 Biscayne Blvd Suite #375, Aventura, FL 33180

Tap 42 Craft Kitchen and Bar Aventura
https://tap42.com/aventura/ $$-$$$ (1 mi)
(American, gastropub, Vg/GF)
11:30 am – 12:00 am;
19501 Biscayne Blvd Suite 1960, Aventura, FL 33180-2342

Pubbelly Sushi
https://www.pubbellyglobal.com/aventura-menus/ $$ (1 mi) (Japanese, sushi - at Aventura Mall, Vg)
11:30 am – 11:00 pm;
19565 Biscayne Blvd Suite 936, Aventura, FL 33180

Pollos & Jarras
https://www.pollosyjarras.com/ $$-$$$ (1 mi)
(Peruvian- at Aventura Mall, Vg)
11:30 am – 10:30 pm;
19565 Biscayne Blvd #956, Aventura, FL 33180

NARA Sushi
https://www.naramiami.com/ $$ (5 mi) (Sushi, Vg)
4:00 pm – 1:00 am;
3881 NE 163rd St, North Miami, FL 33160

Shake Shack Aventura
https://shakeshack.com/#/store/632 $$ (1 mi)
(Burgers- at Aventura Mall)
11:00 am – 9:00 pm
19565 Biscayne Blvd Space FH5, Aventura, FL 33180

Chili's Grill and Bar
https://www.chilis.com/menu $$ (1 mi) (at Aventura Mall, GF)
11:00 am – 11:00 pm; 19905 Biscayne Blvd, Aventura, FL 33180

Bella Luna
https://bellalunaaventura.com/ $$ (1.2 mi) (Italian - at Aventura Mall, V/Vg/GF)
11:30 am – 11:00 pm;
19575 Biscayne Blvd #1097, Miami, FL 33180

The Cheesecake Factory
https://menu.thecheesecakefactory.com/fl/aventura-24/ $$ (1.2 mi) (at Aventura Mall, Vg)
11:30 am – 11:00 pm;
19501 Biscayne Blvd, Aventura, FL 33180

Sea Grill Restaurant
https://seagrillmiami.com/ $$$ (5 mi)
(Seafood/Greek)
12:00 pm – 11:00 pm
3913 NE 163rd St, North Miami Beach, FL 33160

Lique Miami Waterfront Restaurant and Lounge
https://www.liquemiami.com/ $$$$ (5 mi)
(Mediterranean)
9:00 pm – 2:00 am
3957 NE 163rd St, North Miami Beach, FL 33160

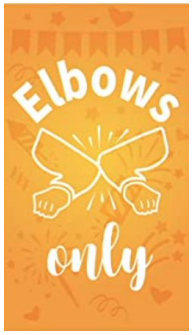
Fuego by Mana
https://fuegobymana.com/ $$$$ (5 mi)
(Steakhouse, Kosher options)
5:30 -11:00 pm;
3861 NE 163rd St, North Miami Beach, FL 33160

PSAW III Steering Committee

Erin McMichael *(ECS Federal - OST)*	Lead Workshop Coordinator Co-Chair Session 1 & 5
Lesley Stokes *(SEFSC)*	Co-Chair Session 1 & 5
Alex Curtis *(SWFSC)*	Co-Chair Session 4
Genevieve Davis *(NEFSC)*	Co-Chair Session 2
Nancy Friday *(AFSC)*	Co-Chair Session 3
Caroline Good *(OPR)*	Co-Chair Session 3
Chris Jordan *(NWFSC)*	Co-Chair Session 4
Julie Scheurer *(ARO)*	Co-Chair Session 2 & Chair Session 6

Color Coding Your Comfort Level

While some workshop participants may have continued COVID-19 concerns, it's important to recognize and respect other people's comfort levels with physical touch and social distancing. If you are interested, please take a colored sticker (available at the registration table) that correlates to your comfort level and affix it to your name tag. That way, others will know the distance at which you prefer to interact. PSAW III encourages you to respect other people's boundaries and use this color coding system to communicate your preferences with touch and distance.



Images Courtesy of Pajean

U.S. Secretary of Commerce
Gina Raimondo

Administrator of National Oceanic and Atmospheric Administration and Undersecretary of Commerce
Richard Spinrad

Assistant Administrator for Fisheries
Janet Coit

March 2023

www.nmfs.noaa.gov

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Silver Spring, MD 20910