



ATLANTIC MARINE BIRD  
COOPERATIVE

OCTOBER 9<sup>TH</sup>-13<sup>TH</sup>, 2023  
47<sup>TH</sup> ANNUAL MEETING

**FORT LAUDERDALE, FLORIDA**

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## Social Media

Facebook: @waterbirdsociety

Instagram: @the\_waterbird\_society

Twitter: @WaterbirdSociet

## Meeting Information

Society Website: <https://waterbirds.org>

Meeting Website: [The Waterbird Society Meeting 2023 \(dryfta.com\)](https://www.dryfta.com)

## Welcome from the President

Welcome to our 47th annual meeting!

I want to start by recognizing Ricardo Zambrano for his extraordinary commitment to the Society this year. In serving as Vice President, he is responsible for the Scientific Program for this meeting, and for perhaps the first time ever, the Scientific Program Chair is also the Chair of the local organizing committee! Ricardo put together an amazing team of colleagues to organize this intellectually stimulating, socially vibrant, and place-based conference. The Florida meeting was delayed because of the COVID year virtual meetings, but Ricardo never wavered in his commitment to hosting the conference.

The local committee worked closely with our Diversity, Equity, and Inclusion committee to ensure this meeting is safe, inclusive, and respectful of all members joining us in Florida. Further, this committee has planned an innovative symposium: One Water. It brings a diverse panel of experts together to probe current and historical aspects of conserving water for birds and sustainable human communities.

I am happy to report that the Strategic Plan Steering Committee completed its work this summer and will present its recommendations to Council and to the full membership during this meeting. It is our hope that this plan will foster the growth and continued vibrancy of the Society through 2030.

Finally, on behalf of the Society, I want to express our deep appreciation to Dr. James Kushlan and Dr. Ian Nisbet. Jim has been a driving force behind research and conservation of herons around the world for more than 30 years. Ian is renowned for his research on terns and gulls, and leadership and vision for the society since its inception. Both established endowments that fund the Kushlan and Nisbet research grants to support outstanding research and conservation efforts around the world. We are grateful for the continuing contributions to those endowments by Jim and Ian. Their generosity ensures support for the Society's research mission in perpetuity.

Welcome! It is great to have you here!

Warm regards, Patty

Patricia Szczys  
President 2022-23

## Welcome from the Conference Planning Committee Chairs

On behalf of the Conference Planning Committee, we welcome you to the Sunshine State and to Fort Lauderdale, Florida for the 47th annual Waterbird Society Conference and joint meeting with the Atlantic Marine Bird Cooperative (AMBC). This year's joint meeting is an opportunity to connect with members of AMBC, who share the Waterbird Society's strong science and conservation values and desire to help advance waterbird science and conservation. We are excited to be back to a fully in-person meeting and to see many of our members and friends and to meet new ones! Students, early career scientists and managers, and seasoned professionals will have various opportunities to mingle at two socials, coffee breaks and a student and mentor luncheon.

The Conference Planning Committee is also excited to showcase south Florida's natural areas, spectacular beaches, coral reefs, and the greater Everglades ecosystem. We hope you will have time to explore the region's Great Florida Birding and Wildlife Trail or participate in one of our field trips. Join us for an airboat ride through Florida's iconic Everglades landscape or on a guided tour through a stormwater treatment area that serves as a home for dozens of waterbird species. A 10-minute walk from the hotel will take you to the world-famous Fort Lauderdale Beach and the Bonnet House Museum and Gardens. Across from the street you will find Hugh Taylor Birch State Park where you can rent a kayak and explore the mangrove wetlands or hop over to the beach.

We could not have offered all the elements of this conference without the help of the local conference organizing committee (see below), the welcoming staff of the Gallery One Double Tree and the generous contributions from sponsors and the Florida Fish and Wildlife Conservation Commission. This year, we are proud to welcome Betty Osceola, representing the Miccosukee tribe, to open the conference with a recognition to the native tribes that originally inhabited South Florida and where this conference is being held. Our gratitude to the land and water and to the indigenous people who have, and who continue to, steward both. May we all commit today to eradicate the erasure of Indigenous cultures wherever we live.

Enjoy your stay in Fort Lauderdale and the greater South Florida area and hope you will come visit again after the conference.

Sincerely,

**Ricardo Zambrano**, Florida Fish and Wildlife Conservation Commission, West Palm Beach, Florida, and **Daniela Tabilo** (Co-Chair), Florida Fish and Wildlife Conservation Commission, West Palm Beach, Florida

## Conference Planning Committee Members

Tyler Beck	Florida Fish & Wildlife Conservation Commission
Natalie Bergeron	Florida Fish & Wildlife Conservation Commission
Billy Brooks	U.S. Fish & Wildlife Service
Janell Brush	Florida Fish & Wildlife Conservation Commission
Brian Garrett	South Florida Water Management District
Blair Hayman	Florida Fish & Wildlife Conservation Commission
Kevin Kalasz	U.S. Fish & Wildlife Service
Marisa Martinez	U.S. Geological Survey
Michelle Petersen	Florida Atlantic University
Brittany Piersma	Audubon Society of the Western Everglades
Caroline Poli	University of Florida
Rebecca Schneider	Florida Fish & Wildlife Conservation Commission
Eric Suarez	Florida Fish & Wildlife Conservation Commission
Daniela Tabilo	Florida Fish & Wildlife Conservation Commission
Natasha Warraich	South Florida Water Management District
Ricardo Zambrano	Florida Fish & Wildlife Conservation Commission

## Welcome from the Scientific Program Chair

I'd like to extend a warm welcome to all participants of the 47th Annual Meeting of the Waterbird Society. The Waterbird Society is excited to be co-hosting this conference with the Atlantic Marine Bird Cooperative (AMBC). This year's program may be like no other in Waterbird Society history. The scientific sessions will be kicked off by plenary speakers from the U.S., the Middle East and Asia. The program will include six symposia, One Water, Black Skimmer Conservation, Avian Influenza, Artificial Habitat, Waterbird Movement, and AMBC. And back by popular demand, we are bringing back a poster session but also including lightning talks geared towards preliminary findings and student presentations.

New this year, the Waterbird Society will have four free workshops that can be instrumental in waterbird research and management. These workshops include training in quantitative necropsies, using drones and UAVs, using passive acoustic monitoring (ARUs), and analyzing data using R statistical software. All workshops will be hosted by professionals with extensive expertise in the subject and will provide excellent training and networking opportunities. We wish we could offer them all to everyone, but space is limited. Perhaps, next year! The scientific program will include six symposiums, 50 symposium talks, 62 regular talks, 33 posters, five lightning talks, and three plenary lectures for a total of 153 presentations spanning 9 countries! We have 48 student presentations (posters and talks). The 2023 Annual Meeting will close with the Waterbird Society Business Meeting and the Award Ceremony.

I want to extend a huge thank you to Dani Tabilo and Natalie Bergeron for their tireless assistance with the program. This program and conference would not have been possible without their energy, efficiency, organization, ideas, hard work, and patience (mostly with me). I couldn't have asked for a better team! I also owe many thanks to Marisa Martinez and Juliet Lamb for their work with the Diversity, Equity, and Inclusion (DEI) committee for their work making this conference and the Waterbird Society a welcoming society, and to Brittany Piersma for coordinating all of our volunteers. I also want to thank all the workshop instructors who volunteered their time and energy to put on the workshops. Please be sure to thank them during the conference even if you are not attending their workshops. Unfortunately, there is not enough room on this page to list them all, but you can find them in the workshop section below and on the conference website.

Saludos!

Ricardo Zambrano,

Chair of the Scientific Program and Vice President of the Waterbird Society 2022-2023



## Statement in Support of Human Rights

The Waterbird Society celebrates the diversity of its members and works hard to cultivate a pluralistic and welcoming community through equitable and inclusive values and practices. It is Society policy to “ensure that the Waterbird Society is inclusive of all waterbird biologists, policymakers, and community members regardless of their sex, gender identity, sexual orientation, race, ethnicity, economic status, age, national origin, religion, (dis)ability status, language, political perspective, education, etc. (Diversity, Equity, and Inclusion Committee [DEI; mission statement]).”

The 2023 meeting of the Waterbird Society will be held in Fort Lauderdale, Florida, USA. Florida is home to a robust community of birders, wildlife biologists, and avian conservationists, and the Society is eager to learn from and offer support to these members and their affiliates. The Waterbird Society also understands that Florida’s recent actions to curtail the rights of transgender and LGBTQ+ individuals, immigrants, and Black, indigenous, people of color impact the ability of members to feel safe and welcome at our 2023 meeting. Therefore, the Waterbird Society is undertaking actions to best ensure that our meeting is as safe a space as possible for such individuals, along with members belonging to all other marginalized groups.

First, the Waterbird Society ensures that any acts of hate, violence, or intolerance at the 2023 meeting will be addressed with appropriate action, both internally through our Code of Conduct and externally through relevant legal channels. Second, alongside scientific programming and waterbird-centered activities, the DEI Committee is planning several actions that support and celebrate the LGBTQ+ community, including 1) working with the City of Fort Lauderdale LGBTQ Community Liaison and the conference venue to ensure that all meeting spaces and conference activities are safe and inclusive; 2) planning an LGBTQ+ social event geared toward celebrating and supporting trans rights; 3) developing a poster (for presentation at the poster session) to raise awareness of barriers faced by transgender biologists and other at-risk groups in conservation and waterbird research. With any questions, comments, suggestions, or concerns please reach out to the DEI committee co-chairs (Aliya Caldwell, Marisa Takada Martinez, and Juliet Lamb) before, during, or after the 2023 meeting.

# About the Waterbird Society

## Our Mission

The Waterbird Society is an international scientific, not-for-profit organization whose mission is to foster the study, management, and conservation of the world’s aquatic birds. The Society’s primary goals are to: (1) promote the basic and applied research on waterbirds and their habitats, (2) foster science-based waterbird conservation globally, and (3) enhance communication and education at all levels – among professionals, policy makers, and citizens. To accomplish these goals, the Society publishes an international peer-reviewed journal, hosts scientific meetings, provides grants and awards, and facilitates other activities.

## Our History

The Society was established in 1976 following the North American Wading Bird Conference held in Charleston, South Carolina, USA, and was named the Colonial Waterbird Group. The organization changed its name to the Colonial Waterbird Society in 1986. In 1999, the organization became the Waterbird Society to reflect an expanded interest in all aquatic birds.

## Waterbird Society Council

### Officers

Patricia Szczys - *President*      Ricardo Zambrano – *Vice President*  
Kate Shlepr - *Secretary*      Christine Custer - *Treasurer*

### Elected Council Members

Don Lyons	Jim Lyons	Caz Taylor	Marisa Martinez
Kiah Williams	Michelle Stantial	Aliya Caldwell	Diego F. Cisneros-Heredia
Yat-tung Yu	Alison Kocek	Jonah Gula	

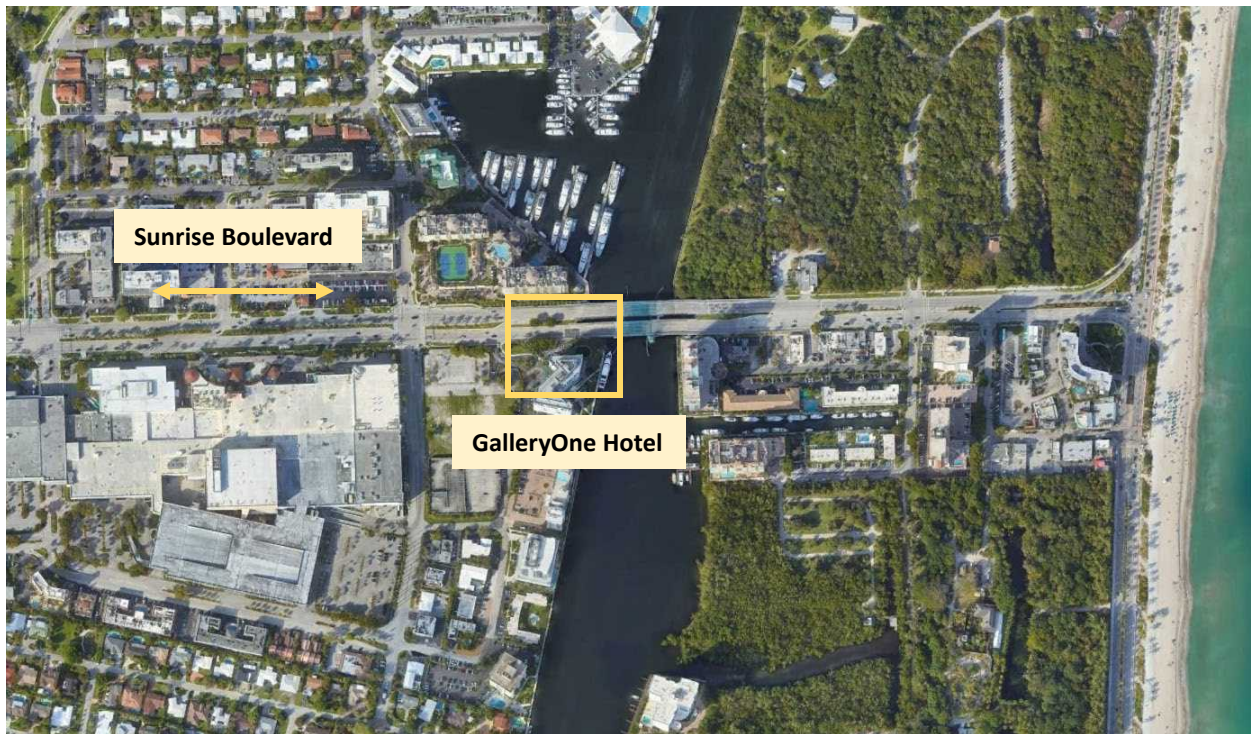
### Past Presidents

David Moore (2020-2021)  
Clay Green (2018-2019)  
Erica Nol (2016-2017)

If you are interested in becoming more involved with the society, scan this code with your phone camera.



## GalleryOne Location and Parking Information

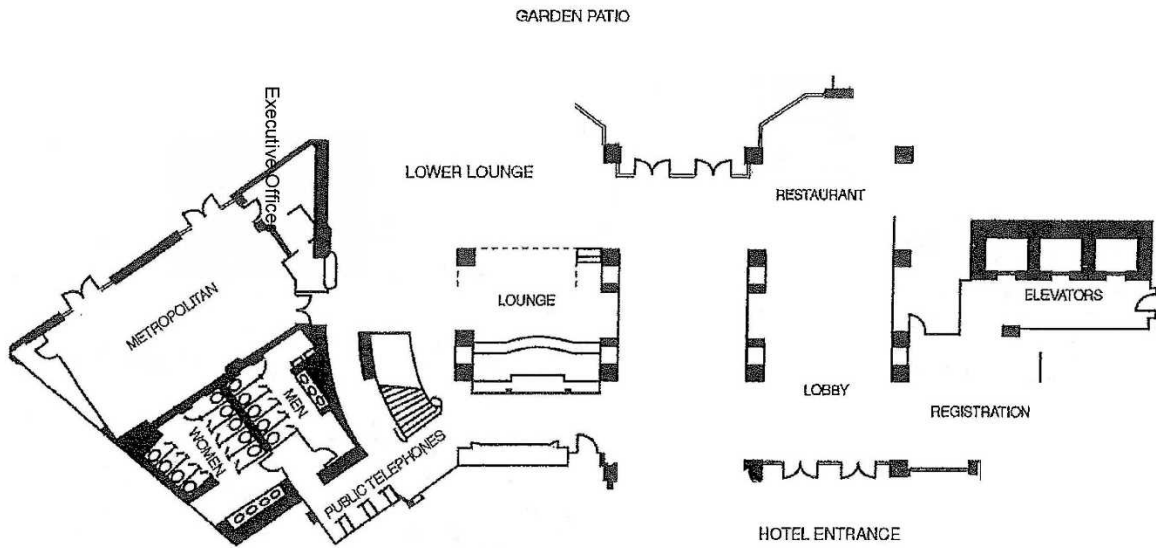


Transportation to/from airport:

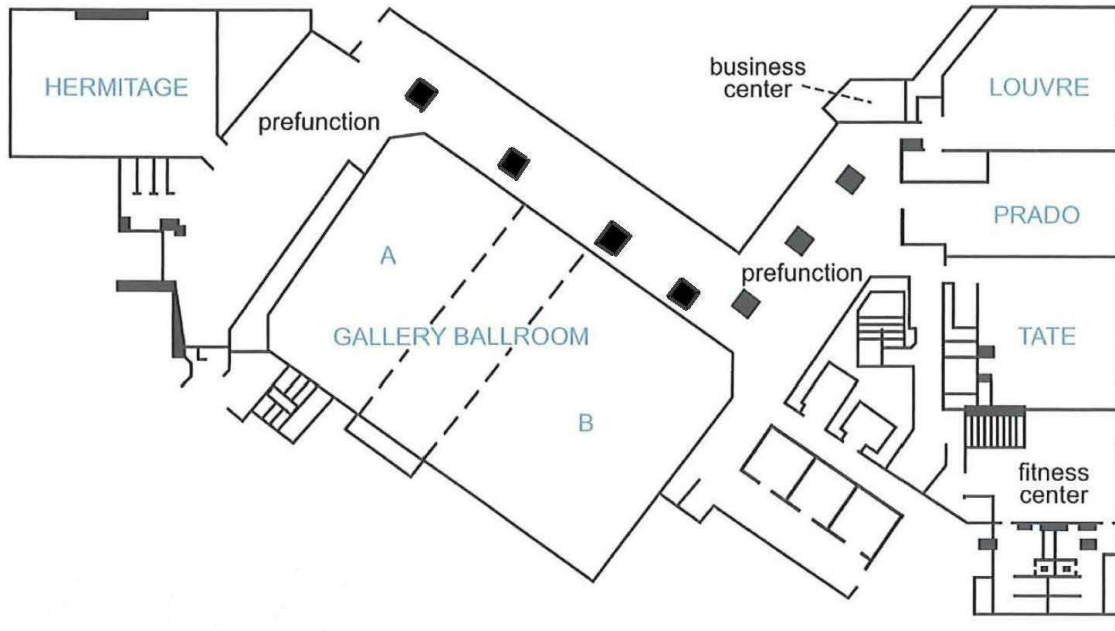
- **Tri-Rail:** [Tri Rail | South Florida Regional Transportation Authority \(tri-rail.com\)](http://tri-rail.com)
- **Brightline:** [High-Speed Passenger Train: Buy Tickets Today | Brightline \(gobrightline.com\)](http://gobrightline.com)
- **Airport Shuttles:** Recommended companies
  - Everyone's Choice Transportation -Angel, (754) 273-0479, [Info@everyoneschoicefl.com](mailto:Info@everyoneschoicefl.com)
  - FLL Crew Transportation - Juan Gonzalez, (954) 993-4418/(954) 328-1234, [fllcrewtransportation@gmail.com](mailto:fllcrewtransportation@gmail.com)
  - A&M International Transportation Services, Inc. Antwon Audevert, (754) 667-0174/(954) 994-8800, [aandm.int.trans.services@gmail.com](mailto:aandm.int.trans.services@gmail.com)

Hotel parking: All parking is valet parking only. Daily valet parking is discounted to \$12.00/day. Overnight Valet Parking is discounted to \$33/day. We encourage carpooling or using public transportation to the hotel.

# GalleryOne Floor Plan



FIRST FLOOR



SECOND FLOOR

## Fort Lauderdale Guide

### Nearby Attractions

**Hugh Taylor Birch State Park** *0.4 miles*

8 am – Sunset

\$6 admission per vehicle

**Dr. Von D. Mizell-Eula Johnson State Park** *10.4 miles*

8 am – Sunset

\$6 admission per vehicle

**Oleta River State Park** *21.1 miles*

8 am – Sunset

\$6 admission per vehicle

**Museum of Discovery and Science** *4.0 miles*

10 am – 5 pm [Mon-Sat], 12 pm – 5 pm [Sun]

\$27 admission per adult

**Stonewall National Museum and Archives** *1.9 miles*

11 am – 5 pm [Mon, Tues, Wed, Fri], 11 am – 8 pm [Thurs], 11 am – 3 pm [Sat, Sun]

free admission

**NSU Art Museum Fort Lauderdale** *3.7 miles*

11 am – 5 pm [Tues-Sat], 12 pm – 5 pm [Sun], closed Mon

\$16 admission per adult, \$5 per student with ID, free 1<sup>st</sup> Thurs of every month 11 pm – 7 pm

## Popular Birding Locations

### **Hugh Taylor Birch State Park** *0.4 miles*

8 am – sunset

\$6 per vehicle

This park is known for sightings of numerous Caribbean species as well as migratory species, with over 250 species on the park's bird list. Take stroll down the short Coastal Hammock Trail or along the Rail Trail that leads you just over 2 miles around the perimeter of the park and along the Intracoastal Waterway.

### **Easterlin Park** *6.2 miles*

8 am – 7:30 pm

FREE on weekdays, \$1.50 per adult on weekends

This is a small urban park characterized by cypress tress and a thick hardwood hammock. When entering the park, turn right at the office and park at the end of the road to access the nature trail. Some notable bird species sightings for this park include the Cape May Warbler, Black-throated Green Warbler, Yellow-throated Vireo, and Painted Bunting.

### **Plantation Preserve Linear Trail** *9.8 miles*

Dawn-dusk

FREE on weekdays, \$1.50 per adult on weekdays

This is a 1.1 mile linear trail through a golf course and wetlands area that is popular for wading birds and songbirds. There are two entrances to the trail, one on 70<sup>th</sup> Ave and Broward Blvd and the other off of East Tropical Way.

### **West Lake Park and Anne Kolb Nature Center** *10.7 miles*

8 am – 7:30 pm

FREE on weekdays, \$1.50 per adult on weekends

Take a walk or a paddle on this 1,501-acre preserve that offers coastal mangrove habitat, numerous short hikes, and a nature center with a small entrance fee. The mangrove boardwalks are great for spotting Yellow-crowned Night Herons, the Intracoastal Waterway hosts many species of shorebirds, and Short-tailed Hawks can be found in the park in winter. Canoes and kayaks are available to rent for birding from the water.

**Dr. Von D. Mizell-Eula Johnson State Park** *10.4 miles*

8 am – sunset

\$6 per vehicle

This state park offers year-round habitat for many native and migratory birds, including species stopping to rest and feed during migrations. From the shoreline, pelicans, terns, gulls, and plovers are common sights and songbirds may be seen in the tropical hardwood hammock. Herons, egrets, skimmers, ibises, and storks are seen feeding in the tidal creek, and ospreys are often spotted in the park. Take a stroll on the 0.4 mile Barrier Nature Trail or the 3 mile service road.

**Fern Forest Nature Center** *12.1 miles*

9 am – 5 pm

FREE

This natural area has a Cypress Creek boardwalk trail that crosses a wetlands canal where around 30 species of fern can be seen. The Prairie Overlook Trail, just under 1 mile long, passes through a small remnant of Pine Rockland habitat, has an observation tower, and pops out onto the edge of a prairie. The Maple Walk is a 0.5 mile loop through swamp, so it can be wet and muddy with recent rainfall.

**Pine Island Ridge Natural Area and Tree Tops Park** *16 miles*

8 am – 7:30 pm

FREE on weekdays, \$1.50 per adult on weekends

This ridge reaches an elevation of 29 feet above sea level, making it the highest natural elevation in the county! The area is mainly high hammock forest and is dominated by live oaks and slash pines and is home to species of owls, migratory warblers, woodpeckers, and hawks. Begin your 1.8 mile round trip hike in Tree Tops Park (more info below), and if you feel like continuing further, hop on to the connecting Westridge-Robbins Park Trail. Tree Tops Park also has a short boardwalk trail along a restored freshwater marsh and an observation tower.

## Program at a Glance

Meals/Catering	Symposia
Social Activities	Regular Sessions

<b>Monday, October 9<sup>th</sup></b>		
7:00 am – 12:00 pm	Council Meeting	Prado
8:00 am – 5:00 pm	AMBC Working Group	Metropolitan
12:00 pm – 1:00 pm	Lunch	Prado
6:00 pm – 8:00 pm	Welcome Reception	Lower Lounge

<b>Tuesday, October 10<sup>th</sup></b>		
8:00 am – 8:30 am	Announcements	Ballroom A&B
8:30 am – 9:30 am	Plenary Speaker, Dr. Peter Frederick	Ballroom A&B
9:30 am – 10:00 am	Break	Ballroom Foyer
10:00 am – 12:00 pm	One Water Panel	Ballroom A
10:00 am – 12:00 pm	Regular Talks	Ballroom B
10:00 am – 12:00 pm	Regular Talks	Louvre
12:00 pm – 1:00 pm	Student Mentoring Lunch	Metropolitan
1:00 pm – 3:00 pm	AMBC Symposium I	Ballroom A
1:00 pm – 3:00 pm	Regular Talks	Ballroom B
1:00 pm – 3:00 pm	Regular Talks	Louvre
3:00 pm – 3:30 pm	Break	Ballroom Foyer
3:30 pm – 5:00 pm	AMBC Symposium I	Ballroom A
3:30 pm – 5:00 pm	HPAI Symposium	Ballroom B
3:30 pm – 5:00 pm	Regular Talks	Louvre
6:00 pm – 8:00 pm	Poster Session	Metropolitan



Meals/Catering	Symposia	Workshops
Social Activities	Regular Sessions	

<b>Wednesday, October 11<sup>th</sup></b>		
8:00 am – 8:30 am	Announcements	Ballroom A&B
8:30 am – 9:30 am	Plenary Speaker, Yat-tung Yu	Ballroom A&B
9:30 am – 10:00 am	Break	Ballroom Foyer
10:00 am – 12:00 pm	Regular Talks	Ballroom A
10:00 am – 12:00 pm	Black Skimmer Symposium	Ballroom B
10:00 am – 12:00 pm	Regular Talks	Tate
10:00 am – 12:00 pm	AMBC Symposium II	Prado
12:00 pm – 1:00 pm	Lunch	Metropolitan
1:00 pm – 5:00 pm	UAV Workshop	Ballroom A
1:00 pm – 5:00 pm	ARU Workshop	Ballroom B
1:00 pm – 5:00 pm	R Software Workshop	Tate
1:00 pm – 5:00 pm	Necropsy Workshop	Nova Southeastern Univ.
3:00 pm – 3:30 pm	Break	Ballroom Foyer
6:00 pm – 8:00 pm	Student Social	Metropolitan

Meals/Catering	Symposia
Social Activities	Regular Sessions

<b>Thursday, October 12<sup>th</sup></b>		
8:00 am – 8:30 am	Announcements	Ballroom A&B
8:30 am – 9:30 am	Plenary Speaker, Sabir Bin Muzaffar	Ballroom A&B
9:30 am – 10:00 am	Break	Ballroom Foyer
10:00 am – 12:00 pm	Artificial Habitat Symposium	Ballroom A
10:00 am – 12:00 pm	Regular Talks	Ballroom B
12:00 pm – 1:00 pm	Lunch	Metropolitan
1:00 pm – 3:00 pm	Waterbird Movement Symposium	Ballroom A
1:00 pm – 3:00 pm	Regular Talks & Lightning Talks	Ballroom B
3:00 pm – 3:30 pm	Break	Ballroom Foyer
4:00 pm – 5:00 pm	Business Meeting	Ballroom A
6:00 pm – 10:00 pm	Banquet	Ballroom A&B

<b>Friday, October 13<sup>th</sup></b>	
8:00 am – 12:00 pm	STA 2 Field Trip
8:00 am – 12:00 pm	Airboat Field Trip in the Everglades

## Plenary Speaker: Dr. Peter Frederick

*Tuesday, October 10<sup>th</sup>, 8:30 am – 9:30 am*

**“A century of avian research yields a path among uncertainties in restoring one of the largest wetlands in the world.”**

Dr. Frederick’s career exemplifies a lifetime of exceptional, published research that has resulted in major contributions to the study and conservation of waterbirds.



Dr. Frederick has a long publication history, spanning from 1985 to present, almost entirely on the behavior, ecology, physiology, toxicology, genetics, and conservation of wading birds. He has published more than 126 papers in peer-reviewed journals (44 first-authored), many in high-tier journals, and has maintained a continuous output, averaging 3.6 peer-reviewed publications per year.

Cumulatively, Dr. Frederick’s research has made significant impacts on our understanding and conservation of the Everglades ecosystem, and on the ecology and conservation of wading birds, both as species and communities in wetland systems. Dr. Frederick is an excellent scientist, an effective communicator of his work, and an advocate for conservation. He has an impressive record of service to the scientific community, and a long history of service to and participation in the Waterbird Society. This year, Dr. Frederick will deliver the 2022 Robert Cushman Murphy Prize Plenary.

## Plenary Speaker: Yat-tung Yu

*Wednesday, October 11<sup>th</sup>, 8:30 am – 9:30 am*

### **“Waterbird Conservation in Hong Kong: Act Locally, Think Globally.”**

Yat-tung Yu is currently the director of the Hong Kong Bird Watching Society, an NGO focusing on wild birds and their habitats conservation in Hong Kong and neighbouring areas. The society is a partner of BirdLife International, the East Asian-Australasian Flyway Partnership (EAAFP),



and a member of the International Union for Conservation of Nature (IUCN). After obtaining his master's degree from the University of Hong Kong, where he studied the globally endangered Black-faced Spoonbill, he actively promotes coordinated censuses of this species and regular waterbird monitoring activities. The census and monitoring results are extensively used for conservation purposes, including publishing scientific papers and the International Single Species Action Plan, lobbying governments to establish protected areas, citizen science programs, and raising public awareness about the spoonbill and wetlands. Yat-tung is currently the coordinator of the East Asian-Australasian Flyway Partnership (EAAFP) Black-faced Spoonbill Working Group. He also has a strong interest in seabirds, particularly terns, and actively participates in and promotes seabird research and conservation activities within this flyway as the coordinator of the EAAFP Seabird Working Group. In addition to these roles, Yat-tung is a veteran birdwatcher and bird ringer with over 30 years of experience. He thoroughly enjoys searching for birds in the wilderness.

## Plenary Speaker: Sabir Bin Muzaffar

*Thursday, October 12<sup>th</sup>, 8:30 am – 9:30 am*

**“Socotra Cormorants on the move: breeding phenology, range shifts and migration in range-restricted cormorant.”**

Sabir Bin Muzaffar is an ecologist specializing in the migration, diseases and conservation of birds and mammals. He received his B.Sc., M.Sc. and Ph.D. degrees from Memorial University of



Newfoundland, St. John's, Newfoundland, Canada where he worked on the ecology, parasites and diseases of seabirds (puffins, razorbills and murre) in eastern Canada. He then did his post-doctoral research at the University of California Davis, on the migration of ducks, geese and gulls and their relationship with the geographic spread of highly pathogenic in central and eastern Asia and the Middle East. Sabir has also worked on the ecology and conservation of a wide variety of wildlife in Asia including shorebirds, the critically endangered Hoolock Gibbon, and Bengal slow loris. He has worked extensively on the wildlife-domestic animal interface that remains an important area of exchange for diverse pathogens between humans and wildlife. He has published 82 peer-reviewed papers, over 20 book chapters and one book. He is currently a Professor at the Department of Biology, United Arab Emirates University, Al Ain, United Arab Emirates. He is a passionate advocate of nature conservation and has worked with local authorities and governments to develop policies to protect wildlife. He is a long-standing member of the IUCN, with contributions to specialist groups such as the Cormorant Specialist Group. He has also been a long-standing member of the Waterbird Society. He will be talking about the ecology and conservation of the Socotra Cormorant in the Persian/Arabian Gulf: a species on which he has been working for the past twelve years.

# Symposia

## One Water Panel

*Tuesday, 10 am – 12 pm*

Access to clean water and healthy watersheds is a vital to the health of all life on earth. However, water management has traditionally been antagonistic, with different user groups fighting to monopolize water resources. This has led to inefficient water management, degraded ecosystems, and inequities in water rights and access among human communities, all of which are augmented by climate change.

In recent years, the One Water Movement has sought to address these issues by rethinking water management to prioritize human and environmental health, well-being, and equity. The goal of this unified approach is to bring together diverse stakeholders to unify water management across a variety of sources, contexts, and user groups, deploy natural solutions, and create equitable outcomes. While most One Water initiatives focus on human user groups, the explicit integration of environmental restoration into this framework offers the chance to develop creative approaches for incorporating the needs of non-human stakeholders, such as waterbirds. As key users of aquatic ecosystems, the presence and recovery of waterbird populations can serve as valuable indicators of progress toward environmental goals. Moreover, given their visibility and cultural significance, waterbirds are ideal ambassadors for complex water management issues. In order to effectively incorporate waterbird needs into water management frameworks, however, there is a need to first identify points of intersection as well address any barriers to integration.

This symposium will explore current research and future prospects for integrating One Water management with waterbird science and conservation. We will bring together experts working at the intersection of waterbird ecology and conservation, water management, and social sciences who will introduce the One Water approach, present case studies on current efforts to manage water for human and waterbird needs, and conclude with a panel discussion integrating the perspectives of practitioners, indigenous nations, and local communities. Topics of discussion will include approaches for balancing human and waterbird water needs, managing stormwater and agricultural water for waterbirds, understanding the role of wetlands and waterbirds in disease ecology, and engaging communities in waterbird and water resource management. Our goal is to identify actionable opportunities to integrate waterbird science and conservation with One Water management to promote a secure, equitable water future for humans and waterbirds.



Take a photo with your phone camera for more information!

## **Atlantic Marine Bird Cooperative**

*Tuesday, 1 pm – 3 pm and 3:30 pm – 5 pm*

Since 2005, the Atlantic Marine Bird Cooperative (AMBC) has brought together partners to better understand and conserve northwest Atlantic marine birds and their habitats from Florida to Atlantic Canada, through cooperative science-driven actions. Current priorities include engaging partners in proactive planning for offshore wind development, compiling resources to better identify mortality events and respond to HPAI, identifying priority gaps in diet and productivity monitoring, and engagement in coordinated colonial waterbird survey planning. This symposium is a place for discussing projects, sharing ideas, and fostering productive partnerships related to northwestern Atlantic marine birds. This symposium will offer an opportunity for participants to present and update one another on recent work, and a forum for working groups to convene and share plans and accomplishments. In addition, participants will have an opportunity to review and discuss progress, processes and future directions of the AMBC.

## **Highly Pathogenic Avian Influenza**

*Tuesday, 3:30 pm – 5 pm*

This symposium will bring together experts to discuss the latest findings and developments in the emergence and spread of highly pathogenic avian influenza (HPAI) in waterbirds. This symposium will focus on the epidemiology, ecology, and evolution of avian influenza in wild bird populations, assessments of mortality and population-level impacts and strategies for surveillance, prevention, and control. Attendees will have the opportunity to engage in discussions and gain insights into the challenges and opportunities for understanding and managing this important global wildlife health issue.

## **Black Skimmer Conservation, Management, and Research**

*Wednesday, 10 am – 12 pm*

This is a planned event to allow interested parties to come together and present information on Black Skimmer population dynamics across the breeding range in North America. Presentations will be centered around conservation, management, and research topics which includes site specific information on Atlantic and GoM breeding activities, management issues such as human-wildlife interactions, and research including conservation genetics, foraging ecology, juvenile survival, mark-recapture study results, and migration. We hope to use this seminar as a starting place to develop information on research gaps for future research activities and to identify management priorities.

## **Artificial Habitat**

*Thursday, 10 am – 12 pm*

This symposium will highlight ways in which waterbirds are utilizing artificial habitats – intended or not intended – for breeding, feeding, and sheltering. Presentations will focus on ecological studies of these artificial systems, as well as management and conservation strategies in atypical environments. The objective of the session is to understand the relative need or importance of artificial habitats for waterbird ecology and to cross-collaborate on novel approaches to research and monitoring.

## **Waterbird Movement Ecology**

*Thursday, 1 pm – 3 pm*

Waterbirds are among the most mobile groups in the avian world, and they represent a huge diversity of population movement strategies, ranging from sedentary to migratory to nomadic. Waterbirds also seem to be highly plastic in their individual movement behavior on both short and lifelong time scales. The leading conceptual hypothesis is that birds dynamically adjust their movement behavior in response to resource availability, thus enhancing fitness. While that general concept has been accepted for some time, an understanding of specific thresholds and linkages between resources and movement behavior have been limited, and somewhat constrained by a focus on a migratory vs sedentary axis. The advent of advanced telemetry techniques, a range of new methods to document resource distributions, and recent advances in defining the full spectrum of individual- and population-level movement strategies have rapidly changed our knowledge about waterbird movements in particular, at a time when anthropogenic actions have become strong forcing functions upon resource distributions for this taxonomic group. This symposium aims to pull together speakers whose work represents recent advances in the field of movement ecology, encompassing both conceptual/theoretical issues, examples of movement behavior in relation to dynamic resource distributions, and rapid changes in movement strategies in reaction to human-induced changes in resource distribution.



## Workshops

### **The use of drones and UAVs in waterbird research and conservation**

This workshop will cover the basics of different types of drones and UAVs and the applications for their use in waterbird research and conservation. It will also cover information on license and registration requirements, programs that can be used to aid with analyzing data collected and examples of how drones have been used to study wildlife. This workshop will have an outdoor hands-on component.

Instructor: Andrew Alloco, Andy is a UAS Hands-on flight trainer and Part 107 License Instructor as well as an FAA commercial helicopter and airplane pilot and an FAA part107 remote pilot (UAV/UAS/Drone). He has 30+ years of experience building and flying remote controlled airplanes, helicopters, and gliders. Andy is a USAF Auxiliary Search and Rescue Pilot, and the former UAS Program Manager for Civil Air Patrol's Florida Wing. Andy is also the founder of Birddog Drones, Inc., a licensed FAA drone services provider and consultant which has worked with numerous other public agencies and private corporations in developing their UAS programs, policies, and in-house training and operations curricula. Andy is currently the UAS/Drone Program Coordinator for the South Florida Water Management District.

### **An Introduction to passive acoustic monitoring (ARU) and acoustic data analysis**

*Before participating in this workshop, please complete the following questionnaire: <https://forms.gle/ZekpgwtdmL35ifb86>. Once you complete the questionnaire, you will receive a link to a virtual workshop hosted by the instructional team on August 17. We highly recommend that you watch the virtual workshop before participating in person at the WBS 2023 Meeting.*

This workshop will introduce the field of passive acoustic monitoring. We will briefly discuss equipment, survey design, data management and data storage. The majority of the workshop will be focused on the analysis of acoustic data, with particular emphasis on implementing machine learning models to find key species and evaluating the performance of these models.

Instructors: Laurel Symes and Larissa Sugai: Laurel is the Assistant Director at the K. Lisa Yang Center for Conservation Bioacoustics. She is a community ecologist with experience in passive acoustic monitoring in temperate and tropical terrestrial environments. Her research spans frogs, bats, insects and birds. Larissa co-leads training programs in passive acoustic monitoring for ecology and conservation at the Yang Center. In research, she is interested in understanding what shapes ecological assemblages in space and time, with frogs being the adopted (but not exclusive) model organism.

## **R statistical software – data manipulation, exploration, and visualization made easy: the *tidyverse* packages**

Reproducible data practices are not only important to ensure our science is rigorous – they also make our life easier and save us time. Tired of spending hours processing, reshaping, and manipulating data by hand in Excel? This workshop is for you! Using the tidyverse packages in R, you will learn how to write code to automatically process and manipulate your data and to produce beautiful, reproducible visualizations and graphs. Participants will need to install R and RStudio prior to the workshop. Follow the installation instructions here (sections 0.1.4 and 0.1.5): <https://ecorepsci.github.io/reproducible-science/index.html#r>. Email [spicardi@uidaho.edu](mailto:spicardi@uidaho.edu) with any questions.

Instructor: Simona Picardi, Assistant Professor, Department of Fish and Wildlife Sciences, College of Natural Resources, University of Idaho. Dr. Simona Picardi is a quantitative ecologist with years of experience teaching programming to ecologists at all level – from undergraduate students to professionals. She is a certified instructor with The Carpentries, a non-profit organization whose mission is to promote informatics literacy among researchers worldwide. She developed and teaches a graduate-level course titled "Reproducible Data Science", which teaches students how to manage data reproducibly throughout their life cycle – from collection to publication and dissemination. The materials for this course are publicly available online at <https://ecorepsci.github.io/reproducible-science/>.

## **Quantitative necropsy**

This workshop will help you to become familiar with the basic internal and external anatomy of waterbirds so that you can participate in collaborative efforts that will not only further your skills in the field and laboratory but will also enhance your abilities to obtain the most comprehensive understanding of the internal maladies that your populations might be encountering. You will also receive modifiable files that you will use as datasheets, reminders of the process flow, and supplies lists and contacts for putting together easily packable kits for field deployment. All participants will have the opportunity to perform all or part of quantitative necropsy with previously frozen specimens.

Instructors: Dr. Kate Sheehan, Assistant Professor, Department of Biology, Frostburg State University. PhD in Wildlife and Fisheries Biology, Clemson University. Performing avian necropsies since 2010. Renata Schneider, DVM. Emergency and Wildlife Medicine Veterinarian with twenty years' experience. Currently the Veterinarian and Clinic Liaison at Pelican Harbor Seabird Station in Miami and Veterinarian at the Pet Emergency Center in Fort Lauderdale. Dr. Schneider has presented at FWRA, NWRA, HSVMA and several Universities on various wildlife and exotic animal topics.

# Detailed Scientific Program

\*Student Participating in award competition

Ballroom A

Ballroom B

Louvre

## Tuesday, Session 1

Tuesday, Session 1			
One Water Panel <b>Moderators: Marisa Martinez and Juliet Lamb</b>	Start Time	Shorebird and Seabird Conservation and Management <b>Moderator: Janell Brush</b>	Migration and Distribution <b>Moderator: David Moore</b>
10:00 am - 12:00 pm	10:00 am	<b>[16] Janell Brush</b> <i>Florida's Shorebird Program: Coordinated Conservation in the Anthropocene</i>	<b>[106] Allie Hjort Toms*</b> <i>Movement ecology of late season migrant shorebirds in the Northumberland Strait Coast</i>
<b>Panelists: Emme Christie</b>	10:15 am	<b>[48] Ariam Jimenez</b> <i>Current Ground-nesting Abundance of Least Tern (<i>Sterna antillarum</i>) and Black Skimmer (<i>Rynchops niger</i>) in Florida</i>	<b>[105] Thorkell Lindberg Thórarinnsson</b> <i>Wintering and Migration Strategies of Horned Grebes <i>Podiceps auritus</i> Breeding in Iceland</i>
<b>Betty Osceola</b>	10:30 am	<b>[76] Raya Pruner</b> <i>Predation Behavior of Gull-billed Terns (<i>Gelochelidon nilotica</i>) and its Implications for Imperiled Shorebirds in Florida</i>	<b>[65] David Moore</b> <i>Migration and winter distribution of GPS-tagged Ring-billed Gulls breeding on the Laurentian Great Lakes.</i>
<b>Pete Lebeouf</b>	10:45 am	<b>[107] Carly Toulan</b> <i>Small island habitat loss drives Black Skimmer and Common Tern population declines in Maryland's Coastal Bays</i>	<b>[4] Gianco Angelozzi-Blanco*</b> <i>Effects of severe weather events on migrating shorebirds staging in the Northumberland Strait, Canada</i>
<b>Susan Bonfield</b>	11:00 am	<b>[102] Liam Taylor*</b> <i>What do young seabirds get better at?</i>	<b>[78] Felicia Sanders</b> <i>Spring migration patterns of Red Knots in the Southeast United States</i>
	11:15 am	<b>[79] Andrea Santariello*</b> <i>Caught on Camera: factors that influence the breeding success of Royal Terns (<i>Thalasseus maximus</i>) and Black Skimmers (<i>Rynchops niger</i>) breeding on Louisiana's coastal islands</i>	<b>[96] Candace Stenzel</b> <i>The Shorebird Science and Conservation Collective: Uniting Researchers and Conservationists across flyways and hemispheres to employ shorebird tracking data for conservation</i>
	11:30 am	<b>[104] Janet Thibault</b> <i>Beyond Dreams &amp; Donations; The Restoration of Crab Bank, a Seabird Nesting Island in Charleston, South Carolina</i>	<b>[57] Jim Lyons</b> <i>Long-term patterns in relative abundance of short- and long-distance migrant Red Knot at Delaware Bay, USA, 2006-2021</i>
	11:45 am	<b>[15] Lyn Brown</b> <i>Foraging behaviors of American Oystercatchers breeding on two barrier islands in Virginia</i>	<b>[8] Mario Balitbit</b> <i>Willet, or won't it? Evaluating the potential impacts of offshore wind on migratory shorebirds</i>

**+Winner of Publication Award for Outstanding Contribution to Conservation**

**Tuesday, Session 2**

Start Time	Atlantic Marine Bird Cooperative Symposium I <b>Moderator: Caleb Spiegel</b>	Disease and Contaminants <b>Moderator: Kate Sheehan</b>	Conservation <b>Moderator: Dale Gawlik</b>
1:00 pm	<b>[95] Ian Stenhouse</b> <i>Developing guidance for pre- and post-construction monitoring to detect changes in marine bird distributions and habitat use related to offshore wind development</i>	<b>[85] Julia Silva Seixas*</b> <i>From the Everglades to the Cities: Trade-offs of Urbanization to White Ibises (<i>Eudocimus albus</i>)</i>	<b>[27] Drew Fowler</b> <i>Lever and switches that influence the conservation value of rice agriculture for wetland dependent birds</i>
1:15 pm	<b>[53] Juliet Lamb</b> <i>A synthetic analysis of post-construction displacement and attraction of marine birds at offshore wind energy installations</i>	<b>[89] Kate Sheehan</b> <i>Avian Drivers of An Unexpected Parasite Outbreak: A Subarctic Lake in Seasonal Flux</i>	<b>[86] Paul Senner+</b> <i>Changes in Avian Community Composition at a Restored Floodplain Grassland in the Mekong Delta</i>
1:30 pm	<b>[84] Martin Scott</b> <i>History of marine wildlife digital aerial surveying</i>	<b>[58] Marykate McHale*</b> <i>Developing a Spatial Model to Predict Avian Botulism Outbreaks in Alaska</i>	<b>[63] David Mizrahi</b> <i>A national assessment of waterbird hunting in coastal wetlands of Suriname</i>
1:45 pm	<b>[90] Henrik Skov</b> <i>Comparable avoidance behaviour of seabirds measured at three offshore wind farms in the Northwest Atlantic (US), United Kingdom (Scotland) and eastern North Sea (Netherlands)</i>	<b>[101] Matt Tatz*</b> <i>Investigating the Relationship Between Mercury, Urbanization, and Salmonella spp. in the American White Ibis (<i>Eudocimus albus</i>)</i>	<b>[34] Matthew Gonnerman</b> <i>Leveraging scientific surveys and citizen science data: applying integrated species distribution models to understand waterfowl distributions in the Chesapeake Bay</i>
2:00 pm	<b>[113] Julia Robinson Willmott</b> <i>New insights into the influence of turbines on the behavior of migrant birds: implications for predicting impacts of offshore wind developments on wildlife</i>	<b>[46] Alexia Hilber*</b> <i>An overview on the Helminth Endoparasite Community of Wading Birds in Southeastern Florida</i>	<b>[31] Dale Gawlik</b> <i>A data-driven prioritization tool to guide waterbird colony island rehabilitation on the Texas coast</i>
2:15 pm	<b>[97] Jennifer Stucker</b> <i>Results from testing - A Multi-Sensor Approach for Measuring Bird and Bat Collisions with Wind Turbines</i>	<b>[117] Ke Zhang*</b> <i>Infection Rates of Avian Malaria in White Ibis and Tricolored Herons in the Southeastern US</i>	<b>[94] Tabitha Stadler</b> <i>Conservation Strategies at the Human/Seabird Interface in the Caribbean</i>
2:30 pm	<b>[36] Holly Goyert</b> <i>Avian risk assessment to support New York's Offshore Wind Master Plan 2.0: Deep Water</i>	<b>[9] Sonja Barber*</b> <i>Larid ectoparasite and microbial community dynamics associated with Avian Botulism</i>	<b>[2] Ghisselle Alvarado-Quesada</b> <i>Costa Rican Waterbird Conservation Strategy</i>
2:45 pm	<b>[40] Christopher Haney</b> <i>Flight behaviors in subtropical seabirds exacerbate collision risk for wind energy development in deep-water environments</i>		<b>[60] Seabird McKeon</b> <i>Towards an Oceanic Joint Venture</i>

## Tuesday, Session 3

Start Time	Atlantic Marine Bird Cooperative Symposium I <b>Moderator: Caleb Spiegel</b>	Highly Pathogenic Avian Influenza Symposium <b>Moderator: Stephanie Avery-Gomm</b>	Foraging Behavior <b>Moderator: Antonio Cantu</b>
3:30 pm	<b>[33] Jeffrey Gleason</b> <i>The Gulf of Mexico Avian Monitoring Network (GoMAMN): a brief history of a value-driven bird monitoring community of practice in the wake of the Deepwater Horizon oil spill</i>	<b>[6] Phil Atkinson</b> <i>Highly pathogenic avian influenza in wild birds in the United Kingdom 2022-2023: impacts, conservation and knowledge gaps.</i>	<b>[17] Antonio Cantu*</b> <i>Mapping foraging habitat availability for Reddish Egrets (<i>Egretta rufescens</i>) in Florida</i>
3:45 pm	<b>[33] Jeffrey Gleason</b> <i>The Gulf of Mexico Avian Monitoring Network (GoMAMN): Discussion</i>	<b>[7] Stephanie Avery-Gomm</b> <i>Wild bird mass mortalities in eastern Canada during the 2022 Highly Pathogenic Avian Influenza (HPAI) outbreak</i>	<b>[112] Jeff White*</b> <i>Isotopic niche of fjord breeding Fiordland penguins/tawaki</i>
4:00 pm	<b>[61] Pamela Michael</b> <i>Migration, breeding location, and seascape shape seabird assemblages in the northern Gulf of Mexico</i>	<b>[32] Jolene Giacinti</b> <i>A phylogeographic reconstruction of the spatiotemporal emergence and spread of highly pathogenic H5N1 avian influenza in Canada.</i>	<b>[20] Gemma Clucas</b> <i>From presence/absence to reliable prey proportions: A field test of fecal metabarcoding for characterizing seabird diets</i>
4:15 pm	<b>[80] Yvan Satgé</b> <i>Update on the forthcoming Gulf of Mexico nesting waterbird atlas and registry</i>	<b>[43] Johanna Harvey</b> <i>From napkin to action: Using network analysis to unravel how US bird conservation can adapt to HPAI</i> <b>[75] Diann Prosser</b> <i>Development of an adaptive modeling approach for predicting avian influenza transmission risk at the wild to domestic interface</i>	<b>[81] Elizabeth Schell*</b> <i>Consistent changes in muscle metabolism underlie dive performance across multiple lineages of diving ducks</i>
4:30 pm	<b>[98] Kate Sutherland</b> <i>Stable Isotope and Mercury Analysis of Black-capped Petrel (<i>Pterodroma hasitata</i>) Feathers to Investigate Trophic Position and Foraging Areas of Light, Dark, and Intermediate Forms</i>	<b>[73] Rachael Pierce</b> <i>Monitoring the Impact of Highly Pathogenic Avian Influenza on Caspian Terns in the Great Lakes</i>	<b>[18] Melissa Chaplin</b> <i>Identifying optimal foraging habitat characteristics to inform piping plover habitat management in South Carolina</i>
4:45 pm	<b>[114] Sarah Wong</b> <i>The Nunatsiavut Seabird Tracking Program: Understanding the year-round movements of seabirds breeding in Nunatsiavut waters.</i>	<b>[116] Carlos Zavalaga</b> <i>Unprecedented mortality of Peruvian pelicans (<i>Pelecanus thagus</i>) during the 2022-2023 H5N1 influenza virus outbreak in Peru</i>	

## Wednesday, Session 1

Start Time	Reproductive Biology <b>Moderator: Jennifer Arnold</b>	Black Skimmer Conservation, Management, and Research Symposium <b>Moderators: Katharine Goodenough and Elizabeth Forys</b>
10:00 am	<b>[13] Lilah Bricker</b> <i>Elevated divorce rates among Common Terns at an inland breeding colony in Canada</i>	<b>[35] Katharine Goodenough</b> <i>Black Skimmer research: A global overview of the species and conservation status in the Americas</i>
10:15 am	<b>[47] Wriley Hodge*</b> <i>A rock with a view: nesting density and distribution of a colonial seabird in relation to habitat and physical features</i>	<b>[99] Patricia Szczys</b> <i>Connectivity Among Black Skimmer Populations in North and South America: a population genetic investigation</i>
10:30 am	<b>[21] Samantha Collins</b> <i>Nesting Ecology of Black-crowned Night-Herons within Key Nesting Areas in New Jersey</i>	<b>[50] Luanne Johnson</b> <i>Notes on the Northernmost Colony of Black Skimmers on the Atlantic Coast</i>
10:45 am	<b>[88] David Shealer</b> <i>First Test for Assortative Mating by Body Feather Color and Brightness in Black Terns</i>	<b>[56] Robert Longiaru</b> <i>Working towards filling knowledge gaps of Black Skimmer movements along the Atlantic Coast: A New York case study</i>
11:00 am	<b>[62] Rostam Mirzadi*</b> <i>Nest survival of five species of colonial waterbirds nesting on the Texas coast</i>	<b>[24] Christina Davis</b> <i>Early insights into demography and movements of Black Skimmers in New Jersey</i>
11:15 am	<b>[108] Kiara Valentine*</b> <i>What's happening to Beach-nesting Birds in southwest Louisiana? Novel Observations from the Field in 2023</i>	<b>[26] Elizabeth Forys</b> <i>Natal and Breeding Dispersal of Black Skimmers in Florida</i>
11:30 am	<b>[5] Jennifer Arnold</b> <i>Novel predator exclusions increase productivity and nesting numbers of Common Terns: Building a fortification through research, monitoring, collaboration, and resilience</i>	<b>[23] Abby Darrah</b> <i>Factors influencing annual survival and productivity for Black Skimmers in the northern Gulf of Mexico</i>
11:45 am	<b>[12] Sarah Bolinger*</b> <i>Using simulation to investigate storm-related bias and species effects on nest survival estimates in beach-nesting birds</i>	<b>[67] David Newstead</b> <i>Site fidelity and migration timing of Black Skimmers in the western Gulf of Mexico</i>

<b>Wednesday, Session 1 (Continued)</b>		
Start Time	<b>Wood Stork Conservation</b> <b>Moderator: William Brooks</b>	<b>Atlantic Marine Bird Cooperative Symposium II</b> <b>Moderator: Caleb Spiegel</b>
10:00 am	<b>[83] Sara Schweitzer</b> <i>Pilot study of Wood Storks nesting in North Carolina</i>	<b>[71] Kimberly Peters</b> <i>Exploring environmental compensation measures for offshore wind: black-legged kittiwake in the U.K.</i>
10:15 am	<b>[41] Christy Hand</b> <i>Status update for the Wood Stork in South Carolina: successes and emerging threats</i>	<b>[69] Iman Pakzad*</b> <i>Identifying Longline Vessel Related Fishing Tactics that Impact Seabird Bycatch Risk</i>
10:30 am	<b>[77] Kristina Ramstad</b> <i>Genomic population structure of the peripatetic wood stork</i>	<b>[93] Jeffrey Spendelow</b> <i>A preliminary look at comparative use of staging sites at Cape Cod National Seashore by Hatch Year Roseate and Common Terns from colony sites where these species nest sympatrically</i>
10:45 am	<b>[19] Shawn Clem</b> <i>Decline of the Corkscrew Wood Stork colony: long-term trends and current conservation needs</i>	<b>[10] Tatsiana Barychka</b> <i>iNaturalist: Benefits and challenges of using a citizen science tool to understand mortality events in the Western Hemisphere.</i>
11:00 am	<b>[49] Carmen Johnson (Lightning)</b> <i>Expanding wings: The application of unoccupied aerial systems in monitoring nesting Wood Storks</i>	<b>[115] Sarah Wong</b> <i>Year 1 after the 2022 Highly Pathogenic Avian Influenza (HPAI) outbreak in eastern Canada: Assessing population impacts on seabirds breeding in Atlantic Canada</i>
11:15 am	<b>[14] William Brooks</b> <i>Southeast U.S. Wood Stork Distinct Population Segment Breeding Range Expansion (1970 – 2022)</i>	<b>[103] Liam Taylor</b> <i>Real-time monitoring of highly pathogenic avian influenza virus A(H5N1) at a seabird colony reveals details of wild disease outbreaks</i>
11:30 am	<b>[22] Mark Cook</b> <i>What triggers irruptive wading bird breeding events? New insights from landscape-scale foraging patterns</i>	
11:45 am	<b>Discussion</b>	

## Thursday, Session 1

Start Time	Artificial and Human-made Habitats that Support Waterbird Nesting and Foraging Symposium <b>Moderator: Rebecca Schneider</b>	Population Monitoring <b>Moderator: John Anderson</b>
10:00 am	<b>[11] Ruth Boettcher</b> <i>Seabird Conservation in a Coastal Urban Setting: An Adaptive Management Challenge</i>	<b>[25] Alexis Diaz*</b> <i>Genetic diversity and population structure of the Slate-colored Coot (<i>Fulica ardesiaca</i>) from Peru</i>
10:15 am	<b>[30] Patrick Garrett</b> <i>Building and Operating Large-Scale Constructed Nutrient Treatment Wetlands with the Presence of Protected Waterbirds</i>	<b>[3] John Anderson</b> <i>On a wing and a prayer: 25 years of seabird research and education on Great Duck Island</i>
10:30 am	<b>[82] Rebecca Schneider</b> <i>Rooftop-Nesting Least Terns in Florida: Conservation Status and Predation Pressures</i>	<b>[45] Dave Hewitt</b> <i>Aerial Photographic Surveys of Nesting Colonial Waterbirds Along the Northern Gulf of Mexico</i>
10:45 am	<b>[100] Daniela Tabilo</b> <i>Are raised artificial bird nesting platforms feasible as alternative nesting sites for terns?</i>	<b>[37] Christopher Gulick*</b> <i>What can spatial networks tell us about wading birds in the coastal Gulf of Mexico?</i>
11:00 am	<b>[1] Kim Abplanalp</b> <i>Build an Island - Terns will come!</i>	<b>[29] Lindsey Garner</b> <i>Using drones and computer vision for large-scale nest monitoring of long-legged wading birds in the Everglades</i>
11:15 am	<b>[109] Jan Van Der Winden</b> <i>Human-made archipelago "Marker Wadden" an example of a large scale novel freshwater wetland boosting bird populations</i>	<b>[70] Prava Pandey*</b> <i>Evaluating Conservation Status of Tern Species in Koshi River Basin, Nepal</i>
11:30 am	<b>[111] Yvonne Verkuil</b> <i>The development of a breeding Pied Avocet population in a human-made freshwater archipelago: implications for management for pioneer birds</i>	
11:45 am	<b>[55] Aylett Lipford*</b> <i>If you build it, will they come? Assessing habitat quality for birds at created marshes in southeastern Louisiana.</i>	



## Thursday, Session 2

Start Time	Waterbird Movement Ecology Symposium <b>Moderators: Peter Frederick and Simona Picardi</b>	Marsh Bird Monitoring and Management <b>Moderator: Tabitha Olsen</b>
1:00 pm	<b>[39] Richard Hall</b> <i>Consequences of habitat specialization for infection dynamics in White Ibis</i>	<b>[64] Lauren Monopoli*</b> <i>Fire Effects of Breeding Marsh Bird Success with Implications for Eastern Black Rail</i>
1:15 pm	<b>[87] Alexander Sharp*</b> <i>Seasonal patterns of urban habitat selection by Little Blue Herons (<i>Egretta caerulea</i>) in coastal Florida</i>	<b>[42] Eleonora Hargett*</b> <i>Developing abundance estimates of Eastern Black Rails in Southeastern Colorado</i>
1:30 pm	<b>[28] Peter Frederick</b> <i>The ability to move seasonally between sharply differing climatic zones in the southeastern US may help support large populations of long legged wading birds.</i>	<b>[68] Tabitha Olsen*</b> <i>Estimating Detection Probability Using Passive and Active Survey Methodology for Six Species of Rail</i>
1:45 pm	<b>[110] Aimee Van Tatenhove*</b> <i>Modeling survival and connectivity of a migratory waterbird in a continuous-time framework</i>	<b>[51] Bailey Kephart*</b> <i>Monitoring Black Rail Occupancy in North Carolina Game Lands to evaluate the effects of prescribed burns on habitat use during the breeding season</i>
2:00 pm	<b>[72] Simona Picardi</b> <i>Fitness Consequences of Partial Migration in Wood Storks Along an Urban Gradient</i>	<b>[92] Christy Soldo</b> <i>Black Rail Detection Model using Deep Learning and Audio Analysis</i>
2:15 pm	<b>[74] Caroline Poli</b> <i>Foray movements are common and have survival benefits for a highly mobile waterbird</i>	<b>[66] Leah Moran*</b> <i>Characterizing Trends of Secretive Marshbird Distributions Across the Deltaic Plain of Louisiana</i>
2:30 pm	<b>[38] Laurie Hall</b> <i>Contrasting migratory chronology and routes of Lesser Scaup: Implications of different migration strategies in a broadly distributed species</i>	Lightning Talks <b>[91] Bonnie Slaton*</b> <i>A Seabird Success Story: Resiliency of Brown Pelicans following Hurricane and Restoration</i> <b>[44] Erin Heller</b> <i>Abundance and origin of blue mussels (<i>Mytilus edulis</i>) on Virginia's peat banks with implications for the conservation of the red knot (<i>Calidris canutus rufa</i>) and other shorebirds</i> <b>[52] Alexander Kropp</b> <i>Operation Wrack Line: Engaging Law Enforcement in Waterbird Protection</i>
2:45 pm	<b>[54] Jennifer Linscott</b> <i>Dynamic Freshwater Wetlands Support a Long-Distance Migratory Shorebird</i>	<b>[59] Monica McKenzie</b> <i>The Impact of Hurricane Ian on Lee County's Snowy Plover (<i>Charadrius nivosus</i>) Nesting Productivity</i>

## Presentation Abstracts

**Alphabetical by presenter (bolded names and emails in blue). Asterisks represent students participating in the presentation award competition.**

**[1] Brinker, David F.<sup>1</sup>, [Kim Abplanalp](#)<sup>2</sup>, David Curson<sup>3</sup>, and Roman Jesien<sup>2</sup>**

<sup>1</sup>Maryland Department of Natural Resources, Annapolis, Maryland, USA; <sup>2</sup>Maryland Coastal Bays Program, Berlin, Maryland, USA; <sup>3</sup>Mid-Atlantic Audubon, Baltimore, Maryland, USA; [dave.brinker@maryland.gov](mailto:dave.brinker@maryland.gov)

### **Build an Island - Terns will come!**

In 1991 1,268 pairs of Common Tern (*Sterna hirundo*) bred in Maryland's coastal bays; by 2020 this population segment had declined to ~35 pairs. The decline is the result of habitat deterioration from sea level rise related accelerated island erosion and loss. In 2021 a 1,024 sq. ft. floating raft was constructed and deployed to provide critically needed breeding habitat. The raft was enlarged in 2022 to 2,304 sq. ft. In 2021, 23 pairs of Common Tern fledged 19 chicks from the raft (0.83 fledglings per nest). Nearly 80% of 19 nesting adult terns marked with field readable bands in 2021 returned to breed on the raft in 2022. During 2022 the breeding colony produced 155 nests and fledged 147 chicks (0.94 fledglings per nest). In 2023, 82% of 110 adult terns marked during the previous two breeding seasons returned to breed on the raft, including 89% of the 2021 adult birds. The raft produced 322 nests in 2023, but reproductive success will be lower because of a three-day storm that killed ~90 small chicks (< 10 days old) through exposure and starvation. Innovative design elements of the raft include dock hinges that allow raft segment articulation to absorb storm wave energy and wheeled dock floats to facilitate raft deployment, removal and storage using a rollback. The raft design withstood sustained winds of 50 mph during tropical storm Elsa in 2021 and a sustained 8-day northeaster in May 2022. While not an inexpensive solution, (approximately \$110,000) artificial islands are an important conservation technique to provide critical breeding habitat while permanent natural habitat solutions are implemented.

**[2] Alvarado-Quesada, Ghisselle M.\*<sup>1</sup>**

<sup>1</sup>National Museum of Costa Rica, San José, Costa Rica; [galvarado@museocostarica.go.cr](mailto:galvarado@museocostarica.go.cr)

### **Costa Rican Waterbird Conservation Strategy**

Among all Costa Rican waterbirds, threatened species must be a priority for any National Conservation Plan. I used data from the National Museums of Costa Rica Annual Waterbird Counts (2011- 2020), to identify priority sites for conservation of wetlands in north Costa Rica. Priority sites were based on presence or absence of Species of Conservation Concern. I also created a data matrix to calculate the conservation priority for all Costa Rican

threatened waterbird species (20), using various parameters, e.g., conservation status, species knowledge, reproduction knowledge. Those with the lowest scores were considered as high priority.

Fourteen of 24 sites surveyed had at least one threatened species and 10 sites showed two to nine threatened species. The wetlands with six or more threatened species were: Mata Redonda Wildlife Refuge (6), Palo Verde National Park (6), Medio Queso Wildlife Refuge (8) and Caño Negro National Park (9). More surveys focused on abundance, habitat use, local movements, breeding season and specific threats to each of the species must to be conducted.

According to the matrix analysis the most threatened species, were the Clapper Rail (*Rallus longirostris*), Ocellated Crake (*Microphygia schomburgkii*), Yellow-breasted Crake (*Hapalocrex flaviventris*) and the Pinnated Bittern (*Botaurus pinnatus*) and Least Bittern (*Ixobrychus exilis*). These species urgently need further study and strong habitat conservation.

### **[3] Anderson, John<sup>1</sup>**

<sup>1</sup>College of the Atlantic, Bar Harbor, Maine, USA; [jga@coa.edu](mailto:jga@coa.edu)

#### **On a wing and a prayer: 25 years of seabird research and education on Great Duck Island**

It is an oxymoron that field ecology requires training in the field, yet few undergraduates have the opportunity to participate in research especially at the beginning of their degrees. In 1998 College of the Atlantic acquired the Great Duck Island Light station, located at 44 08 33 N, 68 14 45 W, approximately 10 Km southeast of Mt Desert Island, Maine. The station had been abandoned in 1986. When we started research in 1999 a small number of Herring and Great Black-backed Gulls (*Larus argentatus* and *L. marinus*) had begun to reoccupy historical nesting areas near the lighthouse. The island also provides nesting habitat to large numbers of Leach's Storm Petrels (*Hydrobates leucorhous*), Black Guillemots (*Cephus grille*) and nesting and nursery spaces for Common Eider Ducks (*Somateria mollissima*). Since 1999, teams of primarily undergraduate students have worked to map and census populations of breeding seabirds, and to study the behavior of individual species. Gull nests at the South end of the island have been mapped every year, using high-precision GPS, and entered into a ARCMAP GIS database. The island as a whole has been surveyed for total gull nests. Nesting habitat, vegetation, and surficial geology have been mapped into the GIS. We now have an extensive long-term data set to draw on. Gull nests at the south end of the island have risen from 107 to 993, while the island total has gone from 682 to 1395. Foraging eiders declined alarmingly in the first quarter of the 21<sup>st</sup> century, from a high of 1120 in 2002 to a low of 57 in 2015 but have shown some signs of recovery recently. Likewise, eider chicks dropped from a high of 126 in 2003 to a low of 10 in 2005 but rebounded to 86 in 2016. Besides the long-term seabird data, a major importance of the island has been the training of a new generation of field ecologists. A total of 110 undergraduates have worked as field assistants on the island, of these 51 have subsequently completed graduate degrees in a variety of areas.

**[4] Angelozzi-Blanco, Gianco\*<sup>1</sup>, Sophia M. Fraser<sup>1</sup>, Allie H. Toms<sup>1</sup>, Erin C. MacMillan<sup>1</sup>, Diana J. Hamilton<sup>1</sup>, and Julie Paquet<sup>2</sup>**

<sup>1</sup>Mount Allison University, Sackville, New Brunswick, Canada; <sup>2</sup>Environment and Climate Change Canada, Sackville, New Brunswick, Canada; [geangelozzi@mta.ca](mailto:geangelozzi@mta.ca)

### **Effects of severe weather events on migrating shorebirds staging in the Northumberland Strait, Canada**

Arctic breeding shorebirds rely on staging sites to replenish energy reserves during their southbound migration. The Canadian Maritime provinces host migrating shorebirds during their post-breeding migration, between late July and October, a period that overlaps with the storm season in this region. The effects of extreme weather events on migrating shorebirds remain poorly studied despite the climate change-driven increasing frequency and intensity of storms. Shorebirds are declining throughout the Americas, and understanding the implications of changing weather patterns is essential to conservation planning. Extreme weather can affect birds via direct mortality or cause habitat disruptions that can lead to sub-optimal body condition for migration. To better understand the sub-lethal effects of storms on shorebirds, we assessed changes in body condition relative to storm events for Semipalmated Sandpiper, Semipalmated Plover, and Sanderling captured using mist nets at Petit Cap, New Brunswick, Canada, between late August and October 2021 and 2022. There were storms in both years and the remnants of Hurricane Fiona, arriving in late September 2022, were especially destructive in the region. In 2022, a subset of individuals captured both before and after Fiona arrived, were fitted with VHF nanotags to estimate their staging duration in the region. Additionally, we collected vertically stratified benthic invertebrate samples to assess the prey availability for the three species before and after Fiona. We found that in both years storms had a larger negative effect on hatch-year birds, which migrate through the region later, and thus a larger proportion of their population was exposed to storm conditions. For all species, birds that were present during storms had poorer body condition and staged in the region longer than birds captured pre or post-storm. Prey availability was significantly reduced after the hurricane, which could explain the increased length of stay of spanning birds. These results highlight the risks of extreme weather events to southbound migrating shorebirds. Additional work examining the duration of these negative effects and long-term consequences is needed.

**[5] Arnold, Jennifer<sup>1,2</sup>, Stephen Oswald<sup>1</sup>, Donald Tyerman<sup>3</sup>, and Michael Barker<sup>3</sup>**

<sup>1</sup>Pennsylvania State University, State College, Pennsylvania, USA; <sup>2</sup>Cornell University, Ithaca, New York, USA; <sup>3</sup>Ontario Parks, Ontario, Canada; [jma25@psu.edu](mailto:jma25@psu.edu)

### **Novel predator exclusions increase productivity and nesting numbers of Common Terns: Building a fortification through research, monitoring, collaboration, and resilience**

Predation is a major source of colony failure for Common Terns (*Sterna hirundo*). Presqu'ile Provincial Park in Ontario supported the largest Common Tern colony in the

Great Lakes region in the 1960s, with over 10,000 pairs, but underwent a precipitous decline in the 1970s to under 100 pairs, around which it stayed. In 2008, in a collaboration between Penn State University and Ontario Parks, a long-term research program began that focused on monitoring breeding, productivity and mark-recapture of terns to advise colony management and restoration. Loss of tern nests and chicks to predatory birds was identified as the root cause of reproductive failure and colony decline. Following multiple years of effectively-zero productivity and a plummeting colony size of 62 breeding pairs, we piloted methods of predator exclusion. We developed a fortified exclusion grid, akin to gull exclusion grids but shorter (~65 cm high), with hard-fenced walls and polywires strung parallel across the top at short intervals of 25-30 cm. These initial grids prevented total colony failure but still resulted in productivity below colony replacement. Between 2013 and 2019, grids were continually refined to improve breeding success and facilitate larger-scale application. In 2019, we added electrified railings using commercial fencing charge controllers, with wires sufficiently apart to prevent grounding by terns. This drastically reduced gull incursion and eliminated predation by night herons, increasing productivity but this success was limited by the number and use of grids. Between 2020 and 2023, the number of exclusion grids were expanded within areas selected for nesting by terns. Over the last two years, the Presqu'ile colony produced more fledglings than during the entire previous decade and has increased in size four-fold (>240 nests in 2023). We discuss the applicability of fortified exclusion grids as a potential tool for tern management elsewhere, and the importance of continual monitoring, refinement, and close collaboration between researchers and natural resource managers.

**[6] Atkinson, Phil<sup>1</sup>, Dawn Balmer<sup>1</sup>, Niall Burton<sup>1</sup>, Gary Clewley<sup>1</sup>, Teresa Frost<sup>1</sup>, Sarah Harris<sup>1</sup>, Liz Humphreys<sup>1</sup>, Nina O'Hanlon<sup>1</sup>, Chris Pollock<sup>1</sup>, and James Pearce-Higgins<sup>1</sup>**

<sup>1</sup>British Trust for Ornithology, Thetford, Norfolk, England; [phi.atkinson@bto.org](mailto:phi.atkinson@bto.org)

### **Highly pathogenic avian influenza in wild birds in the United Kingdom 2022-2023: impacts, conservation and knowledge gaps.**

Since the start of the recent 2021 outbreak of H5NI Highly Pathogenic Avian Influenza (HPAI) in the UK, a number of different quantitative data sources on the mortality associated with HPAI have been collated by statutory nature conservation bodies, and conservation and volunteer-based organisations. These ranged from detailed post hoc assessment of mortality in individual sites (e.g. reviews by site managers, or individuals tasked to undertake a detailed analysis of mortality data), ongoing data entry into three national databases by site managers, to ad-hoc observations submitted by the birdwatchers in the BTO BirdTrack app and website. For some species, specific assessments of mortality in a site or group of sites has been published. The UK hosts internationally important numbers of breeding waterbirds and this species group was most affected with minimum estimates of mortality in some common species exceeding 10% of the UK's breeding population. Most affected were Great Skua *Stercorarius skua*, Northern Gannet *Morus*

*bassanus*, Barnacle Goose *Branta leucopsis* and Black-headed Gulls *Chroicocephalus ridibundus*. Other gull, terns and auk species were also heavily impacted. During the outbreak management guidelines were put in place and a number of data gaps and research priorities identified.

**[7] Avery-Gomm, Stephanie<sup>1</sup>, Tatsiana Barychka<sup>1</sup>, Matthew English<sup>1</sup>, Jean-François Rail<sup>1</sup>, Sabina Wilhelm<sup>1</sup>, William Montevicchi<sup>2</sup>, Stéphane Lair<sup>3</sup>, Megan Jones<sup>4</sup>, Magella Guillemette<sup>5</sup>, and Jean-François Giroux<sup>6</sup>**

<sup>1</sup>Environment and Climate Change Canada, Canada; <sup>2</sup>Psychology Department, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, Canada; <sup>3</sup>Canadian Wildlife Health Cooperative, University of Montréal, St-Hyacinthe, Québec, Canada; <sup>4</sup>Canadian Wildlife Health Cooperative, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada; <sup>5</sup>Department of Biology, Chemistry, and Geography, University of Québec Rimouski, Rimouski, Québec, Canada; <sup>6</sup>Department of Biological Sciences, University of Québec Montréal, Montréal, Canada; [stephanie.avery-gomm@ec.gc.ca](mailto:stephanie.avery-gomm@ec.gc.ca)

### **Wild bird mass mortalities in eastern Canada during the 2022 Highly Pathogenic Avian Influenza (HPAI) outbreak**

The Highly Pathogenic Avian Influenza (HPAI) virus H5N1 clade 2.3.4.4b is causing unparalleled mortality of wild birds, threatening population levels for some species. In eastern Canada, tens of thousands of wild birds were reported sick or dead during a major HPAI outbreak in 2022. Here, we present the first comprehensive estimate of mortality caused by HPAI between April 1 and September 30 from these reports. Reports were collated from Federal, Indigenous, Provincial and Municipal governments, NGOs, academics, and citizen science platforms. We undertook a scenario analysis to compare how the total number of reported mortalities would change under a range of spatial and temporal pooling (to remove double counts of the same birds). We summarize the taxonomic and spatiotemporal mortality patterns for a scenario that excluded the smaller of paired records, where pairs of records were based on the same species being observed within one day and one kilometre (0.62 miles). Over 40,000 wild birds were reported sick or dead in eastern Canada during the spring and summer of 2022. Over 98.7% of these were seabirds and sea ducks, long-lived species that are slow to recover from perturbations. The most significant mortality was reported in Northern Gannets (*Morus bassanus*; >25,000), Common Murres (*Uria aalge*; >8,000) and Common Eiders (*Somateria mollissima dresseri*; >1,600). These numbers do not reflect total mortality levels because they do not include birds that died on land but were not reported and do not account for birds that died at sea but did not wash ashore. The actual mortality was likely much higher, and work to refine mortality estimates by accounting for at-sea losses is underway. This mortality assessment will support an evaluation of population-level impacts for species that suffered significant mortality globally (e.g., Northern Gannets) and harvest management decisions for hunted species (e.g., Common Eiders, Common Murres).

**[8] Balitbit, Mario<sup>1</sup>, Alexandra Wilke<sup>1</sup>, Bryan Watts<sup>2</sup>, Chance Hines<sup>2</sup>, Laura Duval<sup>2</sup>, and Zak Poulton<sup>1</sup>**

<sup>1</sup>The Nature Conservancy Virginia, Nassawadox, Virginia, USA; <sup>2</sup>Center for Conservation Biology, College of William & Mary, Williamsburg, Virginia, USA; [mario.balitbit@tnc.org](mailto:mario.balitbit@tnc.org)

**Willet, or won't it? Evaluating the potential impacts of offshore wind on migratory shorebirds**

Over 570 km<sup>2</sup> of protected coastal lands on Virginia's Eastern Shore, USA (ESVA) provides important breeding and migratory staging habitats for hundreds of thousands of shorebirds, including a relatively under-studied population of breeding eastern willet (*Tringa semipalmata semipalmata*). This population likely undertakes transoceanic migrations to and from nonbreeding grounds in Central and South America. However, these exact migratory pathways have not been documented using the advanced tracking technology that is now available. The ESVA is also located adjacent to two active wind energy lease areas (Dominion's Coastal Virginia Offshore Wind and Avangrid's Kitty Hawk Wind), providing the opportunity to evaluate the potential exposure risk of this species to these and other future wind energy areas. To this end, we deployed 21 high-resolution, solar-powered GPS dataloggers and one high-resolution, solar-powered cellular GPS tag on breeding eastern willet during the 2023 breeding season. Breeding individuals were captured on their nests using handheld nets. The dataloggers and cellular unit include customizable geofencing options, the ability to measure altitude and environmental conditions, and to collect more than 500 GPS fixes per day. Resulting movement and migration data streams are in progress and will ultimately allow us to document the transoceanic migratory pathways of this species during both north- and south-bound migration and evaluate this species' potential interaction with current and future offshore wind energy areas. An additional 40 units will be deployed during the 2024 nesting season.

**[9] Barber, Sonja\*<sup>1</sup>, Kate L. Sheehan<sup>1</sup>, and Douglas Causey<sup>2</sup>**

<sup>1</sup>Frostburg State University, Frostburg, Maryland, USA; <sup>2</sup>University of Alaska Anchorage, Anchorage, Alaska, USA; [sbarber0@frostburg.edu](mailto:sbarber0@frostburg.edu)

**Larid ectoparasite and microbial community dynamics associated with Avian Botulism**

Feather and skin surfaces provide habitats that support communities of ectoparasites, including feather mites, feather lice, ticks, and sticktight fleas. While interacting with host resources, the parasites and host inadvertently exchange microbes, integrating the host microbiome within the ectoparasites. Bacterial populations are influenced by host and environmental conditions including host temperature, endogenous and exogenous chemicals, and intracommunity interactions with other bacteria. Healthy microbiomes provide important services to the host, and disruption to their communities can have

deleterious effects on host health- known as dysbiosis. *Clostridium botulinum*, a cosmopolitan bacterium, can produce a suite of lethal neurotoxins that cause Avian Botulism (AB) in waterbirds. Botulism toxins affect the condition of host birds and induce microbial dysbiosis. AB causes waterbird die-offs worldwide and is considered the disease agent of an AB outbreak on Middleton Island, Alaska, where larid colonies suffered hundreds of deaths in 2021. Here, we compare the ectoparasite and microbial communities of AB-impacted larids from Middleton Island to conspecifics collected in 2016 during non-outbreak 'healthy' conditions. We sorted and enumerated arthropod ectoparasites washed from the external surfaces of larid carcasses into morphospecies. Healthy Black-legged Kittiwakes (*Rissa tridactyla*, BLKI) carried a higher abundance of ectoparasites ( $p=0.027$ , t-test), while AB-intoxicated BLKI exhibited higher ectoparasite community evenness with higher diversities ( $p=0.018$ , t-test). We could differentiate between infected and healthy birds with >92% accuracy ( $R^2=0.67$ , discriminant analysis) based on their ectoparasite communities. We compared the microbiomes from healthy and AB-intoxicated birds using 16S metagenomic extraction and analyses. Preliminary results suggest that the diversity and richness of the observed microbial OTUs (operational taxonomic units) are higher in AB-infected birds (Shannon  $p=0.023$ , richness  $p=0.031$ , Kruskal-Wallis). Further, we find that the microbial communities between healthy and AB-intoxicated birds are dissimilar based on OTU abundance ( $p=0.028$ , Bray-Curtis) and presence/absence ( $p=0.011$  Jaccard). These results imply similar AB infection consequences on the microbial and ectoparasite communities of seabirds. Therefore, this approach could be used to surveil avian colonies for dysbiosis by evaluating and cataloging ectoparasite communities. This promising technique will assist in developing a more comprehensive understanding of Avian Botulism.

**[10] Barychka, Tatsiana<sup>1</sup>, Natasha Bartolotta<sup>2</sup>, Tabatha Cormier<sup>1</sup>, Matthew English<sup>1</sup>, Thomas Hilling<sup>3</sup>, Seabird McKeon<sup>4</sup>, Mark Pokras<sup>5</sup>, Caleb Spiegel<sup>6</sup>, and Stephanie Avery-Gomm<sup>1</sup>**

<sup>1</sup>Environment and Climate Change Canada, Canada; <sup>2</sup>National Loon Center, Crosslake, Minnesota, USA; <sup>3</sup>Western Connecticut State University, Danbury, Connecticut, USA; <sup>4</sup>American Bird Conservancy, The Plains, Virginia, USA; <sup>5</sup>Cummings School of Veterinary Medicine, Tufts University, Massachusetts, USA; <sup>6</sup>U.S. Fish and Wildlife Service, USA; [tania.barychka@gmail.com](mailto:tania.barychka@gmail.com)

### **iNaturalist: Benefits and challenges of using a citizen science tool to understand mortality events in the Western Hemisphere.**

iNaturalist is a global, open-source platform used by citizen scientists to report plant and animal observations. Data contributed by observers can be easily extracted. iNaturalist has proven to be a valuable source of information during unusual mortality events, particularly in areas where mortality data are not otherwise collated. To elucidate spatiotemporal trends in waterbird (i.e., seabird and waterfowl) mortality in the Western Hemisphere, the Atlantic Marine Bird Cooperative (AMBC) Community Science and Marine Bird Health Working Group launched the Beached Birds iNaturalist project. Since December 2021,



when the current outbreak of highly pathogenic avian influenza (HPAI) virus began in North America, over 5000 research-quality observations of dead birds have been captured by this project. We report spatiotemporal patterns in reported mortality and identify the most commonly reported dead species on iNaturalist in the Western Hemisphere. Although iNaturalist observations can provide valuable data to supplement mortality assessments, the reported mortalities represent only a fraction of the true mortality. We will demonstrate this using a case study from eastern Canada to describe the benefits and difficulties of working with iNaturalist data and discuss the next steps for improving the value of iNaturalist as a tool for learning about wild bird mortality.

**[11] Boettcher, Ruth<sup>1</sup>, Rebecca Gwynn<sup>1</sup>, David Norris<sup>1</sup>, Stephen Living<sup>1</sup>, Chelsea Weithman<sup>2</sup>, Kelsi Hunt<sup>2</sup>, Sarah Karpanty<sup>2</sup>, Dan Gibson<sup>2</sup>, Dan Catlin<sup>2</sup>, and Jim Fraser<sup>2</sup>**

<sup>1</sup>Virginia Department of Wildlife Resources, Henrico, Virginia, USA; <sup>2</sup>Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, Virginia, USA; [ruth.boettcher@dwr.virginia.gov](mailto:ruth.boettcher@dwr.virginia.gov)

### **Seabird Conservation in a Coastal Urban Setting: An Adaptive Management Challenge**

South Island (SI) is part of the Hampton Roads Bridge-Tunnel (HRBT) complex in Hampton, Virginia and from 2009-2019 it supported the Commonwealth's largest seabird colony. The HRBT Expansion Project commenced in fall of 2019 and required the colony be relocated permanently. In February 2020, the Virginia Department of Wildlife Resources was charged with providing temporary nesting habitat for the displaced seabirds. Ft. Wool (FTW), an artificial island adjacent to SI, was transformed into a 1.5-acre breeding site. An additional acre of habitat was created on industrial barges anchored in the FTW embayment. We used audio lures and decoys to attract the following species: Royal Terns (*Thalasseus maximus*; ROYT), Sandwich Terns (*Thalasseus sandvicensis*; SATE), Common Terns (*Sterna hirundo*; COTE), Gull-billed Terns (*Gelochelidon nilotica*; GBTE), and Black Skimmers (*Rynchops niger*; BLSK). All five species nested on FTW and the barges in 2020 (n=11,750 breeding adults) and in even greater numbers in 2021 (n=13,142 breeding adults) and 2022 (n=15,300 breeding adults). FTW and the barges attracted other breeding waterbirds including Laughing Gulls (*Leucophaeus atricilla*; LAGU), Herring Gulls (*Larus argentatus*), Snowy Egrets (*Egretta thula*), Brown Pelicans (*Pelecanus occidentalis*) and American Oystercatchers (*Haematopus palliatus*). From 2018-2022, we applied field-readable bands on 9,366 ROYT (226 adults, 9,140 young), 1,466 COTE (163 adults, 1,303 young), 1,242 LAGU (286 adults, 956 young), 303 BLSK (29 adults, 274 young), 136 SATE (1 adult, 135 young), and 99 GBTE (24 adults, 75 young) to examine distribution, reproduction and survival. FTW and the barges are not permanent solutions, as each has its own challenges. The U.S. Army Corps of Engineers received funding to construct a nesting island within 10 km of SI and is currently in the project feasibility study phase. Construction of the new island is expected to begin in 2025.

## [12] Bolinger, Sarah\*<sup>1</sup>, Erik Johnson<sup>2</sup>, and Paul Leberg<sup>1</sup>

<sup>1</sup>University of Louisiana Lafayette, Lafayette, Louisiana, USA; <sup>2</sup>Audubon Delta, Louisiana, USA;  
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### **Using simulation to investigate storm-related bias and species effects on nest survival estimates in beach-nesting birds**

Daily survival rate (DSR) of nests is commonly estimated using field evidence. Storms increase the uncertainty of DSR estimates in beach-nesting birds because evidence of true fate may be washed away and failure erroneously attributed to the storm. I used simulated data to investigate how changing storm duration/frequency affects uncertainty of DSR estimates. I simulated nests with randomly assigned initiation dates. The model had a true DSR and a conditional daily failure probability from multiple causes, plus an observation process (nest discovery probability and observation interval). I simulated storms at different frequencies and durations, then compared the bias and variance of DSR estimates from three different models under each scenario. I found that storm frequency has a larger effect on variance than storm duration, although increased sample size mitigates bias in DSR estimates. Observation interval and incubation time (which can vary by almost two weeks between species) also had an effect. As climate change increases vulnerability of coastal sites as well as duration/frequency of storm events, storm-related bias is important to consider, especially for studies that lack the budget or appropriate location (such as public beaches) for camera monitoring.

## [13] Bricker, Lilah<sup>1</sup>, Jennifer Arnold<sup>1,2</sup>, and Steve Oswald<sup>1,2</sup>

<sup>1</sup>Cornell University, Ithaca, New York, USA; <sup>2</sup>Pennsylvania State University, State College, Pennsylvania, USA;  
[lbricker1@my.hpu.edu](mailto:lbricker1@my.hpu.edu)

### **Elevated divorce rates among Common Terns at an inland breeding colony in Canada**

Mate fidelity in socially monogamous birds may enhance reproductive success through mate familiarity and by avoiding costs associated with remating. For Common Terns (*Sterna hirundo*) in Europe, the likelihood of divorce has been linked to age, breeding experience, reproductive success, and asynchronous arrival at breeding colonies. Common Tern breeding populations in inland North America have exhibited extensive declines, unlike coastal breeders, and identifying divorce rates and the drivers of mate retention and divorce in inland populations may help to elucidate stressors. We assessed divorce rates and whether indices of individual quality, reproductive success, and breeding chronology impacted the probability of divorce among Common Terns at a small colony in Lake Ontario, Canada for adults marked and recaptured over a 10-year period. Across the 119 breeding individuals in our study, 50.8% divorced at least once, a higher frequency than that of both experienced and first-time breeders reported by studies in the Banter See in Northern Germany. Divorce rates in our study varied greatly across years, ranging from

8.3% to 80.0%. Egg-laying date was the most important factor predicting re-pairing in the next year, with likelihood of subsequent divorce increasing as individuals laid later in the season. The probability of a pair divorcing also varied between year, independent of laying date. Because predation and flooding, which force birds to re-nest later in the season, tend to be more common at inland colonies, we expect divorce rates to be higher across inland colonies, not just at our study site. As well as population declines, Common Terns breeding in inland North America have been found to exhibit decreased productivity and site fidelity. Elevated divorce rates are thus another potential stressor experienced within these declining populations.

### **[14] Brooks, William<sup>1</sup>**

<sup>1</sup>U.S. Fish and Wildlife Service, USA; [skoorbylib@gmail.com](mailto:skoorbylib@gmail.com)

#### **Southeast U.S. Wood Stork Distinct Population Segment Breeding Range Expansion (1970 – 2022)**

Genetic analyses of wood storks (*Mycteria americana*) nesting in the southeastern United States indicate that these birds represent a single population that shows no evidence of discrete subpopulations. When the wood stork was listed in 1984, the population was estimated at 4,000–5,000 nesting pairs, a decline of 75 percent of the historical population. At that time, the overall range of the wood stork included Alabama, Florida, Georgia, and South Carolina. Nesting primarily occurred in south and central Florida. Currently, the federally listed entity of wood stork has a distribution that includes the coastal plain of Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina, with breeding occurring in Florida, Georgia, South Carolina and expansion beyond the historical range to now include North Carolina. The most recent survey data (2022) indicate that there are 106 known active wood stork breeding colony sites, which is more than 3.5 times the number of breeding colonies (29) that were in existence at the time of listing. Within the breeding range, wood stork colonies and nest numbers generally cluster into four regions (in the south, central, northwest, and northeast portions of the breeding range). There are 310 different nesting colony sites in the southeast U.S. where wood storks nest or have previously nested. Annual nesting during the past five years has ranged 9,905-12,453 nesting pairs with an average of 11,224 for the four years with full surveys.

### **[15] Brown, Lyn<sup>1</sup> and Erica Nol<sup>1</sup>**

<sup>1</sup>Trent University, Peterborough, Ontario, Canada

#### **Foraging Behaviors of American Oystercatchers breeding on two barrier islands in Virginia**

The breeding population of American Oystercatchers has been strongly declining across the Virginia barrier islands since 2016. Here we explore potential causes for the decline in breeding success and number of breeding pairs on two Virginia barrier islands. We focus on how foraging habitat quality may be implicated in the decline. In 2022 and 2023, we combined observations of foraging and chick provisioning behaviors of oystercatchers with fine-scale GPS tracking data, and related this to breeding success.

**[16] Brush, Janell<sup>1</sup>, Raya Pruner<sup>1</sup>, Shea Armstrong, Michelle Van Deventer<sup>2</sup>, Ariam Jimenez<sup>1</sup>, Emma LeClerc<sup>1</sup>, and Kristin Rogers<sup>1</sup>**

<sup>1</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; <sup>2</sup>The Nature Conservancy, USA; [janell.brush@myfwc.com](mailto:janell.brush@myfwc.com)

### **Florida's Shorebird Program: Coordinated Conservation in the Anthropocene**

Florida's coastal areas are highly sought after for development and tourism because of their aesthetic and recreational value. Consequently, there is little pristine beach habitat remaining in the state, and even undeveloped areas are often disturbed and degraded to the detriment of beach-dependent birds. Realizing the value of a collaborative approach to statewide conservation, the Florida Shorebird Alliance (FSA) was created to coordinate conservation actions and expand collective knowledge and resources. This partner-driven monitoring and educational outreach program is crucial for progress toward species recovery goals and adaptively managing nesting sites. Partners follow a standardized monitoring protocol and enter data into a centralized data repository, the Florida Shorebird Database. The structure of the FSA facilitates programmatic learning, sharing lessons learned, tracking outcomes in response to actions, and adapting to ever-changing conditions and emerging issues. Here we will present the value of standardized, long-term monitoring data collection for identifying research priorities, developing population estimates and recovery goals, and informing restoration strategies. We will also share best practices, lessons learned, and the importance of a multi-pronged approach to conserving shorebird populations in areas with increased human disturbance, predator abundance, catastrophic events, and even sometimes competing conservation interests.

**[17] Cantu, Antonio\*<sup>1</sup>, Dale Gawlik<sup>1</sup>, Leonardo Calle<sup>2</sup>, and Andrew Cox<sup>3</sup>**

<sup>1</sup>Harte Research Institute for Gulf of Mexico Studies, Texas A&M University Corpus Christi, Corpus Christi, Texas, USA; <sup>2</sup>Earth System Science Interdisciplinary Center, University of Maryland, College Park, Maryland; <sup>3</sup>Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, Florida, USA; [acantudeleija@islander.tamucc.edu](mailto:acantudeleija@islander.tamucc.edu)

### **Mapping foraging habitat availability for Reddish Egrets (*Egretta rufescens*) in Florida**

The availability of foraging habitats has been linked to the reproductive performance and survival of several wading bird species (Ciconiiformes and Pelecaniformes) and is thus an important consideration for their conservation. In coastal environments, foraging habitat availability is regulated by two dominant drivers: water level fluctuations (due to tides, winds, and freshwater inputs) and geomorphology (e.g., seafloor roughness). These drivers interact to control the depth, spatial extent, and timing of available foraging habitats to wading birds based on their species-specific intrinsic limitations to access aquatic foods, namely leg length and foraging behavior. Although coastal environments are naturally dynamic and complex, human activities and sea level rise are exacerbating coastal change, altering waterbird foraging habitats and leaving coastal resource managers in need of new data-driven tools. Here, we will use the Time-integrated Model of Shallow-water Availability (TiMSA) for mapping predicted foraging habitat availability for Reddish Egrets (*Egretta rufescens*), a coastal specialist of conservation concern that forages in shallow water (< 25 cm) on intertidal flats. TiMSA outputs are temporally-explicit gridded data products that allow us to quantify areas where foraging habitat is most available. We apply this model to compare the spatial and temporal availability of shallow foraging habitats around three historically important wading bird nesting areas on the west coast of Florida, USA. Finally, we show how TiMSA can be used to identify and prioritize areas where restoration and protection could be most beneficial, and discuss some limitations and considerations for dynamic intertidal foraging habitat modeling.

**[18] Tweel, Andrew<sup>1</sup>, Melissa Chaplin<sup>2</sup>, Denise Sanger<sup>2</sup>, Katherine Silliman<sup>2</sup>, and Tanya Darden<sup>2</sup>**

<sup>1</sup>South Carolina Department of Natural Resources, South Carolina, USA; <sup>2</sup>U.S. Fish and Wildlife Service, USA; [tweela@dnr.sc.gov](mailto:tweela@dnr.sc.gov)

### **Identifying optimal foraging habitat characteristics to inform piping plover habitat management in South Carolina**

Sandy and fine substrate intertidal habitats along the South Carolina coast are home to many species of wintering and migrating shorebirds including the piping plover (*Charadrius melodus*). In South Carolina, the preferred foraging locations for piping plovers are intertidal estuarine and marine habitats, particularly semi-protected sand- and mudflats common along the ends of barrier islands. This study aimed to: 1) further refine piping plover preferred prey species using genetic analysis of fecal samples, 2) synthesize existing benthic community, habitat, and shorebird foraging datasets using the refined prey results and identify important habitat characteristics, and 3) use this information to develop a management guide to habitat quality based on a suite of indicators. The meta-analysis yielded a composite benthic infauna dataset of 3,450 benthic samples that were analyzed for prey availability and habitat importance. Samples were collected between 2011 and 2021 across seven primary habitat types and seven beaches spanning 80 km of coastline. Each site type was classified into one of seven habitat types (sampling strata),

based on geomorphological characteristics at time of sampling: depression (isolated or semi-isolated), inlet-facing beach, ocean-facing beach, runnel, sheltered, and sheltered *Spartina*. Foraging opportunity varied by habitat type but was significantly greater in isolated depression habitats by more than a factor of three compared to all other habitats. These isolated depressions were available for foraging over 90% of the time and supported prey biomass (1.65 g m<sup>-2</sup>) twice that of the next highest groups (semi-isolated: 0.89 g m<sup>-2</sup>, runnel: 0.71 g m<sup>-2</sup>). During the winter of 2020-2021, 37 piping plover fecal samples were collected following methods of Gerwing and others (2016). Across all previous studies included in this analysis, there were several species of polychaete worms and amphipods that comprise the bulk (51% of all observed infauna) of the overall potential prey species. The polychaete worm *Laeonereis culveri* was observed in the greatest abundances, accounting for 79% of all prey polychaete observations across all studies. Three haustoriid amphipod taxa- *Protohaustorius wigleyi*, *Neohaustorius schmitzi*, and the genus *Acanthohaustorius*- accounted for 82% of all haustoriid amphipod observations.

## [19] Clem, Shawn<sup>1</sup>

<sup>1</sup>Audubon Florida, Florida, USA; [shawn.clem@audubon.org](mailto:shawn.clem@audubon.org)

### **Decline of the Corkscrew Wood Stork colony: long-term trends and current conservation needs**

The old-growth bald cypress forest that is now central to Audubon's Corkscrew Swamp Sanctuary (Naples, FL) has served as a colony site for Wood Storks (*Mycteria americana*) since prior to the early 1900s. Monitoring that began soon after the Sanctuary was established provides a running 67-year record of annual breeding effort for this colony. The Corkscrew colony supported thousands of nests each year in the 1960s and 1970s when it was the largest Wood Stork breeding colony in the United States. In the species' U.S. South Breeding Region, the Corkscrew colony contributed over half of known Wood Stork nests most years through the 1990s and 66% of all Wood Stork nests in this region 1965-1999. The Corkscrew colony has declined in recent decades, however, with successful nesting in only 10 of the last 20 nesting seasons and averaging only 173 nests each year. The decline of the Corkscrew colony was concurrent with development and wetland loss in Southwest Florida, in addition to significant alteration of the Sanctuary's hydrology, and provides an indicator of broad ecological impacts of these perturbations. Hydrologic alteration has also triggered invasion of Sanctuary marshes and wet prairie by native shrubs and trees (e.g., Carolina willow, buttonbush, red maple), reducing foraging habitat and exacerbating water loss. We discuss long-term trends in Wood Stork nesting in the Corkscrew region concurrent with development and land use changes, the perceived importance of the Western Everglades for recovery of Everglades' Wood Storks, and conservation and restoration strategies to benefit Wood Storks and Western Everglades wetlands.

**[20] Clucas, Gemma<sup>1</sup>, Andrew Stillman<sup>1</sup>, Jennifer Seavey<sup>2</sup>, and Elizabeth Craig<sup>2</sup>**

<sup>1</sup>Cornell Lab of Ornithology, Cornell, Ithaca, New York, USA; <sup>2</sup>Shoals Marine Lab, University of New Hampshire, Appledore Island, Maine, USA; [gemma.clucas@cornell.edu](mailto:gemma.clucas@cornell.edu)

**From presence/absence to reliable prey proportions: A field test of fecal metabarcoding for characterizing seabird diets**

Fecal metabarcoding is an increasingly popular method for studying the diets of birds and other taxa. While this approach can detect a wider range of prey than traditional methods, estimating prey proportions continues to be challenging. To test this in seabirds, we recorded the ID and length of fish provisioned to Common Tern chicks on the Isles of Shoals, NH, in 2017 – 2019 while also collecting fecal samples from chicks in the same colony for fecal metabarcoding. We used the popular MiFish primers to sequence a portion of the 12S gene from fecal samples and compared fish visual counts and biomass estimates to two common metabarcoding metrics: the frequency of occurrence (FOO) of prey species, which uses presence/absence, and the relative read abundance (RRA) of those species, which accounts for the relative number of recovered sequences. We found the lowest mean absolute error (MAE=0.06) and root mean squared error (RMSE=0.07) between the relative biomass consumed and RRA, showing that RRA is a surprisingly good metric for estimating prey proportions. RRA also outperformed FOO in detecting interannual changes in fish prey. Thus, RRA appears to be a suitable metric for estimating fish proportions in tern diets (and likely other seabirds) using fecal metabarcoding. To investigate the effect of fecal samples size on error rates, we simulated an annual monitoring protocol ranging from 10 – 40 samples per year and show that error rates reached a lower asymptote around 30-40 samples each year. Therefore, future studies of seabirds with similar levels of diet diversity should sequence 30 – 40 samples per colony/life stage and use RRA to estimate the proportions of prey consumed.

**[21] Collins, Samantha<sup>1</sup>, Lisa Ferguson<sup>1</sup>, and Christina Davis<sup>2</sup>**

<sup>1</sup>The Wetlands Institute, Stone Harbor, New Jersey, USA; <sup>2</sup>Fish and Wildlife, New Jersey Department of Environmental Protection, New Jersey, USA; [scollins@wetlandsinstitute.org](mailto:scollins@wetlandsinstitute.org)

**Nesting Ecology of Black-crowned Night-Herons within Key Nesting Areas in New Jersey**

The Black-crowned Night-Heron (*Nycticorax nycticorax*) has experienced significant population declines in recent decades throughout New Jersey and statewide aerial surveys show a decrease in the number of active nesting colonies over the last 20 years. Research to investigate habitat suitability and limiting factors for Black-crowned Night-Heron within key nesting areas is considered a priority for this region to provide recommendations on marsh island management and habitat enhancement plans. Gull Island and Sturgeon Island,

located in Cape May County, contain historic dredged material placement areas that host approximately 46% of all Black-crowned Night-Herons nesting in New Jersey. Within the four distinct nesting areas on these islands, we investigated changes in nest site selection, habitat availability, and factors influencing reproductive success of Black-crowned Night-Herons for the 2019-2023 nesting seasons. Differences in breeding season phenology and species abundance was evident within nesting areas between years and evidence of interspecific competition was apparent. Further, we observed changes in suitable nesting habitat availability between years with increased flooding and storm events. With few alternative sites, habitat enhancement and management may be necessary to ensure suitable habitat and improve reproductive outcomes to support the statewide population.

## [22] Cook, Mark<sup>1</sup>

<sup>1</sup>South Florida Water Management District, West Palm Beach, Florida, USA; [mcook@sfwmd.gov](mailto:mcook@sfwmd.gov)

### **What triggers irruptive wading bird breeding events? New insights from landscape-scale foraging patterns**

Recovery of historical trophic relationships sustaining nesting populations of wading birds is a primary goal of Everglades Restoration. The Trophic Hypothesis captures the concept that wading bird nesting is currently limited by the production and accessibility of aquatic prey at appropriate water depths, times and locations. While a substantial body of literature has identified many of the key links in the Trophic Hypothesis, the mechanisms driving some of the defining characteristics of historic nesting such as early Wood Stork nesting and exceptionally large coastal breeding aggregations remain poorly understood.

Yet recent years of unprecedented hydrological conditions and nesting responses are providing new insights into wading bird reproductive ecology. Nesting and foraging patterns from these years suggest that hydrological recovery of local short-hydroperiod habitats is critical for producing enough available prey at the right time and place to trigger large coastal nesting events.

I tested this hypothesis by quantifying foraging responses of wading birds across the Greater Everglades landscape using systematic aerial foraging surveys. Flights were conducted weekly from November through June during a wet year with hydrological conditions and nesting responses comparable to the pre-drainage period, and a dryer year with hydrology and nesting typical of post-drainage conditions. Survey locations were predetermined on a weekly basis using WADDEM habitat suitability maps, and photography was used to quantify flock size and species composition.

As predicted, short-hydroperiod wetlands supported exceptionally large numbers of foraging Wood Storks and other wading birds throughout the nesting period during the year with relatively wet antecedent conditions and exceptional nesting. Critical foraging habitats included the coastal marshes, Western Marl Prairies and Lostmans Slough, but few



birds were observed in Shark River Slough. In the dry year with limited nesting, relatively few birds foraged in either short-hydroperiod or slough habitats. These results run contrary to the idea that rehydration of Shark River Slough alone will be sufficient to restore large, coastal nesting colonies and suggests that restoring hydroperiods across a broader swarth of the southern Everglades, including the Western Marl Prairies and the Lostmans Slough regions, is key to wading bird recovery.

## [23] Darrah, Abby<sup>1</sup>

<sup>1</sup>Audubon Delta, USA; [abby.darrah@audubon.org](mailto:abby.darrah@audubon.org)

### **Factors influencing annual survival and productivity for Black Skimmers in the northern Gulf of Mexico**

The Black Skimmer (*Rynchops niger*) is a species of high conservation concern that has experienced up to a 70% decline in populations in recent decades. The goal of this study was to determine which factors limit productivity and survival in Black Skimmers nesting in the northern Gulf of Mexico, and to test whether recent restoration projects have led to increased productivity. Observers monitored breeding Black Skimmer colonies on mainland beaches, natural islands, and island restoration sites in Mississippi from 2017-2023. Black Skimmers were banded throughout the year starting in 2020 using noose mats (adults and fledglings) or dip nets (chicks). Scaled mass index at capture was calculated for all individuals using wing chord and mass. Location and date of banded bird sightings were recorded during standardized breeding and non-breeding surveys in Mississippi and Louisiana, and incidentally by the public throughout the Gulf of Mexico. We used linear models to examine the effects of year and site on colony-level productivity. We analyzed the capture and resight data using Cormack-Jolly-Seber models to estimate the effects of age and body condition at capture on Black Skimmer annual survival. Mean colony productivity was 0.20 (0.09 SE), and was not related to site or year. Adult apparent annual survival was 0.88 (0.11 SD) and was not related to body condition at capture ( $\hat{\beta} = 0.59 \pm 0.39$  SD), while juvenile apparent annual survival was 0.28 (0.23 SD) and was positively related to body condition ( $\hat{\beta} = 1.68 \pm 0.79$  SD). Mean scaled mass index of pre-fledged chicks was significantly lower in 2022 ( $307 \pm 3.8$  SE) than in other years ( $318 \pm 3.0$  SE). Black Skimmer colonies in this study did not experience greater productivity on restoration sites than on natural island sites or on mainland beaches. Body condition was an important component of juvenile survival, and factors that influence chick provisioning rates might be an overlooked issue for Black Skimmer colonies in this region. Future studies should investigate adult foraging areas, food availability, and provisioning rates to test this hypothesis and to improve conservation actions targeting this species.

**[24] Ferguson, Lisa<sup>1</sup>, Christina Davis<sup>2</sup>, Samantha Collins<sup>1</sup>, Meghan Kolk<sup>1</sup>, Emily Heiser<sup>2</sup>, and Brittany Morey**

<sup>1</sup>The Wetlands Institute, Stone Harbor, New Jersey, USA; <sup>2</sup>Fish and Wildlife, New Jersey Department of Environmental Protection, New Jersey, USA; [Christina.Davis@dep.nj.gov](mailto:Christina.Davis@dep.nj.gov)

### **Early insights into demography and movements of Black Skimmers in New Jersey**

Over the past decade, the population of *Rynchops niger* (Black Skimmer) in New Jersey (NJ) during the breeding season has held relatively stable, ranging from 2,000-2,500 individuals in most years. The distribution of active nesting sites, however, has shifted from a combination of beach strand and marsh islands to nearly all beach strand sites, where human disturbance is of greater concern. We initiated a banding study to better understand population dynamics and management needs in the state, with an initial focus on examining inter-annual return to nesting and natal sites, and inter-colony movements. As breeding adults, skimmers return to NJ in May for the start of the breeding season and disperse from colonies by late September. Skimmers typically begin breeding at 2-3 years and natal site fidelity is not thought to be high, though these characteristics have not been well described in NJ. Since 2017, we have banded 227 hatch-year (HY) skimmers and 46 adults with coded blue plastic bands from three colonies. Resighted individuals were reported across their range from formal surveys of colonies, staging, and wintering sites and from public observations. To date, 192 banded skimmers have been resighted (70.3%). Approximately 40% of banded HY skimmers were resighted in NJ the year after banding, and 41-57% of banded adult skimmers were observed in the state in years after banding. Starting in 2021, we also outfitted 19 adult skimmers with GPS VHF transmitters to provide important information about location and distance of foraging commutes and inter-colony movements during the breeding season. The banding study provides the opportunity to establish a stronger understanding of the demographic parameters of the NJ skimmer population.

**[25] Diaz, Alexis\*<sup>1</sup>**

<sup>1</sup>University of Miami, Coral Gables, Florida, USA; [alexis.diaz@miami.edu](mailto:alexis.diaz@miami.edu)

### **Genetic diversity and population structure of the Slate-colored Coot (*Fulica ardesiaca*) from Peru**

The Slate-colored coot (*Fulica ardesiaca*) thrives in freshwater lakes and swamps, predominantly breeding at the extremes of steep elevational gradients of the central Andes. Such distinct distribution and restricted behavior make this species an ideal organism for investigating the influence of heterogeneous mountain landscapes on genetic variation. We therefore analyzed variation in the mtDNA control region and ddRAD-seq nuclear markers of six populations of *F. ardesiaca* from Peru. Despite considerable admixture of mtDNA haplotypes, ADMIXTURE and fineRADstructure analyses showed clear differentiation between individuals from low-altitude populations and those from the high-altitude north population, distinguishing them from those found in high-altitude populations in central

and south latitudes based on nuclear markers ( $\Phi_{ST} = 0,0824$ ). Moreover, the principal component analyses and the co-ancestry matrix revealed a more subtle structure, classifying populations into four genetic clusters: a) a cluster combining the high-altitude north population and the low-altitude populations from north and central latitudes, b) low-altitude south population, c) high-altitude center population, and d) high-altitude south population. All six populations showed low levels genetic diversity ( $\theta_{\pi_{mtDNA}} = 0,0075-0,0142$ ,  $\theta_{\pi_{nuDNA}} = 0,0028-0,0033$ ) and the neutrality test (Tajima's D) did not find evidence for selection acting on any of both markers. Using the *∂a∂i* software for pairwise population comparisons, demographic insights suggest ancestral population sizes of 87,688–126,212 individuals when comparing within high-altitude populations, or between the low-altitude and high-altitude populations from central and south latitudes (these comparisons followed the 'divergence with gene flow' evolutionary model). These average values were considerably higher than those obtained in comparisons solely within low-altitude populations or between low-altitude populations and the high-altitude north population (7,573–14,309 individuals; these comparisons followed the 'no divergence' model). Additionally, the average divergence time from the pairwise comparison between the high-altitude north population and the high-altitude south population (8,839 ybp) was considerably higher than in comparisons between low-altitude and high-altitude population from central and south latitudes (1,568–4,050 ybp). Collectively, these findings suggest the high-altitude origin of the Slate-colored coots' populations in Peru.

## [26] Forsy, Elizabeth<sup>1</sup> and Olivia Spicer<sup>2</sup>

<sup>1</sup>Eckerd College, St. Petersburg, Florida, USA; <sup>2</sup>University of Louisiana at Lafayette, Lafayette, Louisiana, USA; [forysea@eckerd.edu](mailto:forysea@eckerd.edu)

### **Natal and Breeding Dispersal of Black Skimmers in Florida**

Understanding how seabird colonies are connected through dispersal is important for management of these long-lived species. Natal dispersal refers to an individual's movement between birth and their first reproductive event while breeding dispersal is when an individual moves to a new colony for subsequent breeding events. We used band data from a long-term Black Skimmer (*Rynchops niger*) banding project (2015-2023) in SW Florida, USA to determine the proportion of birds who were natal and breeding dispersers. We had data on 99 individuals for whom we knew their sex and who had bred for at least one season. For their first reproductive event (natal dispersal), the majority of the birds (59%) dispersed to a colony >10km from their natal colony. Slightly more females dispersed than males, but this was not statistically significant. Most birds dispersed < 50km from their natal colony, but both males and females were observed dispersing more than 200km. The difference in dispersal distance did not differ significantly between males and females. We had breeding data for 94 individuals for more than one season and a range of 2-7 seasons (mean =3.8 seasons, SD=1.82). The majority (76%) of birds did not exhibit any breeding dispersal and remained at their first breeding colony, 19% bred at one additional colony and 5% bred at 3 colonies. Males and females were not statistically different, all tended to

stay at their original breeding colony. The majority of the birds who moved to a new breeding colony did so because they lost their colony due to overwash. In summary, over half of all skimmers move to a new colony to breed for the first time, but once established, they are unlikely to switch to another colony. The finding of a high proportion of natal dispersal is advantageous for their genetic diversity and the prevention of inbreeding.

## [27] Fowler, Drew<sup>1</sup> and Sammy King<sup>1</sup>

<sup>1</sup>Louisiana Fish & Wildlife Cooperative Research Unit, U.S. Geological Survey, Louisiana, USA;  
[dfowler@agcenter.lsu.edu](mailto:dfowler@agcenter.lsu.edu)

### **Lever and switches that influence the conservation value of rice agriculture for wetland dependent birds**

Globally, many wetland ecosystems have been altered by agricultural production. Conversion to agricultural systems often results in loss or alteration of ecosystem function and processes, and as a result, wetland-dependent wildlife can be impacted by these altered functions that lead to habitat loss or change. Rice agriculture, however, which is grown on over 162 million hectares of land across the world, provides many wildlife benefits through routine production practices and therefore can provide surrogate habitat for a range of wetland-dependent wildlife, particularly birds. Specifically, systems of rice agriculture provide important habitat for resident and migratory wetland dependent birds that have adapted migration strategies predicated on natural wetland habitat that have been diminished or lost during landscape alteration. Nonetheless, management techniques for rice production are highly variable worldwide, and even within the United States, growing practices vary regionally across major production areas of the Gulf Coast, Lower Mississippi Alluvial Valley, and Central Valley of California. Importantly, different rice production practices, within and among growing regions, influences the availability and suitability of habitat across wetland-dependent bird guilds and can determine how birds are able to fulfill their annual cycle needs as well as how they move and interact with the agricultural landscape. Variable practices range across the entire production cycle, from field preparation, planting, seasonal irrigation practice, harvest, and post-harvest management techniques. Efforts to advance conservation and management goals of migratory wetland-dependent birds have often involved incentive programs for rice producers to manage fields with practices that are viewed to benefit wetland-dependent birds. However, a thorough knowledge of the drivers that motivate production decisions is needed in order to understand the impacts and scale that conservation incentives are able to provide. In this talk, we specifically focus on rice production within the Gulf Coast and review systematic changes in production practices in recent decades that have both positively and negatively influenced wetland-dependent birds. Further, we postulate economic drivers that motivate agronomic decisions and may enhance success of strategies to incentivize conservation efforts for wetland-dependent birds.

## **[28] Frederick, Peter<sup>1</sup> and Simona Picardi<sup>2</sup>**

<sup>1</sup>University of Florida, Gainesville, Florida, USA; <sup>2</sup>University of Idaho, Moscow, Idaho, USA; [pfred@ufl.edu](mailto:pfred@ufl.edu)

### **The ability to move seasonally between sharply differing climatic zones in the southeastern US may help support large populations of long legged wading birds.**

Both the categorization, and the drivers behind various avian movement patterns have undergone intensive revision in the recent past, and the movements of waterbirds in particular represent excellent examples to help understand how resource patterns affect spatial use and distributions. Long legged wading birds (herons, ibises, storks, spoonbills) generally have low foraging and breeding site fidelity in part because they rely on ephemeral or seasonal hydrological events (surface water drying, anoxia, extreme tides) to create high prey availabilities in shallow water. These conditions are unpredictable in space and time, resulting in a variety of large-scale movement patterns. Storks and ibises are known to move their centers of breeding distribution in response to regional drought. Egrets, ibises and storks have all shown rapid post breeding movements (cf 100 – 300 km) out of southern Florida at the onset of the rainy season (June) when surface water levels are rising, and prey become diffuse and difficult to capture. Multiyear distributions of ibises suggest strong attraction to active aquaculture sites, and are apparently responsive to market fluctuations in prices. These examples suggest a strong response of wading birds to resource pulses acting over hundreds of km. Wood Storks tracked with satellite tags demonstrate orientation towards parts of the southeastern US that are typically in a drying phase while Florida and parts of the coastal plain are in their wet season. A key feature of this system is that the two climatic systems (subtropical summer wet season, temperate summer-dry pattern) are relatively close by and have a fairly sharp border, allowing birds to make a quick transition between the two. I suggest that waterbirds may generally exploit locations where strongly differing climatic regimes are in close proximity and that these may be important for understanding distributions and movement patterns of waterbirds globally.

## **[29] Ernest, Morgan<sup>1</sup> and Lindsay Garner<sup>1</sup>**

<sup>1</sup>University of Florida, Gainesville, Florida, USA; [lagarner@ufl.edu](mailto:lagarner@ufl.edu)

### **Using drones and computer vision for large-scale nest monitoring of long-legged wading birds in the Everglades**

Wading birds play an important role in the Everglades ecosystem and their nesting activities across the system form an important indicator of ecosystem health and restoration status. Monitoring nesting activity (i.e., colony sizes, nesting timing and success) at the scale of the Everglades is labor intensive and nesting success metrics are necessarily based on relatively small sample sizes. We explored whether uncrewed aircraft systems (UAS) and computer vision could be used to collect colony-scale high resolution

images and automate the large-scale detection of active nests. We conducted weekly UAS surveys of up to 8 active wading bird colonies in the Everglades from 2020-2023. Imagery collected from these surveys were processed into georectified orthomosaics providing centimeter-scaled positional accuracy of bird locations. Using an existing machine learning algorithm capable of detecting birds in imagery, we developed an automated approach that identified locations that exhibited frequent bird detections over time and thus were likely active nest locations. Using location data on 66 known nests monitored from the ground by our field crew in 2022, we compared human and computer abilities to detect known nests. Computer- and human-based approaches to nest detection exhibited similar performance, with humans detecting 74% of known nests and the computer detecting 68%. Thus, the computer was capable of finding 90% of human-detected nests. While humans and computers performed similarly at identifying nests, both struggled with nests obscured by canopy cover and image distortion. Other sources of error included low detection of quick-to-fail nests and over detection of late-season fledglings and consistent adult roosting spots. While humans can only monitor a tiny fraction of nests over the breeding season, this automated approach could provide an exceptional increase in nest sample sizes, thus providing more accurate nest success over a season. This method could also support a superpopulation approach to quantify nest turnover rate at a colony scale and estimate the total numbers of nests initiated throughout the breeding season in an extremely large wetland.

### **[30] Garrett, Patrick<sup>1</sup>**

<sup>1</sup>South Florida Water Management District, West Palm Beach, Florida, USA; [bgarret@sfwmd.gov](mailto:bgarret@sfwmd.gov)

#### **Building and Operating Large-Scale Constructed Nutrient Treatment Wetlands with the Presence of Protected Waterbirds**

The South Florida Water Management District (District) is a regional governmental agency that manages water resources in the southern half of the state, covering 16 counties that encompass approximately 18,000 square miles serving a population of 9 million residents. A key initiative of the District is restoration of the Everglades – the largest environmental restoration project in the nation's history. As part of the massive Everglades Restoration Program, the District is responsible for creating and managing large man-made wetlands called Stormwater Treatment Areas (STAs) and Flow Equalization Basins (FEBs) that are designed to remove phosphorous and nutrients from flood and storm runoff from agricultural areas before it enters the Everglades. These STAs and FEBs cover over 100,000 acres and are some of the largest constructed wetlands in the world.

While they were not constructed for wildlife, these wetlands have been beneficial to numerous species as refugia, foraging locations, and breeding sites. These large wetlands attract dozens of species of waterbirds; many of which are protected by state and federal laws. There have been decades of intensive discussions between the District and wildlife regulatory agencies as well as frequent surveys to ensure that both STAs and FEBs can

continue to operate without impacts to protected waterbirds such as Everglade snail kites, least terns, and black-necked stilts.

**[31] Gawlik, Dale<sup>1</sup>, David Essian<sup>1</sup>, Rostam Mirzadi<sup>1</sup>, Bart Ballard<sup>2</sup>, Jordan Giese<sup>2</sup>, David Newstead<sup>3</sup>, James Gibeaut<sup>1</sup>, Jessica Magolan<sup>1</sup>, Matthew Streich<sup>1</sup>, Liam Wolff<sup>1</sup>, and Katya Wowk<sup>1</sup>**

<sup>1</sup>Hart Research Institute for Gulf of Mexico Studies, Texas A&M University Corpus Christi, Corpus Christi, Texas, USA; <sup>2</sup>Caesar Kelberg Wildlife Research Institute, Texas A&M University Kingsville, Kingsville, Texas, USA; <sup>3</sup>Coastal Bend Bays & Estuaries Program, Corpus Christi, Texas, USA; [dale.gawlik@tamucc.edu](mailto:dale.gawlik@tamucc.edu)

### **A data-driven prioritization tool to guide waterbird colony island rehabilitation on the Texas coast**

Coastal managers are rehabilitating waterbird colony islands on the Gulf of Mexico coast because this important habitat is eroding from storms and sea level rise. However, with >200 colony islands on just the Texas coast, agencies will not have the funds to rehabilitate them all. Nor do all islands have the same potential to increase waterbird populations. Therefore, a data-driven prioritization tool that incorporates bio-geo-physical constraints on nesting and economic considerations is needed by managers to prioritize colony islands for rehabilitation. In 2022, we initiated the Colony Island Network Design and Implementation project (CINDI), which uses a co-production process to develop a prioritization tool for rehabilitating islands to help conserve colonial waterbird populations on the Texas coast. Interviews with managers identified that the major sources of uncertainty were related to funding and operations, rather than around ecological responses. Survey respondents identified availability of nesting substrate, amount of human disturbance, presence of predators, and amount of foraging habitat as the greatest constraints on colony size. We analyzed a subset of our islands and found a 24% decrease in island area from 1995 to 2018, with a 44% decrease in bare substrate over that time. Mean distance from colony to foraging areas, which identify the size of the foraging habitat buffer around colonies, ranged from 5.2 km for Great Egrets (*Ardea alba*) to 14.7 km for Reddish Egrets (*Egretta rufescens*). Mean (n nests) brood size at fledging calculated from weekly drone surveys was 1.9 (53), 1.8 (21), 1.7 (23), 1.7 (103), and 1.5 (23), for the Great Egret, Reddish Egret, Tricolored Heron (*E. tricolor*), Black Skimmer (*Rynchops niger*), and Caspian Tern (*Hydroprogne caspia*), respectively. A set of spatial occupancy models based on data in the Texas Colonial Waterbird Survey (2003-2021), indicated that colony persistence was lowest (0.51) for the Caspian Tern and Black Skimmer (0.57), whereas it ranged from 0.63 to 0.69 for the herons. The final prioritization tool, developed in Marxan, will incorporate all interim data products using an optimization algorithm that minimizes costs of designing a specific network of islands, while maximizing conservation metrics.

**[32] Giacinti, Jolene<sup>1</sup>, Anthony Signore<sup>2</sup>, Megan Jones<sup>3</sup>, Stéphane Lair<sup>4</sup>, Claire Jardine<sup>5</sup>, Dayna Goldsmith<sup>6</sup>, Chelsea Himsworth<sup>7</sup>, Margo Pybus<sup>8</sup>, Stephanie Avery-Gomm<sup>1</sup>, Yohannes Berhane<sup>2</sup>, and Catherine Soos<sup>1</sup>**

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### **A phylogeographic reconstruction of the spatiotemporal emergence and spread of highly pathogenic H5N1 avian influenza in Canada.**

Since the emergence of the A/goose/Guangdong/1/1996 H5N1 clade 2.3.4.4b in Atlantic Canada in November 2021, the dynamics and impacts of highly pathogenic avian influenza virus (HPAIV) in wild birds have been monitored through substantial interagency collaborative surveillance efforts. As of August 2023, at least 23,000 samples were collected from sick/dead and live/harvested wild birds across Canada, 12% of which were confirmed or suspect H5 HPAIV positive. More than 2000 genomes were sequenced at the National Centre for Foreign Animal Disease and assessed for reassortment. These sequences were combined with publicly available (GISAID) H5N1 clade 2.3.4.4b genomes from the United States (US), Europe, and Asia. Sequences, collection dates, and locations were used for phylogenetic and phylogeographic inference using maximum likelihood and Bayesian estimations to investigate viral evolution and spatiotemporal spread. Over thirty viral genotypes were detected, demonstrating spatial clustering within major flyways. Reassortant diversity was highest in waterfowl, followed by raptors. Preliminary phylogeographic inference suggests that following the initial incursion in Atlantic Canada, wholly Eurasian HPAIV moved southward through the US, and then northward back into Canada in association with seasonal wild bird migration within flyways. Beginning in February 2022, the virus also demonstrated inter-flyway transmission contributing to its movement across Canada. Movement of genotypes occurred both westward and eastward between adjacent flyways. Timely detection and genomic analysis of HPAIV is necessary to track viral evolution as it continues to circulate among wild bird populations and across the wild bird-poultry interface. In all but two provinces, the first HPAIV detections in sick/dead wild birds occurred prior to the first reported infected poultry premise, which exemplifies the importance of continued wild bird surveillance for early detection. Given that HPAIVs have impacts on wildlife, domestic animal, and/or human health, it is essential for Canada to continue implementing One Health approaches to wild bird surveillance.



**[33] Gleason, Jeffrey<sup>1</sup>, Evan Adams<sup>2</sup>, Terri Maness<sup>3</sup>, Auriel Fournier<sup>4</sup>, Trey Barron<sup>5</sup>, Janell Brush<sup>6</sup>, Melody Chimahusky<sup>7</sup>, Melanie Driscoll<sup>8</sup>, Rob Dobbs<sup>9</sup>, and Jacquelyn Grace<sup>10</sup>**

<sup>1</sup>U.S. Fish and Wildlife Service, USA; <sup>2</sup>Biodiversity Research Institute, Portland, Maine, USA; <sup>3</sup>School of Biological Sciences, Louisiana Tech University, Ruston, Louisiana, USA; <sup>4</sup>Forbes Biological Station, Havana, Illinois, USA; <sup>5</sup>Texas Parks and Wildlife Department, Texas, USA; <sup>6</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; <sup>7</sup>Mississippi Department of Environmental Quality, Mississippi, USA; <sup>8</sup>Phoenix Rising, LLC, USA; <sup>9</sup>Louisiana Department of Wildlife and Fisheries, Louisiana, USA; <sup>10</sup>Department of Ecology and Conservation Biology, Texas A&M University, College Station, Texas, USA; [jsgleaso@hotmail.com](mailto:jsgleaso@hotmail.com)

### **The Gulf of Mexico Avian Monitoring Network (GoMAMN): a brief history of a value-driven bird monitoring community of practice in the wake of the Deepwater Horizon oil spill**

In the wake of the Deepwater Horizon oil spill, establishing population baselines for a number of affected bird species (93 species as estimated by USFWS) was challenging. Issues ranged from but were not limited to: (1) variation in study designs, (2) bird studies are typically at a small spatial scale and short-term (1-3 years), (3) lack of explicit objectives and/or hypotheses, and (4) limited or inconsistent use of standardized monitoring protocols but required remedy. Such issues are clearly not unique to the study of birds or the Gulf of Mexico Region. The Gulf of Mexico Avian Monitoring Network (GoMAMN) was formed in 2014 to facilitate the collection and ultimately, the use of bird monitoring data to inform conservation and restoration decision-making. GoMAMN is an ad-hoc, self-organized group of federal, state, academic, and NGO partners representing the broader Gulf of Mexico bird conservation community, i.e., Community of Practice. By employing facilitated workshops and the principles of structured decision-making, GoMAMN established a platform for coordination, communication, and consensus. The network, comprising diverse Gulf of Mexico stakeholders, utilized decision theory to define core values and data needs. This self-directed, non-regulatory group identified monitoring objectives and evaluation criteria to inform prioritization of future monitoring activities. The overarching goal of this effort is to maximize the utility of bird monitoring data to inform restoration and to advance bird-habitat conservation across the northern Gulf of Mexico. Seven taxa based (Landbirds, Marshbirds, Raptors, Seabirds, Shorebirds, Wading Birds, Waterfowl) Working Groups were initially formed and an Avian Health Working Group was established prior to completion of the GoMAMN Strategic Bird Monitoring Guidelines. The relatively newly organized Renewable Energy Working Group was established just prior to the Fall 2021 Virtual GoMAMN Meeting. The GoMAMN history, lessons learned, and challenges of maintaining an unfunded conservation partnership will be discussed.

**[34] Gonnerman, Matthew<sup>1,2</sup>, Cody Kent<sup>3</sup>, Jeffrey Sullivan<sup>4</sup>, Jennifer Mullinax<sup>1</sup>, and Diann Prosser<sup>2</sup>**

<sup>1</sup>University of Maryland, College Park, Maryland, USA; <sup>2</sup>Eastern Ecological Science Center, U.S. Geological Survey, USA; <sup>3</sup>Frostburg State University, Frostburg, Maryland, USA; <sup>4</sup>U.S. Geological Survey, USA; [mgonnerm@umd.edu](mailto:mgonnerm@umd.edu)

**Leveraging scientific surveys and citizen science data: applying integrated species distribution models to understand waterfowl distributions in the Chesapeake Bay**

Highly pathogenic avian influenza (HPAI) viruses are a global risk to both wild animal populations and human industries such as poultry farming. Modeling efforts to anticipate future HPAI outbreak dynamics are being built, but there are few ready-to-use options for inputs describing large scale distributions of waterfowl species, a key HPAI reservoir. Current models are available based on eBird data, but this type of information is conducted opportunistically and not designed with waterfowl in mind. Rather than relying on estimates from eBird alone, we developed a new integrated species distribution modeling (iSDM) framework to estimate the distribution of 15 waterfowl species within the Chesapeake Bay region, for future use in HPAI risk monitoring. As waterfowl tend to aggregate into flocks, we anticipated differences in the spatiotemporal dynamics and environmental drivers of occurrence and abundance, which we accounted for by employing a zero-inflated Poisson regression model in INLA. This allowed for separate regressions describing occurrence and abundance within a single joint likelihood to better identify the unique drivers of each. We linked observations from opportunistically collected eBird and USGS Bird Banding Lab data with the North American Breeding Bird Survey and Christmas Bird Count surveys, both long-term systematic designs which are more sparsely distributed on the landscape and in time. By combining datasets in this way, we can accommodate for weakness within each survey design to improve estimates overall. This modeling framework, which uses all publicly available datasets, can be adapted to any number of species, study areas, or datasets and should be considered especially useful for flocking species where dynamics between occurrence and abundance may show divergent patterns.

**[35] Goodenough, Katharine<sup>1</sup>**

<sup>1</sup>Louisiana Fish & Wildlife Cooperative Research Unit, U.S. Geological Survey, Louisiana, USA; [kgoodenough@agcenter.lsu.edu](mailto:kgoodenough@agcenter.lsu.edu)

**Black Skimmer research: A global overview of the species and conservation status in the Americas**

The Black Skimmer (*Rynchops niger*) is a charismatic representative of both coastal nesting waterbird communities in North America and freshwater riverine and coastal systems in South America that provide an important link between terrestrial habitats and aquatic resources. Waterbird species such as the Black Skimmer are at high risk of decline at regional levels influenced by a combination of threats including habitat loss, degradation of remaining habitat (pollution), and the synergistic effects of climate change and continued

land use alteration. Further, modeled scenarios of climatic change on various waterbird populations predict continuous population declines until the end of the twenty-first century highlighting a critical need to document factors influencing population demographics at both the local and global scale. This review summarizes the Black Skimmer range and distribution across the Americas and provides an overview of the species including information on foraging ecology, reproduction, migratory strategies, and conservation status. Special emphasis will be to highlight information on knowledge gaps for the species for conservation, management, and research purposes.

### **[36] Goyert, Holly<sup>1</sup> and Ian Stenhouse<sup>1</sup>**

<sup>1</sup>Biodiveristy Research Institute, Portland, Maine, USA; [holly.goyert@briwildlife.org](mailto:holly.goyert@briwildlife.org)

#### **Avian risk assessment to support New York's Offshore Wind Master Plan 2.0: Deep Water**

The New York State Offshore Master Plan 2.0 Deep Water informs the development of offshore wind energy in regional waters greater than 60 m deep. One of five environmental studies, the avian risk assessment compiled existing data on bird species that may be sensitive to offshore wind development. As part of this study, we derived the exposure and vulnerability of birds to different phases of offshore wind development in the Area of Analysis (AoA). Calculations from Version 2 of the Marine-Life Data and Analysis Team (MDAT) models generated exposure scores for 47 marine bird species that use the Atlantic Outer Continental Shelf. Collision, displacement, and population vulnerability scores scaled risk up or down based on life history traits such as bird flight heights, attraction, and avoidance of offshore wind energy facilities. The spatial risk assessment combined scores across species and seasons to produce an overall risk map. Tracking data filled many data gaps, including areas of uncertainty corresponding to lack of boat-based or aerial survey effort. The findings suggest that the AoA is beyond the range of many breeding terrestrial and coastal bird species but is frequented by several species of offshore migrants and pelagics, including some listed as threatened or endangered. Further monitoring could address knowledge gaps and evaluate the most appropriate mitigation of impacts from stressors on birds within the region.

### **[37] Gulick, Christopher\*<sup>1</sup>, Ke Zhang<sup>1</sup>, and Abby Powell<sup>2</sup>**

<sup>1</sup>University of Florida, Gainesville, Florida, USA; <sup>2</sup>Florida Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Florida, USA; [chris.gulick77@gmail.com](mailto:chris.gulick77@gmail.com)

#### **What can spatial networks tell us about wading birds in the coastal Gulf of Mexico?**

The white ibis (*Eudocimus albus*) is a colony nesting bird that uses widely ranging and sometimes nomadic movements to locate unpredictable food sources in the Southeastern

United States. These behaviors make it difficult to understand their broad movement patterns across multiple annual cycles. This information would help us understand how white ibis breeding populations are structured, and what regions may be most important to ibises throughout their annual cycle. To better understand white ibis movement patterns, we set out to determine three questions: 1.) Where do ibises travel after breeding or fledging in coastal Alabama? 2.) How do different regional sites, or "nodes", contribute to overall connectivity within spatial networks of ibises? 3.) What can movement networks tell us about the spatial structure of breeding white ibis populations in coastal Alabama? We tagged 40 adult and juvenile ibises with Argos transmitters and tracked them from 2020 to 2023. We used state space models and a clustering algorithm to identify nodes of concentrated space use by ibises during our sampling period. From this, we built directed spatial networks to describe broad movements and connections across our sampling population. To answer our research questions, we calculated four network metrics for our models: modularity, betweenness centrality, inbound centrality, and participation coefficient. We found that ibis movements for our sampled population could best be described by 10 nodes across six states, ranging from Texas to southern Florida. Network modularity was low, indicating little spatial structure across the network. Ibises traveled most frequently to Louisiana, Florida, and other parts of Alabama following the breeding season. Nodes in Alabama and Florida contributed most to betweenness centrality, while Louisiana, Florida, and Alabama contributed most to overall connectivity within the network. Our findings provide little support for ibis management at the subregional scale, but regions in coastal Florida, Alabama, and Louisiana appear to be particularly important for facilitating connectivity to all portions of the white ibis' spatial network.

**[38] Hall, Laurie<sup>1</sup>, Christopher Latty<sup>2</sup>, Jeffrey Warren<sup>2</sup>, John Takekawa<sup>3</sup>, and Susan De La Cruz<sup>1</sup>**

<sup>1</sup>U.S. Geological Survey, USA; <sup>2</sup>U.S. Fish and Wildlife Service, USA; <sup>3</sup>Suisun Resource Conservation District, Suisun City, California, USA; [lahall@usgs.gov](mailto:lahall@usgs.gov)

### **Contrasting migratory chronology and routes of Lesser Scaup: Implications of different migration strategies in a broadly distributed species**

Migration allows birds to maximize fitness by exploiting seasonal resource peaks and avoiding limitations. Migration strategies may differ among individuals within a species, but for all strategies, the benefit of increased fitness must outweigh the costs of migration. These costs can include increased mortality risk, time constraints in the annual cycle, and metabolic energy loss. We compared migratory chronology and routes of individuals from a broadly distributed species of waterfowl, the Lesser Scaup (*Aythya affinis*; hereafter Scaup), marked at the northern (66.51000° N, 145.98556° W) and southern (44.63778° N, 111.73694° W) extents of its breeding distribution in North America. Scaup breeding farther North in interior Alaska, USA migrated greater distances and had protracted migrations, especially in fall, compared to Scaup breeding farther South in southwest

Montana, USA. During migration, Scaup breeding in Alaska used more staging and stopover areas compared to Scaup breeding in Montana. Scaup breeding in Alaska also spent less time at their breeding area and more time at their wintering areas compared to Scaup breeding in Montana. In addition, Scaup breeding in Alaska were largely absent from wintering areas in the Intermountain West that were used by Scaup breeding in Montana. These differences could have important effects on Scaup fitness and could contribute to differences in fecundity and recruitment observed across the Scaup's broad latitudinal distribution. Understanding the fitness implications of intraspecific variation in migration strategies of broadly distributed species can assist resource managers by focusing conservation efforts on specific breeding populations, informing models of disease transmission, and improving projections of species' responses to environmental change.

**[39]** Teitelbaum, Claire<sup>1</sup>, **Richard Hall**<sup>2</sup>, Anje Kidd-Weaver, Jeffrey Hepinstall-Cymerman<sup>2</sup>, Sonia Altizer, and Sonia Hernandez<sup>2</sup>

<sup>1</sup>?; <sup>2</sup>University of Georgia, Athens, Georgia, USA; [dr.richard.hall@gmail.com](mailto:dr.richard.hall@gmail.com)

### **Consequences of habitat specialization for infection dynamics in White Ibis**

Urbanization can alter movement behavior of highly mobile species, which in turn can influence their role as dispersers of nutrients, seeds and pathogens across the landscape. We used GPS tracks of white ibis (*Eudocimus albus*) in south Florida to construct a network of non-urban and urban sites used by non-breeding birds. To understand whether individual ibis exhibited preference for urban versus non-urban sites, we compared attributes of the observed network to simulated networks constructed by pooling movement tracks across individuals, and assuming no site-type preference. Compared to these simulated networks, the observed network was less connected and birds moved more between the same site types than between urban and non-urban sites, suggesting habitat specialization among ibis. We explored the consequences of this habitat specialization on infection dynamics with a simulation model on networks of resource-stable urban habitats and resource-fluctuating natural habitats, and compared infection outcomes when animals are habitat specialists versus habitat generalists. We found that habitat specialization lowers infection prevalence and host mortality by limiting pathogen spread from high-density urban sites to natural sites. Together, these suggest urban habituation in ibis has led to changes in non-breeding movement behavior that drive differences in pathogen exposure between urban and non-urban birds.

**[40] Haney, Christopher J.<sup>1</sup>, Pamela E. Michael<sup>1</sup>, Jeffrey S. Gleason<sup>2</sup>, Kathy M. Hixson, and Yvan G. Satgé<sup>3</sup>**

<sup>1</sup>Terra Mar Applied Sciences, Washington, DC USA; <sup>2</sup>U.S. Fish and Wildlife Service, Migratory Bird Program/Science Applications, Chiefland, Florida USA; <sup>3</sup>South Carolina Cooperative Fish & Wildlife Research Unit, Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC USA. <sup>1</sup>[jchrishaney@terramarappliedsciences.com](mailto:jchrishaney@terramarappliedsciences.com)

### **Flight behaviors in subtropical seabirds exacerbate collision risk for wind energy development in deep-water environments**

Collision mortality and injury are among possible adverse impacts to marine birds at offshore wind farms. Evaluating collision risk requires comparing flight height to rotor swept zones (RSZs) of generator turbine blades. Flight height is difficult to estimate in deep oceans where fixed, remotely-operated instrumentation cannot be readily deployed. We use flight heights estimated from vessel-based seabird surveys to investigate potential for taxon- or behavior-specific patterns in exposure to the RSZ. We also discuss how vessel-based observations complement other approaches to estimating flight heights and augment the range of conditions over which seabird flight heights can be characterized. Flight heights were estimated in subtropical waters off the southeastern United States, then compared to characteristic vertical dimensions of RSZs. Data were gathered over multiple years, covered >54,000 kilometers of deep-water surveys, and featured species rarely assessed for collision risk (e.g., *Onychoprion fuscatus*, *Pterodroma hasitata*, *Puffinus lherminieri*, and *Fregata magnificens*). Certain subtropical seabirds regularly fly 50-200 m above the sea, placing them at risk for colliding with offshore wind turbines. Switching from high search modes to low prey captures at the ocean surface also suggest that foraging style can exacerbate collision risk given the repeated ascents and descents in species like Sooty Tern and Magnificent Frigatebird. Binned flight height data are less accurate and precise than instrumented measurements (e.g., lidar, 3-d camera/radar systems). But larger sample sizes, and key meta-data such as wind speed, a major influence on flight height, can be gathered over broader environmental conditions than from fixed instruments. Vessel-estimated flight heights furnish a means to evaluate collision risks of pelagic seabirds outside the breeding season far away from nesting colonies, limitations that also thwart satellite or geolocator tagging for seabird flight height. Vessel-estimated flight heights also can be used where fixed monitoring systems cannot be deployed on floating turbines sited in deep-water wind energy areas.

**[41] Hand, Christy<sup>1</sup>**

<sup>1</sup>South Carolina Department of Natural Resources, South Carolina, USA; [handc@dnr.sc.gov](mailto:handc@dnr.sc.gov)

**Status update for the Wood Stork in South Carolina: successes and emerging threats**

During the past four decades, the coastal plain of South Carolina has provided relatively reliable nesting and foraging habitat for the Wood Stork, *Mycteria americana*. Nesting success in monitored nests has exceeded the recovery criteria of 1.5 fledglings per nest during 12 of the 13 years when monitoring has been completed. Annual nest census data indicate nest numbers in the state have gradually increased from 11 nests in 1981 to nearly 4,000 nests in 2022. This increase represents both overall population growth and a northward shift in colony and nesting density. The relatively high nesting success of Wood Storks in South Carolina, as well as the large numbers of Wood Storks that move northward to South Carolina after breeding and fledging appears to be a result of the unique and expansive mosaic of wetlands in the coastal plain. Throughout the year, private and public landowners and managers manipulate water levels in managed tidal impoundments and backwaters to cultivate high quality habitat for wintering waterfowl. Asynchronous water drawdowns in impoundments occur throughout the nesting and post-nesting season and concentrate fish in shallow pools, which allows Wood Storks to successfully forage. Landscape-scale land conservation efforts have protected much of the nesting and foraging habitats used by Wood Storks in the South Carolina from development, but their habitat remains vulnerable to rising sea levels, increasingly severe storms that damage impoundment infrastructure, and breeding habitat degradation caused by invasive aquatic plants. These emerging threats may have the potential to reverse the gains made by Wood Storks in South Carolina and require close monitoring to ensure the continued success of the species.

**[42] Hargett, Eleonora\*<sup>1</sup>, Thomas Benson<sup>2</sup>, Liza Rossi<sup>3</sup>, and Auriel Fournier<sup>4</sup>**

<sup>1</sup>University of Illinois at Urbana-Champaign, Champaign, Illinois, USA; <sup>2</sup>Illinois Natural History Survey, Illinois, USA; <sup>3</sup>Colorado Parks and Wildlife, Colorado, USA; <sup>4</sup>Forbes Biological Station, Havana, Illinois, USA; [ehargett@illinois.edu](mailto:ehargett@illinois.edu)

### **Developing abundance estimates of Eastern Black Rails in Southeastern Colorado**

The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*), a federally threatened subspecies, is notoriously cryptic and difficult to study. Their elusive nature makes population monitoring challenging and for many years they have gone understudied. Due to the low detection probabilities and patchy distributions observed across much of their current range, occupancy modeling is the dominant monitoring method. In contrast, Southeastern Colorado hosts birds at high occupancy and in dense numbers. Because of the high occupancy, abundance estimates would provide a more robust understanding of population trends and management impacts. Creating accurate abundance estimates would greatly increase our ability to study Eastern Black Rails in this area. From 2018-2023, Colorado Parks and Wildlife has conducted broadcast surveys across Southeastern Colorado. In addition, during the summer of 2022 and 2023, we deployed long-term acoustic recording units. We hope to use both in-person and remote surveys to estimate Eastern Black Rail abundance. The results of this work will inform future monitoring

efforts and will allow for an improved understanding of management impacts on Eastern Black Rails.

**[43] Harvey, Johanna<sup>1,2</sup>, Diann Prosser<sup>2</sup>, Jennifer Mullinax<sup>1</sup>, Michael Runge<sup>3</sup>, and Evan Grant<sup>3</sup>**

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### **From napkin to action: Using network analysis to unravel how US bird conservation can adapt to HPAI**

The highly pathogenic avian influenza virus (HPAI) H5N1 has resulted in an unprecedented epizootic event, significantly impacting domestic poultry and a diverse range of wild birds including seabirds, shorebirds, waterfowl, and raptors. We examine the range of wild birds affected in the United States since the introduction of HPAIV in late 2021. Wild birds face an array of threats, with the exception of waterfowl all management groups namely, waterbirds, shorebirds, and landbirds all display evident declines. The conservation landscape for wild birds in the United States is intricate, characterized by numerous agencies and programs that often intertwine and overlap. In this study, we adopt an ecological-social network analysis approach to dissect the ecological network of HPAI alongside the network of conservation and governance within the United States. This innovative approach facilitates a conceptual exploration of the intricate dynamics and interdependencies inherent in complex frameworks that encompass this One Health disease and its far-reaching impact across species.

**[44] Heller, Erin<sup>1</sup>, Sarah Karpanty<sup>2</sup>, Benjamin Gill<sup>2</sup>, Jonathan Cohen<sup>3</sup>, Shannon Ritter<sup>2</sup>, Barry Truitt<sup>4</sup>, and James Fraser<sup>2</sup>**

<sup>1</sup>Randolph College, Lynchburg, Virginia, USA; <sup>2</sup>Virginia Tech, Blacksburg, Virginia, USA; <sup>3</sup>The State University of New York, Syracuse, New York, USA; <sup>4</sup>The Nature Conservancy, USA; [eheller@randolphcollege.edu](mailto:eheller@randolphcollege.edu)

### **Abundance and origin of blue mussels (*Mytilus edulis*) on Virginia's peat banks with implications for the conservation of the red knot (*Calidris canutus rufa*) and other shorebirds**

As climate change causes ocean temperatures to rise, some intertidal organisms, like blue mussels (*Mytilus edulis*), are retreating northward. Species that consume blue mussels, like the federally-threatened red knot (*Calidris canutus rufa*), may be negatively affected by this range contraction. We investigated the variation in blue mussel abundance from 2010 – 2018 on Virginia's barrier islands, where migrating shorebirds eat recently settled blue mussels. We compared the oxygen isotopic composition of blue mussel shell calcite



( $\delta^{18}\text{O}_c$ ;  $n = 74$ ) to  $\delta^{18}\text{O}_c$ , which is assumed to be in equilibrium with regional ocean water, to predict their origins. During peak red knot migration (May 14 – 27), we collected 34 – 538 blue mussels/core (81 cm<sup>2</sup>) sample and found that blue mussel abundance decreased over the years. Shell umbo (first precipitated shell) had higher concentration of  $\delta^{18}\text{O}_c$  than shell edge (most recently precipitated shell;  $\bar{x} = -0.23\text{‰}$ , SE = 0.12 vs.  $\bar{x} = -0.53\text{‰}$ , SE = 0.10). Blue mussel umbo  $\delta^{18}\text{O}_c$  was not different than the range of  $\delta^{18}\text{O}_c$  calculated in equilibrium with regional ocean water off the Virginia and Delaware coasts. Umbo  $\delta^{18}\text{O}_c$  was more <sup>18</sup>O enriched than the expected estuarine signature at the Delaware Bay's mouth, likely precluding an estuarine origin, and more <sup>16</sup>O enriched than the expected  $\delta^{18}\text{O}_c$  off New Hampshire's coast, likely precluding an origin that far north. We concluded that Virginia's juvenile blue mussels likely originated in the regional ocean between the Delaware Bay and Virginia. Continued increases in regional sea surface temperature may further affect the availability of blue mussels to foraging shorebirds in Virginia.

**[45] Hewitt, David<sup>1</sup>, Jon Hemming<sup>1</sup>, Jon Wiebe<sup>2</sup>, Tim Carruthers<sup>3</sup>, Eva Windhoffer<sup>3</sup>, Jessica Henkel<sup>3</sup>, Harries Bienn<sup>3</sup>, Christian Ariza Porras<sup>3</sup>, R. Glenn Ford<sup>4</sup>, Jeff Davis<sup>5</sup>, and Phillip Capitolo<sup>5</sup>**

<sup>1</sup>U.S. Fish and Wildlife Service, USA; <sup>2</sup>Louisiana Department of Wildlife and Fisheries, Louisiana, USA; <sup>3</sup>The Water Institute, Louisiana, USA; <sup>4</sup>R.G. Ford Consulting, USA; <sup>5</sup>Colibri Ecological Consulting, California, USA; [david\\_hewitt@fws.gov](mailto:david_hewitt@fws.gov)

### **Aerial Photographic Surveys of Nesting Colonial Waterbirds Along the Northern Gulf of Mexico**

The size and duration of the Deepwater Horizon oil spill resulted in extensive injury to birds that rely on the varied habitats in the Gulf of Mexico. Restoration for this injury is ongoing and includes a variety of approaches, including land acquisition, stewardship, and active restoration of important nesting and foraging habitats. Monitoring activities are an important part of the restoration effort for evaluating the outcomes of restoration and adaptively managing the restoration portfolio over time. The state and federal Trustees responsible for restoration, through the Regionwide Trustee Implementation Group, invested in an activity to survey nesting colonies of waterbirds along the northern Gulf of Mexico coast from Texas to the Big Bend region of Florida in 2021. The activity also included work to compile data from similar surveys that occurred in six other years going back to 2010. The surveys were conducted in May and June using high-resolution photography from fixed-wing aircraft flying at altitudes between 700 and 1,000 feet above ground level. Nests of all species at surveyed sites, more than 30 species in total, were manually counted from the photographs using image analysis software. A combined database of nest counts across all seven years has been assembled, including nearly two million nests across hundreds of colonies. The database documents changes in relative abundance, breeding status, and distribution over time, with the most extensive data for nearshore seabirds and wading birds, including Laughing Gull, Brown Pelican, Royal and Sandwich Terns, Tricolored Heron, and White Ibis. The presentation will conclude with key

information derived from the combined database and discuss efforts to make the database widely available for further use.

**[46] Hilber, Alexia\*<sup>1</sup>, David Kerstetter<sup>1</sup>, and Christopher Blonar<sup>1</sup>**

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### **An Overview of the Helminth Endoparasite Community of Wading Birds in Southeastern Florida**

In South Florida, wading birds are common along natural and artificial waterways, where their diet consists of varying degrees of snails, fishes, crustaceans, vegetation, and other opportunistic prey. An understudied aspect of their biology is the diversity of gastrointestinal endoparasites, which can be used to elucidate predator-prey relationships. Prior studies have described host species-level endoparasite communities in some wading birds, but comparisons between communities – as well as the inclusion of rare-event and invasive host species – have yet to be examined. This study aims to fill these gaps with a comprehensive community analysis. A total of 74 individuals from ten Gruiformes species and 163 individuals from fifteen Ciconiiformes and Pelecaniformes species were dissected and esophagus, proventriculus, intestines, and cloaca examined. Across all bird host species, Acanthocephala, Nematoda, Cestoda, Digenea, and Trematoda were found. Overall, acanthocephalans are the least common (24.79%) with highly piscivorous birds being the definitive host. Trematodes are the most common (63.03%). Proventriculus endoparasites are seldom found within gruiformes, Gallinules and Limpkins being the only species hosting them. In Pelecaniformes, proventriculus parasites are more prevalent, nematodes being found in 57.52% of carcasses. In all host species, esophageal parasites are seldom present. 16.34% of pelecaniform specimens contain endoparasites in the esophagus. Between gruiformes, Clapper Rails show the highest percentage of infected individuals and American Coots have the heaviest parasite load. Green Herons and Wood Storks have the greatest parasite load with an average of 1843 and 1638 parasites/bird, respectively. Snowy Egrets have the lowest infection rate among ardeids. Soras have the lightest parasite load at 3 parasites/ carcass. With this study, the dynamics of the endoparasites and their corresponding avian species are explored, along with any similarities and differences of the parasitic communities between host species. These comparisons can then be used to further describe each wading bird species' role in their environment as well as help explain the interconnectedness of the south Florida wetland environment.

## [47] Hodge, Wriley\*<sup>1</sup>

<sup>1</sup>College of the Atlantic, Bar Harbor, Maine, USA; [whodge24@coa.edu](mailto:whodge24@coa.edu)

### **A rock with a view: nesting density and distribution of a colonial seabird in relation to habitat and physical features**

The physical structure of seabird colonies has been explained with an emphasis on reproductive success and individual fitness. Here, I offer an example where the distribution of nesting birds and physical structure of the colony may be better explained by immediate social behavior. In the Gulf of Maine, Herring Gulls (*Larus argentatus*) nest colonially on offshore islands. Within colonies, density and distribution of nesting birds may vary between different habitat types. In this two year study, I examined factors determining nesting density. Nest locations were mapped using high precision GPS and nesting habitats, determined from aerial photos and ground surveys, were stratified on 9 Herring Gull colonies in the Gulf of Maine. Research was focused on Great Duck Island, where phenology of egg laying was mapped in 2023, and reproductive success and site fidelity were monitored between habitats over two years. Habitat features and nesting density were analyzed in a GIS. Nesting density differed significantly between habitat types and heterogeneity of habitat; however, on Great Duck Island, reproductive success did not differ significantly between habitat types over the two years of study. Site fidelity did not differ between habitats. In order to contextualize the results, the ideal free distribution is applied to nesting distributions. These results suggest that habitat may not directly impact fitness. Instead, the observed density is better explained in the context of social behavior. This study highlights the importance of behavior in explaining larger patterns, such as colony structure.

## [48] Jimenez, Ariam<sup>1</sup>, Emma LeClerc<sup>1</sup>, Kristin Rogers<sup>1</sup>, Janell Brush<sup>1</sup>, Raya Pruner<sup>1</sup>, Cody Griffin<sup>2</sup>, and Andrew Cox<sup>1</sup>

<sup>1</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; <sup>2</sup>Natural Resource Ecology and Management, Oklahoma State University, Stillwater, Oklahoma, USA; [ariam.jimenez@myfwc.com](mailto:ariam.jimenez@myfwc.com)

### **Current Ground-nesting Abundance of Least Tern (*Sternula antillarum*) and Black Skimmer (*Rynchops niger*) in Florida**

Quantifying spatial and temporal variability in population abundance is crucial to successfully managing listed seabird species. Florida has a statewide monitoring program where Florida Shorebird Alliance partners conduct repeated surveys during the nesting season and enter data into a centralized data repository. The program is based on a standardized survey methodology and allows survey coverage across all known potential nesting habitats. However, abundance estimates from these data can be biased by asynchronous nesting and the potential movement of renesting pairs. We developed a

method to assess the abundance of ground-nesting Black Skimmer (*Rynchops niger*) and Least Tern (*Sternula antillarum*) in Florida. The method capitalizes on repeated colony counts of nests or nesting and brooding adults over multiple spatial and temporal scales to incorporate our uncertainty in the counts, given the potential movement of ground-nesting birds throughout the breeding season. Here we present the current regional and statewide estimates for both species (2019–2022) and compare them with available historical data (2000). The current estimates indicate population growth at ground-nesting sites compared to historical data. Our analysis produced robust abundance estimates that can be used to gauge our efforts to track the population recovery of these two state-listed species. Our analysis framework can be helpful to other long-term programs relying on a cooperative network of partners to survey over a large spatial scale.

**[49] Johnson, Carmen<sup>1</sup>, Mariko Polk<sup>2</sup>, Katie Sullivan, Megan Lapinsky, Devon Eulie<sup>3</sup>, and Sara Schweitzer<sup>1</sup>**

<sup>1</sup>North Carolina Wildlife Resources Commission, Raleigh, North Carolina, USA; <sup>2</sup>North Carolina State University, Raleigh, North Carolina, USA; <sup>3</sup>University of North Carolina Wilmington, Wilmington, North Carolina, USA; [carmen.johnson@ncwildlife.org](mailto:carmen.johnson@ncwildlife.org)

### **Expanding wings: The application of unoccupied aerial systems in monitoring nesting Wood Storks**

Wood Storks have used mill ponds, lakes, and Carolina Bays in North Carolina to forage in the post breeding season. Beginning in 2005, the species expanded its nesting range northward into the state and the NC Wildlife Resource Commission (NCWRC) began annual monitoring of the population. Nesting in small colonies (2-443 nests), often with other long-legged wading birds, monitoring the species has required use of both ground and aerial surveys to obtain accurate counts of colony size. While fixed-wing aircraft surveys typically provide higher nest counts than those done by kayak, there are many drawbacks, including cost, safety of surveyors, pilot availability, surveyor skillset, and image quality. In 2018, NCWRC and the Coastal and Estuarine Studies Lab, UNC Wilmington began collaborating to test the utility of using small unoccupied aerial systems (UAS) to survey Wood Stork colonies. An average of 13.13 additional nests were detected by UAS compared with ground counts across all colonies surveyed, and an average of 26.25 additional nests were detected at the largest colony in the state. This 6-year monitoring effort has concluded that a UAS is a time and cost-effective method for obtaining counts of Wood Stork colonies.

**[50] Johnson, Luanne<sup>1</sup>, Carolyn Mostello<sup>2</sup>, Liz Olsen<sup>1</sup>, Shea Fee<sup>3</sup>, and Kayla Kasacek<sup>1</sup>**

<sup>1</sup>BiodiversityWorks, Massachusetts, USA; <sup>2</sup>Massachusetts Division of Fisheries and Wildlife, Massachusetts, USA; <sup>3</sup>The Trustees of Reservations, Massachusetts, USA;

**Notes on the Northernmost Colony of Black Skimmers on the Atlantic Coast**

Black Skimmers (*Rynchops niger*) began nesting in Massachusetts in 1985 and have done so annually, with the exception of 2002. Between 1985 and 2013, 0 to 7 pairs nested at one to four sites. Since 2014, the number of nesting pairs increased nearly annually reaching a peak of 23 pairs in 2022. Since 2019, over 90% of the pairs nest on a small (1 ha) sand and gravel spit on the island of Martha's Vineyard, where lethal and non-lethal predator management takes place annually. Productivity at this site 2018 to 2023 ranged from 0.11 – 1.80 chicks fledged/pair (mean 1.11 chicks/pair). From 2017 to 2022, we banded 45 chicks (0 – 12 annually) with federal bands and pumpkin colored field readable bands. Re-sight data from fall 2017 through spring 2023, returned survival data for 69% (36/45) of banded chicks after they left Martha's Vineyard. To date, 42% (15/36) of chicks banded from 2017 to 2020 were re-sighted as nesting adults, and 31% (11/36) returned to nest at or within 1 mile of their natal colony on Martha's Vineyard. Two were re-sighted on Metinic Island, Maine in June of 2022. Re-sights have also provided information on migration paths and overwintering site fidelity. Re-sights in September and October 2017 – 2022 confirmed 10 of these banded skimmers on Long Island and another 5 on New Jersey beaches. This southwest movement from Martha's Vineyard potentially exposes them to offshore wind energy developments. Re-sights from October - December suggest these skimmers make short-distance movements, stopping in New Jersey, Maryland, Virginia, and North Carolina as they move south to wintering sites in South Carolina, Georgia, and Florida. While some show site fidelity to the same wintering location, others wander during the winter, including as far south as Key West, Florida.

**[51] Kephart, Bailey\*<sup>1</sup> and Susan McRae<sup>1</sup>**

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**Monitoring Black Rail occupancy in North Carolina Game Lands to evaluate the effects of prescribed burns on habitat use during the breeding season**

The Eastern subspecies of the Black Rail (*Laterallus jamaicensis jamaicensis*) is one of the rarest marsh birds in North America, and was recently uplisted federally to 'Threatened'. Increased habitat fragmentation has resulted in rapid population declines. Efforts to increase Black Rail habitat include the use of prescribed burns to produce early successional high marsh habitat, but the effectiveness of these management strategies requires validation. Here, we document habitat use by breeding Black Rails in burned and

unburned tracts and examine how prescribed burns alter habitat characteristics of hydrology and vegetation. Cryptic and secretive, Black Rails are notoriously difficult to observe, and their ecology and behavior are poorly understood. We performed standardized marsh bird callback surveys using a series of Black Rail calls to document occupancy in burned and unburned sites. Data loggers were deployed to continuously record water depth fluctuations. We quantified vegetation structure and composition at each survey point using protocols adapted to characterize the microhabitat of these sparrow-sized, ground-dwelling birds. We further deployed trail cameras to document activity patterns of Black Rails during the breeding season. We will identify environmental predictors of Black Rail occupancy as well as how these variables relate to burn management. Our findings will help inform management of Black Rail habitat.

## **[52] Kropp, Alexander N.<sup>1</sup>**

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### **Operation Wrack Line: Engaging Law Enforcement in Waterbird Protection**

Human disturbance can have severe impacts on imperiled shorebirds, seabirds, and wading birds in Florida. Audubon Florida and other Florida Shorebird Alliance bird stewards and monitors play a key role in protecting important nesting areas and educating the public. However, due to limitations in staff and funding, these partners can only be present at critical nesting areas for a small part of the breeding season. Furthermore, stewards cannot enforce FWC rules protecting waterbirds from harm and harassment.

The Florida Fish and Wildlife Conservation Commission's (FWC) Division of Law Enforcement has played an essential role in responding to wildlife violations reported by Florida Shorebird Alliance stewards. However, this role has been primarily a reactive one, where violators may impact nesting activities and leave prior to the arrival of law enforcement. In 2023, FWC's Division of Law Enforcement (DLE) initiated Operation Wrack Line; a statewide effort to implement proactive patrols at priority nesting areas in coordination with FWC biologists. The FWC DLE conducted over 2,500 patrols from January through July of 2023.

## **[53] Lamb, Juliet<sup>1</sup>**

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### **A synthetic analysis of post-construction displacement and attraction of marine birds at offshore wind energy installations**

Changes in use of at-sea habitat by marine birds, including both displacement and attraction, are frequently observed following construction of offshore wind energy installations. However, the presence and strength of these effects have varied widely among studies, likely driven by a combination of study design parameters, differences in the magnitude of responses among species and seasons, and differences in wind farm locations and site characteristics. An understanding of the factors driving both occurrence and magnitude of changes in distribution is required to inform wind farm design and develop best practices for monitoring. We conducted a synthetic meta-analysis of existing literature to assess the state of knowledge on effects of offshore wind energy installations on marine bird distributions. Drawing from 38 studies and reports on distribution of marine birds before and after construction of wind energy infrastructure, we modeled the likelihood of detecting a change in distribution compared to pre-construction and/or reference sites, as well as the proportional change in use of the wind energy area, as functions of wind farm (e.g., turbine density, latitude), biological (e.g., species, season), and study design parameters (e.g., monitoring method, control area size). Occurrence and strength of displacement effects varied most strongly among taxa and seasons, followed by study design criteria, and were least influenced by wind farm characteristics. Displacement effects were more common during breeding, increased with study area footprint and number of survey years, and diminished with distance from wind turbines. Rarer taxa (tubenoses, skuas) had low frequency of significant effects but large effect sizes, suggesting that displacement may be underestimated in these groups. We recommend that future monitoring studies clearly report both means and standard errors of underlying metrics (i.e., abundance and/or density) within defined study areas to allow for robust comparison among sites, species, and survey methodologies.

**[54] Linscott, Jennifer<sup>1</sup>, Rose Swift<sup>2</sup>, Kylie Walker<sup>3</sup>, Juan Navedo<sup>4</sup>, Jorge Ruiz, Sarah Clements<sup>5</sup>, Bart Ballard<sup>6</sup>, Mitch Weegman<sup>7</sup>, and Nathan Senner<sup>1</sup>**

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### **Dynamic Freshwater Wetlands Support a Long-Distance Migratory Shorebird**

Many shorebirds rely on freshwater wetlands as they migrate across the continental interior of North America. The dynamic variability of these wetlands, which change in size and distribution from year to year, means that shorebirds encounter an altered network of wetland sites each time they arrive. How shorebirds adjust movements in response to this unpredictable spatiotemporal variation remains unclear. As freshwater wetlands decline in number across the globe-particularly in the Prairie Pothole Region ('PPR') of North America, where the majority of wetlands have already been drained for row crop agriculture-questions are also emerging about how shorebirds navigate an increasingly sparse wetland network and how ongoing changes in land use and precipitation might

continue to impact shorebird migration in the decades to come. We investigate these questions with a focus on the Hudsonian Godwit (*Limosa haemastica*), a long-distance migratory shorebird that stops briefly in the dynamic wetlands of the PPR during its hemisphere-crossing northward migration. We pair tracking data from godwits outfitted with satellite transmitters in 2019-2022 with novel wetland maps, built using Harmonized Landsat Sentinel-2 satellite imagery, to examine how individuals respond to shifting annual configurations of freshwater wetland habitats as they travel north. Our results suggest that areas of the PPR with a high density of small, temporary wetlands are vital for godwits. With the help of a network model, we are also assessing the number of sites necessary to sustain migrating godwit populations and network vulnerability in light of future land use and climatic changes. Ultimately, reversing the declines of long-distance migratory shorebirds-among the most rapid declines in any bird species-may require predicting changes in these dynamic habitats and prioritizing high-value sites.

**[55] Lipford, Aylett\*<sup>1</sup>, Leah Moran<sup>1</sup>, Sammy King<sup>1</sup>, and Andy Nyman<sup>1</sup>**

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### **If you build it, will they come? Assessing habitat quality for birds at created marshes in southeastern Louisiana.**

Wetland loss occurs at an alarming pace globally, with extremely high rates along the northern Gulf of Mexico. Louisiana loses a football field of wetland every 100 minutes: that is 77,000 m<sup>2</sup> of wetland bird habitat lost daily. In Louisiana, marsh creation projects combat wetland loss, and while wildlife habitat is often used as a justification for restoration, wildlife receives little to no consideration during and after construction. Multi-scale habitat characteristics such as flooding patterns, inundation depth, and vegetation communities affect the abundance of wetland birds and understanding these features is crucial to creating habitat that will benefit birds. Our study compares bird species abundance, vegetation, and site-specific hydrology between natural and created marshes across southeastern Louisiana. We conducted point counts and vegetation surveys at six created and six natural marshes in 2021 and at 10 created and 10 natural marshes in 2022 and 2023. All species of birds seen and heard were recorded and call-back surveys were performed to increase detections of secretive marsh birds. At each created site, we used water-level recording devices to quantify differences in water levels and flooding frequency among sites. Our results suggest that created marshes vary widely in hydrologic regimes and vegetation communities. While some created sites supported overall lower water levels than the natural marshes and therefore a more upland vegetation community, others demonstrated more variable water levels that allowed for frequent flooding and establishment of emergent vegetation. We completed 772 bird surveys (created = 413, natural = 359) and identified 9,674 individual birds of 110 different bird species. We classified all observed birds into foraging guilds. Guild abundance will be modeled in order to determine how water levels and vegetation communities affect the abundance of



wetland birds. These relationships will help us understand key habitat characteristics for wetland birds that should be considered when creating marshes.

**[56] Goodenough, Katharine<sup>1</sup>, Robert Longiaru<sup>2</sup>, Kathleen Robb<sup>2</sup>, and Tara Schneider-Moran<sup>2</sup>**

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### **Working towards filling knowledge gaps of Black Skimmer movements along the Atlantic Coast: A New York case study**

Management of Black Skimmer populations at a regional level across the Atlantic Flyway is both dynamic and difficult due in part to their varied conservation and management statuses at the state level. For example, in the "tri-state" area of New York-New Jersey-Connecticut, Black Skimmers are listed as "Species of Special Concern" in New York and Connecticut and "State Endangered" in New Jersey, yet they are only a stone's throw away from each other. Understanding how skimmer utilize both their local nesting sites and regional movements could shed light on population dynamics of colonies throughout the Atlantic Flyway. With the implementation of mark-recapture studies on Black Skimmer populations (since 2015) and the increasing use of telemetry studies (2018-present) in New York, the knowledge gaps in Black Skimmer movement ecology and breeding population interactions are beginning to close. Here we present initial results of Black Skimmer chick movements and natal philopatry via band resights, space use of breeding adult skimmers, and migration patterns of New York Black Skimmers across the Atlantic Flyway.

**[57] Lyons, Jim<sup>1</sup>, Henrietta Bellman<sup>2</sup>, Philip Atkinson<sup>3</sup>, Audrey DeRose-Wilson<sup>4</sup>, Graham Austin<sup>3</sup>, Gregory Breese<sup>5</sup>, Jacque Clark<sup>3</sup>, Richard De Feu<sup>6</sup>, Kevin Kalasz<sup>5</sup>, Rob Robinson<sup>3</sup>, and Nigel Clark<sup>3</sup>**

<sup>1</sup>Eastern Ecological Science Center, U.S. Geological Survey, USA; <sup>2</sup>Audubon of the Mid-Atlantic, USA; <sup>3</sup>British Trust for Ornithology, England; <sup>4</sup>Audubon Florida, USA; <sup>5</sup>U.S. Fish and Wildlife Service, USA; <sup>6</sup>Wash Wader Research Group, Lincolnshire and Norfolk, England; [jelyons@usgs.gov](mailto:jelyons@usgs.gov)

### **Long-term patterns in relative abundance of short- and long-distance migrant Red Knot at Delaware Bay, USA, 2006-2021**

Red Knot using the Atlantic-Americas flyway have three main wintering areas: southeastern USA, northern Brazil, and Tierra del Fuego/Patagonia. Stable isotope ratios in feather samples can distinguish individuals as "short-distance" (southeastern USA and northern Brazil) or "long-distance" (Tierra del Fuego/Patagonia) migrants. Historically, it

was thought that Red Knot passing through Delaware Bay during spring migration included short- and long-distance migrants in nearly equal proportions. We collected feather samples on the Delaware shore of Delaware Bay, USA, from 2006–2021 and tested three hypotheses: 1) the proportion of long-distance migrants on the Delaware shore has not changed over time, 2) long-distance migrants arrive at the Delaware shore later than short-distance migrants, and 3) individual birds use the same wintering area consistently across years. From 2006–2021, the annual mean proportion of long-distance migrants was 0.51 but increased over time, and by 2021 had increased to 0.65. Long-distance migrants arrived later than short-distance migrants. Results from birds that were sampled in multiple years indicated that birds rarely change wintering area. The trend in proportion of long-distance migrants may be explained by phenotypic flexibility and changes in space-use patterns within Delaware Bay. Long-distance migrants face constraints imposed by atrophy of digestive organs, whereas short-distance migrants have greater flexibility in diet and therefore space-use at Delaware Bay and other stopovers.

## [58] McHale, Marykate\*<sup>1</sup> and Kate Sheehan<sup>1</sup>

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### **Developing a Spatial Model to Predict Avian Botulism Outbreaks in Alaska**

Avian Botulism (AB) causes widespread waterbird die-off events worldwide. Die-offs involve dozens to hundreds of thousands of waterbirds and impact multiple species simultaneously. AB is caused by a neurotoxin (BoNT/C) produced by an anaerobic, spore-forming bacterium, *Clostridium botulinum*. BoNT/C is synthesized when *C. botulinum* is infected with bacteriophages that encode for toxin protein. BoNT/C can then spread by dipteran flies that lay eggs in animals containing the toxin. Birds consume intoxicated maggots from carcasses and become intoxicated themselves, resulting in more infectious carcasses. This cycle is self-perpetuating, resulting in large numbers of avian mortalities from a single toxin bloom. Because of the complex and diverse transmission pathways of AB, predictions of its occurrence are challenging. The recommended management for outbreak control is the costly practice of *in situ* carcass collection. Because AB outbreaks are so unpredictable, there is currently no feasible proactive method to manage an outbreak.

Here, we develop a spatial model to predict locations for AB outbreaks using data from the United States Geological Survey spanning the 1980s and 2010s, along with environmental data from publicly available sources. Response data included point feature layers of die-off locations (suspected but negative and confirmed AB) and background points. Predictors included point data extracted from raster layers for abiotic (temperature, precipitation, hydrological features) and biotic (insect vector presence) data, both in raw and transformed forms, with focal statistics calculated at a radius of 30km. For analysis, we ran a series of Generalized Linear Models in R (package *mgcv*) and performed forward model progression and dredging (*MuMIn* package) after removing correlated variables based on  $a$

*priori* selections. We present results as a predictive map of the United States above the 37<sup>th</sup> parallel, based on the variables present in the most parsimonious models. Furthermore, we investigate the individual effects of each variable contained in these models on AB proliferation. Models like these are foundational to predict potential sites for outbreaks using historical and current climate data. Additionally, they can be used to determine the extent of future outbreaks given climate scenarios in a warming world.

## **[59] McKenzie, Monica<sup>1</sup>**

<sup>1</sup>Florida Gulf Coast University, Fort Myers, Florida, USA; [MKMcKenzie93@gmail.com](mailto:MKMcKenzie93@gmail.com)

### **The Impact of Hurricane Ian on Lee County's Snowy Plover (*Charadrius nivosus*) Nesting Productivity**

Snowy Plovers (*Charadrius nivosus*) can be found nesting along Florida's Gulf Coast shoreline. In September 2022, the state threatened shorebird species in Lee County was faced with Hurricane Ian, completely shifting the geomorphology of the coastline and sand dunes where SP (Snowy Plover) prefer to conduct their nesting between March-June. The changes to the beach may positively impact the nest productivity in 2023, compared to Pre-Hurricane Ian. To see how the impacts from Hurricane Ian affected nest productivity, an averaged nest productivity from 2018-2022 will be compared to 2023. Productivity each year was calculated as the number of fledglings divided by the peak number of adult pairs. All data was collected by Florida Fish and Wildlife Conservation Commissions (FWC) seasonal biologists, following the Breeding Bird Protocol. This study will provide information on how SP react to natural disasters, such as hurricanes and allow for conservation management strategies to be implemented.

## **[60] McKeon, Seabird<sup>1</sup>**

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### **Towards an Oceanic Joint Venture**

As problems facing marine birds are both diverse and diffuse, solutions require multifaceted partnerships able to work across many boundaries to find a path forward for seabirds. In essence, because of their wide ranges, the solution to a localized seabird impact is often not a local response. Thus, a mechanism to bring together stakeholders with a broad knowledge of threats and associated conservation opportunities across the geographic range of the species of concern is needed to adequately ensure that conservation work is effective across multiple scales -- a group to see the big picture and coordinate the needed partnerships across these scales. Migratory Bird Joint Ventures are

collaborative partnerships of government agencies, non-profit organizations, corporations, tribes, and individuals that conserve habitat for the benefit of priority bird species, other wildlife, and people. First established in 1986, Joint Ventures have grown to support the conservation of migratory birds across much of North America. Marine waters have been represented in this effort by some coastal and estuarine habitats, and in the taxon focused efforts of the Sea Duck Joint Venture. The Economic Exclusion Zones of marine waters of North America includes some 20,219,463 km<sup>2</sup> where migratory bird habitat is under-protected or unprotected. The Oceanic Joint Venture (OJV) will support migratory birds across the seascapes of North America to their breeding grounds through the coordination, implementation and execution of adaptive management conservation programs, and compensatory conservation to offset impacts from human activities.

**[61] Michael, Pamela<sup>1</sup>, Kathy Hixson<sup>2</sup>, Christopher Haney<sup>1</sup>, Jeffrey S. Gleason<sup>3</sup>, Yvan G. Satgé<sup>2</sup>, and Patrick G. R. Jodice<sup>2</sup>**

<sup>1</sup>Terra Mar Applied Sciences, Washington DC, USA; <sup>2</sup> Clemson University, Clemson, South Carolina, USA; <sup>3</sup>U.S. Fish and Wildlife Service, USA; [pamela.e.michael@gmail.com](mailto:pamela.e.michael@gmail.com)

### **Migration, breeding location, and seascape shape seabird assemblages in the northern Gulf of Mexico**

The Gulf of Mexico supports many seabird species, yet data gaps describing species composition and habitat use are prevalent. We used vessel-based observations from the Gulf of Mexico Marine Assessment Program for Protected Species to identify and characterize distinct seabird assemblages in the northern Gulf of Mexico (within the U.S. Exclusive Economic Zone; nGoM). Using cluster analysis of 17 seabird species, we identified assemblages based on seabird relative density. Vessel-based surveys documented the location, species, and number of seabirds across the nGoM between 2017–2019. For each assemblage, we identified the (co-)dominant species, spatial distribution, and areas of greater relative density. We also assessed the relationship of the total relative density within each assemblage with environmental, spatial, and temporal covariates. Of the species assessed, 76% (n = 13) breed predominantly outside the nGoM basin. We identified four seabird assemblages. Two assemblages, one dominated by black tern and the other co-dominated by northern gannet/laughing gull, occurred on the continental shelf. An assemblage dominated by sooty tern occurred along the continental slope into pelagic waters. The fourth assemblage had no dominant species, was broadly distributed, and was composed of observations with low relative density ('singles' assemblage). Differentiation of assemblages was linked to migratory patterns, residency, and breeding location. The spatial distributions and relationships of the black tern and northern gannet/laughing gull assemblages with environmental covariates indicate associations with river outflows and ports. The sooty tern assemblage overlapped an area prone to mesoscale feature formation. The singles assemblage may reflect commuting and dispersive behaviors. These findings highlight the importance of seasonal migrations and dynamic features across the seascape,

shaping seabird assemblages. Considering the potential far-ranging effects of interactions with seabirds in the nGoM, awareness of these unique patterns and potential links with other fauna could inform future monitoring, research, restoration, offshore energy, and aquaculture development in this highly industrialized sea.

**[62] Mirzadi, Rostam\*<sup>1</sup>, Dale Gawlik<sup>1</sup>, David Essian<sup>1</sup>, Jordan Giese<sup>2</sup>, David Newstead<sup>3</sup>, James Gibeaut<sup>1</sup>, Jessica Magolan<sup>1</sup>, Mathew Streich<sup>1</sup>, Liam Wolff<sup>1</sup>, Katya Wowk<sup>1</sup>, and Christine Hale<sup>1</sup>**

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### **Nest survival of five species of colonial waterbirds nesting on the Texas coast**

Islands along the Texas coast provide critical breeding habitat for over 34 species of colonially nesting waterbirds. However, these islands are disappearing due to sea level rise, increased storm activity, subsidence, and erosion, thus posing a significant threat to the state's colonial waterbird population. Reproductive success data for most waterbirds on the Texas coast is lacking but is needed to guide colony island management and rehabilitation efforts. Therefore, in 2022, we used a quadcopter drone to estimate nest survival for five species of colonial nesting waterbird species, across six colonies, on the Texas coast. Logistic exposure models showed that the Great Egret had the greatest survival estimates (mean, 95% confidence interval, n) (*Ardea alba*; 96.9%, 94.1–98.3%, 63 nests), followed by the Tricolored Heron (*Egretta tricolor*; 89.5%, 83.1–94.2%, 37 nests), Reddish Egret (*E. rufescens*; 88.3%, 81.7–92.6%, 41 nests), Caspian Tern (*Hydroprogne caspia*; 77.2%, 68.6–84.5%, 48 nests), and Black Skimmer (*Rynchops niger*; 75.2%, 70.7–79.5%, 199 nests), respectively. These estimates of nest survival for our focal species of colonial waterbirds provide a baseline understanding of their breeding biology in the Coastal Bend region of Texas. The next phase of the analysis, identifying island attributes and nest site characteristics that are associated with high nest survival, will be used to prioritize colony islands for rehabilitation in the Colony Island Network Design and Implementation (CINDI) project.

**[63] Mizrahi, David<sup>1</sup>**

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### **A national assessment of waterbird hunting in coastal wetlands of Suriname**

Widespread waterbird hunting warrants appraisals of its sustainability. South America's northern coast has extensive wetlands that are important for waterbird species

conservation. Hunting may contribute to population declines for some of these species. Here, we present an assessment of waterbird hunting in coastal wetlands of Suriname, where waterbirds, except for waterfowl species, are legally protected. Specifically, we ask: (i) what is the magnitude of waterbird hunting in coastal Suriname? (ii) has waterbird hunting magnitude changed over time? and, (iii) what are the motivations of waterbird hunters? To our knowledge, this is the first longitudinal assessment of waterbird hunting in this region. Waterbird hunting data were collected through a national survey based on structured interviews of licensed hunters across the coastal region at two time points (i.e., 2006, 2016). We used a Bayesian hierarchical model to analyze the harvest survey data. We estimated hunting magnitude for 11 waterbird species, all of which are listed by IUCN as Least Concern. For three groups of species, we could not estimate hunting magnitude at a species level (i.e., small herons, small shorebirds, large shorebirds). For most waterbird species, mean harvest per hunter declined between 2006 and 2016 as many survey respondents indicated that their hunting activity decreased between the two survey periods. The exceptions were blue-winged teal (legal to hunt), and migratory shorebirds (illegal to hunt), for which harvest did not change between 2006 and 2016. Survey results suggest that the primary purpose of hunting was non-commercial, which includes subsistence and recreational. Although waterbird hunting levels generally declined between 2006 and 2016, cause for concern remains because it is difficult to assess if declines were in proportion to population declines. Among all waterbirds hunted, shorebirds are of particular conservation concern due to declining populations and slow life history traits. Current estimates of shorebird harvest in Suriname are nearly double of those available for the Lesser Antilles, Guyana and Brazil combined. Given Suriname's importance for waterbirds in the Americas, addressing hunting of conservation priority species, like scarlet ibis and migratory shorebirds, must be a priority.

**[64] Monopoli, Lauren\*<sup>1</sup>, Auriel Fournier<sup>1</sup>, Thomas Benson<sup>1</sup>, Chelsea Kross<sup>1</sup>, Jonathan Lueck<sup>2</sup>, and Erik Johnson<sup>2</sup>**

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### **Fire Effects on Breeding Marsh Bird Success with Implications for Eastern Black Rail**

The continued loss of coastal marsh habitats within the United States poses a serious threat to marsh-dependent species like the federally threatened Eastern Black Rail (*Laterallus jamaicensis*). The elusive nature of the species has made studying Black Rail challenging, resulting in the species being poorly understood. This lack of knowledge regarding Black Rail ecology further complicates conservation efforts, particularly management decisions related to prescribed fire. The goal of this study was to determine the effect of varying fire regimes on breeding marsh bird success in southwest Louisiana. Due to the Black Rail being federally protected, Red-winged Blackbird (*Agelaius phoeniceus*) and Seaside Sparrow (*Ammospiza maritima fisheri*) were used as surrogate species. From March to July 2023, Red-winged Blackbird and Seaside Sparrow nests were routinely searched for and monitored to

determine nest success. In addition, miniature cameras were placed at a subset of nests once they reached full clutch. By using miniature cameras, nests can be recorded continuously thus providing a more detailed account of nest fate. With Eastern Black Rail populations having declined by 75 % over the last decade alone, understanding the timing of prescribed fire in relation to breeding marsh birds is a necessary and critical step in managing for Eastern Black Rail.

**[65] Moore, David J.<sup>1</sup>, Sara C. Pereira de Souza<sup>1</sup>, and Jeffrey N. Costa<sup>1</sup>**

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**Migration and winter distribution of GPS-tagged Ring-billed Gulls breeding on the Laurentian Great Lakes.**

We examined the full-cycle annual movements and winter habitat use of 58 adult Ring-billed Gulls (*Larus delawarensis*) breeding in Hamilton, Ontario, Canada, using GPS pinpoint tags, from 2019-2023. Migration to, and from, winter areas was rapid, ranging from days up to a week. Migration routes and winter locations were highly variable among individuals. Gulls wintered mainly on the Atlantic coast of North America from New Jersey to the Bahamas, with the highest concentration found from Maryland to North Carolina. Some birds spent the winter further inland at sites in Kentucky, Tennessee and Georgia. Alternately, a few individuals were non-migratory, remaining in the Laurentian Great Lakes region over winter. Migratory distances ranged from 154 km to 1,842 km, with an average of  $829 \pm 319$  km SD (no difference between females and males). Individuals utilized from 1-8 discrete winter locations per year (median = 2), with predominantly small-scale movements (< 50 km) between successive locations. For a subset of gulls for which we had data over two complete annual cycles (n=15), winter site fidelity was relatively high: 53% of birds had overlapping winter distributions between years, and a further 40% of birds showed fidelity at a regional scale (i.e.  $\leq 200$  km between centroids of winter distributions). This study is one of only two (see also Clark *et al.* 2016) to track full-cycle movements of individual Ring-billed Gulls in North America, and will contribute to our understanding of migratory connectivity and winter ecology of this species.

**[66] Moran, Leah\*<sup>1</sup>, Aylett Lipford<sup>1</sup>, Sammy King<sup>1</sup>, and Andy Nyman<sup>1</sup>**

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**Characterizing Trends of Secretive Marshbird Distributions Across the Deltaic Plain of Louisiana**

Secretive marshbirds (SMB) are an enigmatic yet common group of waterbirds found within the coastal marshes of Louisiana that are affected by acute and long-term changes

within their environment as well as various anthropogenic and natural events. The lack of information regarding SMB distributions complicates planning, implementation of management and restoration to help conserve SMBs in coastal Louisiana. To address this information gap, we conducted three years of callback surveys to quantify trends and estimate the abundance of five key breeding SMBs across various coastal marsh types within the deltaic plain of Louisiana. A total of 284 points were surveyed from March to June of 2021-2023 with a total of 3,162 surveys completed. Trends differed among species, but overall, we recorded a similar number of detections during 2021 ( $3.3 \pm 3.0$  birds/survey) and 2023 ( $3.1 \pm 2.7$  birds/survey) and a lower average during 2022 ( $2.6 \pm 2.7$  birds/survey), a potential effect from the impact of Hurricane Ida in August of 2021. Future research focuses on the development of species distribution models for SMBs using environmental variables, such as water metrics, vegetation communities, vegetation density, and amount of edge, which are important in dictating marshbird distributions.

[67] Hovey, Lindsay<sup>1</sup>, David Newstead<sup>1</sup>, and Mattityahu Baron<sup>1</sup>

<sup>1</sup>Coastal Bend Bays and Estuaries Program, USA; [dnewstead@cbbep.org](mailto:dnewstead@cbbep.org)

### **Site fidelity and migration timing of Black Skimmers in the western Gulf of Mexico**

The Black Skimmer (*Rynchops niger*) is widely distributed along temperate North American coastlines, and also utilizes riverine systems in parts of its South American range. Some populations are considered resident, making only small interseasonal movements within a region, while others are fully migratory. Skimmers in the western Gulf of Mexico are partial migrants, with a proportion of the population remaining within temperate waters of the northern Gulf during the nonbreeding season while the remainder moves to tropical waters. We used ARGOS and GPS tracking data to document timing and destination of migratory movements, estimate the proportion of migratory individuals in the population, and quantify the degree of site fidelity to breeding and nonbreeding areas for individuals with multiple seasons of tracking data. Breeding home ranges and nonbreeding utilization distributions were determined using a Brownian Bridge Movement Model (BBMM) calculated for adult and juvenile skimmers. The results indicate that a large proportion of western-Gulf breeding skimmers spend the nonbreeding season on the Pacific coast of Mexico and Central America, with most crossing at the Isthmus of Tehuantepec in southern Mexico. There was strong fidelity to both breeding and nonbreeding areas for nearly all individuals, though timing of migration was less consistent between years. Non-migratory skimmers generally moved away from their breeding areas during the nonbreeding season, but not uniformly in a southerly direction. Despite this population being considered primarily coastal, several individuals spent long periods of time inland from the coast along riverine systems. As a declining species of conservation concern, these findings highlight the need to broaden the geographic scope when considering threats over the full life-cycle.



**[68] Olsen, Tabitha\*<sup>1</sup> and Chris Butler<sup>1</sup>**

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**Estimating Detection Probability Using Passive and Active Survey Methodology for Six Species of Rail**

Rails are a secretive group of marshland birds that are challenging to detect consistently. Detection probabilities are variable depending on the rail species, time of year, and methodology used. We targeted six species of rails that reside along the Texas Gulf Coast: Sora (*Porzana carolina*), Yellow Rail (*Coturnicops noveboracensis*), and Virginia Rail (*Rallus limicola*), which are present during the winter, and King Rail (*R. elegans*), Clapper Rail (*R. crepitans*), and Black Rail (*Laterallus jamaicensis*), which are present year-round. We conducted call-playback surveys at 90 points along the Texas Gulf Coast during February-June 2022 and revisited points a minimum of 12 times. At these same points, we deployed 20 autonomous recording units (AudioMoths) and 20 Reconyx trail cameras that we rotated every 14-days to passively detect rails. We also conducted a cost analysis for each survey method used in this study to showcase the monetary and time-related costs of each survey method to relate the potential long-term monitoring of each of the six rail species. Vegetation sampling for above-ground biomass, percent cover for select vegetative categories, and stem density counts were conducted in June-July 2022. Occupancy modeling results show that call-playback generates the highest detection estimates for Yellow Rail ( $\hat{p}=0.043$ ) and Virginia Rail ( $\hat{p}=0.326$ ), relative to other methods, while passive acoustic monitoring is comparable and feasible for King/Clapper Rail ( $\hat{p}=0.706$ ), Sora ( $\hat{p}=0.474$ ), and Black Rail ( $\hat{p}=0.279$ ) during the later portion of the survey season. Cost analyses show that passive monitoring would be monetarily less expensive than active surveying.

**[69] Pakzad, Iman\*<sup>1</sup>, Joan Browder<sup>2</sup>, and Yan Jiao<sup>1</sup>**

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**Identifying Longline Vessel Related Fishing Tactics that Impact Seabird Bycatch Risk**

Western North Atlantic U.S. seabird bycatch in the pelagic longline fishery is a serious concern. The Pelagic Observer Program (POP) started in 1992 to monitor the Atlantic longline fishery bycatch including seabirds and other species of interest in the United States. Existing studies based on the POP data and a Bayesian spatial-temporal generalized linear model found that vessel ID is a significant factor in estimating seabird bycatch probability. In order to further understand the connection between vessel ID and seabird bycatch probability, this study compared the fishing tactics of vessels that do and do not have seabird bycatch. The objective of this study was to find out the reason why vessel ID matters in seabird bycatch probability, and to identify vessel related fishing tactics that

might affect seabird bycatch probabilities to help reduce seabird bycatch. Because of the sample size issue, using a GLM or GAM did not find these fishing tactics significant. Instead we compared the tactics differences between vessels that do and do not have a record of seabird bycatch. In total 31 different tactics across four categories: effort, depth, lures, and miscellaneous were compared in four different management regions. Two of the most heavily fished of these regions: the Gulf of Mexico (GOM) and the Mid Atlantic Bight (MAB) are fished by 63% of vessels. However, MAB has frequently been found to be a hotspot of seabird bycatch while the GOM region is not. The data show that gear usage varies significantly between regions; for example, the GOM region has a higher mean set depth than other regions. Additionally, region-specific analysis showed all but 2 of 31 tactics had significant differences in use between bird and non-bird boats. Of all tactics tested, the gears that were the most consistently different and with the clearest trend between bird and non-bird boats across sites were hook density, light sticks and surf lights. While the other gears did have statistically significant differences between bird and non-bird boats, how they differed was not consistent across the sites.

## [70] Pandey, Prava\*<sup>1</sup>

<sup>1</sup>National Lake Conservation Development Committee, Ministry of Forests and Environment, Nepal;  
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### **Evaluating Conservation Status of Tern Species in Koshi River Basin, Nepal**

Wetlands are considered as fertile lands for agriculture and rich from the biodiversity point of view. These wetlands provide habitat for several species of wildlife and lie within various ecosystems of high-mountain and lowland plains. The wetlands in Nepal comprise approx. 743,500 ha and are particularly important for threatened species. Terai wetlands support as many as 187 species of water bird. So, water birds comprise significant portion of avian fauna of Nepal.

This study reveals the population of Tern species in Koshi River east Nepal from March 2012 to March 2023. Terns are long lived widely distributed wetland birds. Tern is primarily distributed in wetland habitats, which are increasingly being settled, degraded and converted into other landforms. The population of Tern is declining throughout its range. This is a detail study carried out to find out its status, distribution and conservation in Nepal.

Koshi Wetlands are the most important and first Ramsar Site of Nepal due to the presence of diverse types of wetlands, floodplain and large forest make the high species diversity and largest heronry in Nepal. Generally seven species of these species were recorded from the Koshi River Basin. Among these species, Brown headed Gull, *Chroicocephalus brunnicephalus* Great Black-headed Gull, *Ichthyaetus ichthyaetus* Common Tern *Sterna hirundo* and Whiskered Tern *Chlidonias hybridus* are winter visitors, Black-bellied *Sterna*

*acuticauda* and River Terns *Sterna aurantia* are resident whereas Little Tern *Sternula albifrons* is a breeding summer visitor to Koshi wetlands.

Maximum numbers of gulls and terns species were recorded from Koshi wetland. Terns are facing a wide range of threats in Nepal. Habitat loss and damage are the primary threats to decline the species. Besides, they are suffering from food shortages due to overfishing, fish poisoning, water pollution, hunting and trapping and disturbance and destruction of feeding and nesting sites are the major threats and are decreasing. A recent assessment of wetland birds are regarded to be in the critical stage, especially the tern species.

**[71] LePage, Felicity, Eleni Antoniou<sup>1</sup>, Robin Ward<sup>2</sup>, Elizabeth Morgan<sup>2</sup>, and Kimberly Peters<sup>1</sup>**

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### **Exploring environmental compensation measures for offshore wind: black-legged kittiwake in the U.K.**

Black-legged kittiwake has declined rapidly over the past several decades due primarily to climate change and its associated impacts on prey species, oil spills, and fisheries activities (i.e., prey depletion and bycatch). As a result, the species was added to the International Union for the Conservation of Nature (IUCN) Red List in 2017 as Vulnerable to global extinction. Worldwide decarbonization, driven in large part by wind energy expansion, is expected to play a significant role in mitigating several of these threats, and while some offshore wind projects may pose collision risk to kittiwakes, the wind industry is exploring and implementing various methods to minimize and offset these potential risks. Orsted has established aggressive internal biodiversity goals and has been at the forefront of developing compensation workstreams for potential risk to black-legged kittiwakes from two wind energy Projects off the eastern coast of the United Kingdom (UK). For the Hornsea 3 Project, Orsted commissioned three "industry-first" nearshore artificial nesting structures off the East Suffolk coastline. This effort was conducted in partnership with a team of architects, engineers, ecologists and in collaboration with multiple stakeholder groups. Resulting structures are designed to each house up to 500 breeding pairs and to provide protection from avian predators. The structures will also be fitted with decoys that will be ready for the 2024 breeding season. To investigate offshore mitigation options ( $\geq 50$  km from shore) for the Hornsea 4 Project, data on nesting habitats, spatial distribution, and use of existing offshore structures by kittiwakes within the UK southern North Sea were acquired in 2021 and 2022 using vessel-based and aerial survey methods. Kittiwakes were observed readily using several oil and gas platforms in the survey areas, and information gained will be used to inform site selection and future design principles, which may include repurposing gas platforms into structures specifically designed to house kittiwake colonies. An overview of the project goals, decision process, design, and other lessons learned

through these efforts will be shared, along with plans for monitoring use of the structures by kittiwake and other species.

## [72] Picardi, Simona<sup>1</sup>, Peter Frederick<sup>2</sup>, and Mathieu Basille

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### **Fitness Consequences of Partial Migration in Wood Storks Along an Urban Gradient**

Partial migration is an advantageous strategy for populations living in unpredictable environments. The Wood Stork (*Mycteria americana*) population in the southeastern U.S. is partially migratory. On any given year, part of the population migrates between breeding grounds in South Florida and non-breeding grounds elsewhere in the Southeast, while another part of the population remains resident in South Florida year-round. Individuals may also change their migratory behavior year-to-year, acting as facultative migrants. Partial migration is thought to be beneficial for Wood Storks because the availability of food sources in the Everglades of South Florida-where most of the population congregates to breed-is highly unpredictable between years. However, the landscape of South Florida has been dramatically altered by urbanization in the past century, and the consequences of partial migration in this changing landscape are unknown. We used a long-term GPS dataset including 64 individuals tracked between 2004 and 2017 to (1) evaluate selection of foraging sites used during breeding by migrant and resident individuals in relation to proximity to urban areas and (2) quantify the effect of proximity to urban areas on reproductive performance, measured as daily nest-survival probability. Residency was associated with selection of foraging sites closer to urban areas compared to migration, and, in turn, proximity to urban areas was associated with higher nest survival. These findings indicate that resident individuals may benefit from the availability of reliable food sources in urban areas, which increase their reproductive performance. Conversely, migrants appear to rely heavily on non-urban foraging sites, where food availability is less predictable, and to suffer from lower reproductive performance. Under continued landscape change, these differences in reproductive performance may end up favoring residency as a population-level strategy in the long run.

## [73] Pierce, Rachael<sup>1</sup>

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### **Monitoring the Impact of Highly Pathogenic Avian Influenza on Caspian Terns in the Great Lakes**

In 2022, Great Lakes Caspian Terns (CATE) experienced a significant mortality event due to Highly Pathogenic Avian Influenza (HPAI), resulting in an estimated minimum loss of 16% of the adult population. Given the species' regional elevated conservation status, the need for comprehensive monitoring to understand the extent of population impact and subsequent recovery was critical. In May and June of 2023, a complete assessment of all known CATE breeding colonies in the Great Lakes was conducted. This assessment aimed to estimate the current population, ascertain recolonization of sites affected by HPAI in 2022, and determine whether HPAI persisted in the population. A total of 41 colonies were surveyed through ground-based and aerial observations. During these visits, all CATE nests were counted, and instances of mortality were documented. Researchers confirmed nesting at several historically active CATE colonies. However, almost all colonies experienced reduced nesting compared to previous surveys. With few exceptions, colonies that experienced a die off from HPAI in 2022 had zero nests in 2023 and there was no evidence of new sites being colonized. Despite evidence of continued HPAI impact in other colonial nesting birds in the Great Lakes (e.g., Double-crested Cormorant), no HPAI-related mortality was documented among CATE colonies in 2023. Although CATE nesting declined precipitously in 2023, it appears that enough CATE's survived the 2022 HPAI outbreak that new age classes of breeders continue to establish breeding colonies in the Great Lakes. Despite challenges posed by HPAI, the persistence of breeding activity underscores the resilience of the species, emphasizing the need for ongoing conservation efforts to ensure its long-term survival.

## **[74] Poli, Caroline<sup>1</sup>**

<sup>1</sup>University of Florida, Gainesville, Florida, USA; [cpoli@ufl.edu](mailto:cpoli@ufl.edu)

### **Foray movements are common and have survival benefits for a highly mobile waterbird**

Understanding dispersal is central to interpreting the effects of climate change, habitat loss and habitat fragmentation, and species invasions. Prior to dispersal, animals may gather information about the surrounding landscape via forays, or systematic, short-duration looping movements away from and back to the original location. Despite theory emphasizing that forays can be beneficial for dispersing organisms and that such behaviors are predicted to be common, relatively little is known about forays in wild populations. Theory predicts that individuals that use forays may delay dispersal and such behaviors should increase survival, yet empirical tests of these predictions remain scarce. We tested these predictions in a natural system using the critically endangered snail kite (*Rostrhamus sociabilis*), a wetland-dependent raptor. We GPS tracked 104 snail kites from fledging through emigration from the natal site across their breeding range to understand the demographic consequences of movement. We found that forays were common (82.7% of individuals tracked), and natal habitat played an important role in the initiation, execution, and outcome of foray behavior. Critically, forayers incurred early-life survival benefits over non-forayers. Survival was also mediated by the timing of

emigration, where individuals that did not foray emigrated earliest but had the lowest survival. Poor hydrological conditions in the natal environment were especially important for eliciting forays. Finally, females responded more strongly to natal hydrology than males, making more forays and significantly longer, more distant trips. These results emphasize the fundamental role of natal habitat for determining behavioral patterns, strengthen links between individual movement decisions and their demographic consequences, and provide an important behavioral focal point for interpreting movement tracks that would not otherwise be captured by conventional movement models.

**[75] Prosser, Diann<sup>1</sup>, Cody Kent<sup>1</sup>, Jeffery Sullivan<sup>1</sup>, Kelly Patyk<sup>2</sup>, Mary-Jane McCool<sup>2</sup>, Andrew Fox<sup>2</sup>, and Jennifer Mullinax<sup>3</sup>**

<sup>1</sup>U.S. Geological Survey, USA; <sup>2</sup>U.S. Department of Agriculture, USA; <sup>3</sup>University of Maryland, College Park, Maryland, USA; [dprosser@usgs.gov](mailto:dprosser@usgs.gov)

### **Development of an adaptive modeling approach for predicting avian influenza transmission risk at the wild to domestic interface**

Transmission of highly pathogenic avian influenza (HPAI) across the wild bird – domestic poultry interface is a known issue of global importance. Despite the notable ecological and financial impacts of the recent incursion of HPAI H5N1 Clade 2.3.4.4b into North America, there are few data driven models available to guide emergency response and planning. This talk will present our mechanistic approach to providing high resolution spatial and temporal transmission risk models at this interface for the contiguous United States. In this effort, we incorporate weekly species-level wild waterfowl (Anatidae) abundance and endemic avian influenza prevalence metrics with the number of poultry farms per commodity type and relative biosecurity risks at two spatial scales (3km and county-level). Our findings indicate that spillover risk varies across the annual cycle of waterfowl movements and some locations exhibited persistent risk given higher poultry production or biosecurity risk factors throughout the year. Results have been validated using wild bird introduction events identified by phylogenetic analysis of virus isolates from the current HPAI infected premises, and this validation indicates that our models performed strongly in predicting novel introductions despite being developed using endemic virus prevalence. We will also discuss future directions for this research including potential to adjust prevalence models for the dynamically evolving virus as more events occur, and ability to expand risk predictions across continental borders to reflect migratory connectivity from the U.S. into Canada as well as into Central and South America.

**[76] Pruner, Raya<sup>1</sup>, Marvin Friel<sup>1</sup>, and Janell Brush<sup>1</sup>**

<sup>1</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; [raya.pruner@myfwc.com](mailto:raya.pruner@myfwc.com)

**Predation Behavior of Gull-billed Terns (*Gelochelidon nilotica*) and its Implications for Imperiled Shorebirds in Florida**

Predation is an essential ecological process, yet alterations in predator-prey dynamics can yield severe consequences, especially for imperiled species. Gull-billed terns (*Gelochelidon nilotica*) display distinctive dietary preferences and behaviors compared to other tern species. They exhibit opportunistic feeding patterns, exploiting a wide array of prey across marine, estuarine, and terrestrial environments, capitalizing on locally available prey. Gull-billed terns have been documented as predators of shorebird eggs and chicks, including the snowy plover (*Charadrius nivosus*)-a threatened species in Florida. Despite this recognition, their in-flight hunting approach introduces ambiguity and limited empirical evidence from the field. However, field observations suggest that snowy plover reproductive success declines whenever these two species intersect. Recent shifts in gull-billed tern distribution and abundance in the Florida panhandle have altered their interactions, yielding historically low productivity levels for snowy plovers. We conducted gull-bill tern chick provisioning observations and pellet collection to improve our understanding of prey selection. Additionally, using data from 2019-2022, we developed snowy plover chick survival models using spatial data and occurrence records from neighboring gull-billed tern colonies. We confirmed reoccurring gull-billed tern hunting and predation of snowy plover nests and chicks, and our analyses indicated that as local gull-billed tern populations increased, daily survival rates of snowy plover chicks declined.

**[77] Madison Zimmerman<sup>1</sup>, Richard Flamio Jr, Natalia Bayona-Vásquez<sup>2</sup>, and Kristina Ramstad<sup>1</sup>**

<sup>1</sup>University of South Carolina Aike, Aiken, South Carolina, USA; <sup>2</sup>Oxford College of Emory University, Atlanta, Georgia, USA; [kristinar@usca.edu](mailto:kristinar@usca.edu)

**Genomic population structure of the peripatetic wood stork**

The wood stork (*Mycteria americana*, WOST) is a large wading bird native to South America, Central America, Mexico, the Caribbean, and the southeastern United States (US). The species is peripatetic with individuals moving seasonally between foraging and nesting sites (colonies). WOST currently hold threatened status under the Endangered Species Act due to wetland degradation and reduced population size in their historical stronghold of the Florida Everglades. Recent northward expansion, however, has led to proposed de-listing of the US WOST despite very poor understanding of genomic population structure of the species. To assess levels of genetic differentiation across the species range, 447 individuals from 13 colonies (nine in the southeastern US and four in Brazil) were

sequenced at 6,157 SNPs using a RADcap approach. Little to no genetic divergence between colonies was found, suggesting there is high gene flow between all sites sampled.  $F_{ST}$  between sites statistically exceeded zero in nine of 15 pairwise comparisons ( $F_{ST} = 0.008-0.020$ ) but averaged lower than detected interannual ( $F_{ST} = 0.022-0.025$ ). Discriminant analysis of principle components identified all colonies as belonging to a single population. Panmixia is likely due to the peripatetic nature of the species and their reliance on wetlands defined by spatial and temporal heterogeneity in hydrology. Panmixia among WOST at neutral genetic loci suggest the species should be managed as a single population but cannot rule out adaptation that may be present at local or regional scales.

**[78] Sanders, Felicia<sup>1</sup>, Adam Smith<sup>2</sup>, Kara Lefevre<sup>3</sup>, Janet Thibault<sup>1</sup>, Kevin Kalasz<sup>4</sup>, Fletcher Smith<sup>5</sup>, Maina Handmaker<sup>6</sup>, and Tim Keyes<sup>5</sup>**

<sup>1</sup>South Carolina Department of Natural Resources, South Carolina, USA; <sup>2</sup>American Bird Conservancy, USA; <sup>3</sup>Florida Gulf Coast University, Fort Meyers, Florida, USA; <sup>4</sup>U.S. Fish and Wildlife Service, USA; <sup>5</sup>Georgia Department of Natural Resources, Georgia, USA; <sup>6</sup>University of Massachusetts Amherst, Amherst, Massachusetts, USA; [sandersf@dnr.sc.gov](mailto:sandersf@dnr.sc.gov)

### **Spring migration patterns of Red Knots in the Southeast United States**

The *rufa* subspecies of the red knot (*Calidris canutus rufa*) uses the Southeast United States as a stopover during north and southbound migration and during the winter. We examined northbound red knot migration routes and timing using an automated telemetry network and Sunbird Argos tags. Our primary goal was to evaluate the relative use of an Atlantic migratory route through Delaware Bay versus an inland route through the Great Lakes *en route* to Arctic breeding grounds and to identify areas of apparent stopovers. Secondly, we explored the association of red knot routes and ground speeds with prevailing atmospheric conditions. Most of the Red Knots, tracked with Motus Wildlife Tracking System, migrating north from the Southeast United States skipped or likely skipped Delaware Bay (73%) while 27% of the knots stopped in Delaware Bay for at least 1 day. A few knots used an Atlantic Coast strategy that did not include Delaware Bay, relying instead on the areas around Chesapeake Bay, New York Bay or Cape Cod for stopovers. Nearly 80% of migratory trajectories were associated with tailwinds at departure. Most knots tracked with nanotags traveled north through the eastern Great Lake Basin, without stopping, thus making the Southeast United States the last terminal stopover for some knots before reaching boreal or Arctic stopover sites.



## [79] Santariello, Andrea\*<sup>1</sup>

<sup>1</sup>University of Louisiana at Lafayette, Lafayette, Louisiana, USA; [aksant92@gmail.com](mailto:aksant92@gmail.com)

### **Caught on Camera: factors that influence the breeding success of Royal Terns (*Thalasseus maximus*) and Black Skimmers (*Rynchops niger*) breeding on Louisiana's coastal islands**

The rapidly disappearing coastal marshes and islands of Louisiana are important breeding habitat for many seabird species. These areas have also been the target of extensive restoration efforts, leading to variability in habitat characteristics. This study investigated the factors that influence the breeding success of Royal Terns and Black Skimmers on a number of Louisiana's coastal islands. Motion-detection game cameras were used to observe colonies continuously throughout each breeding season in 2018, 2019, and 2021. Breeding success and causes of nest failure were recorded for a sample of nests detected by each camera. We used generalized linear mixed models, with binomial structure and a logistic exposure function, and covariates that include island/colony habitat characteristics and restoration activity to investigate how they influence the daily probability of nest survival. We found that the most common causes of nest failure were flooding/weather events and depredation. Nest elevation and the interaction between island area and nesting species were the most important factors in predicting the probability of daily nest success. The results of this study provide important information on the conservation of Royal Tern and Black Skimmer breeding colonies in Louisiana, specifically as it relates to the restoration of its coastal islands.

## [80] Satgé, Yvan<sup>1</sup>, Kathy Hixson<sup>1</sup>, Jeffery S. Gleason<sup>2</sup>, and Patrick G. R. Jodice<sup>1</sup>

<sup>1</sup>Clemson University, Clemson, South Carolina, USA; <sup>2</sup>U.S. Fish and Wildlife Service, USA; [ysatge@clemson.edu](mailto:ysatge@clemson.edu)

### **Update on the forthcoming Gulf of Mexico nesting waterbird atlas and registry**

The coastal zone of the northern Gulf of Mexico supports a diverse array of breeding waterbirds. Because of the dynamic nature of coastal habitats, waterbirds may shift the location of their breeding sites interannually in response to availability, size and stability of substrates. Such changes can affect local population size or structure, foraging locations, and threat exposure. Overlaid on this dynamic system is a stakeholder network of three Joint Ventures responsible for management of species and breeding habitats that includes five state agencies, multiple federal agencies, and numerous private organizations. Information and data regarding the location and status of colonies is collected regularly but remains scattered among the stakeholder network and difficult to source. With the planned expansion of renewable energy development in federal (and state) waters in the northern Gulf of Mexico, a coast-wide spatial inventory of breeding sites is needed to support habitat management, monitoring and research, as well as marine spatial planning, oil spill

response plans, and post-*Deepwater Horizon* oil spill restoration. Efforts have begun to create an atlas and registry of waterbird breeding sites that integrate existing data from 2010 to 2022. To date, 38 datasets from 8 data providers have been incorporated, representing more than 50,000 surveys of 46 breeding species. This resource will provide critical contemporary information to understand the distribution and status of breeding waterbirds in the northern Gulf of Mexico.

## [81] Schell, Elizabeth\*<sup>1</sup> and Jeff White<sup>1</sup>

<sup>1</sup>University of Miami, Coral Gables, Florida, USA; [elizabeth.r.schell@miami.edu](mailto:elizabeth.r.schell@miami.edu)

### **Consistent changes in muscle metabolism underlie dive performance across multiple lineages of diving ducks**

Diving animals must sustain high activity with limited O<sub>2</sub> stores to successfully capture prey. Studies suggest that increasing body O<sub>2</sub> stores supports breath-hold diving, but less is known about metabolic specializations that underlie underwater locomotion. We measured maximal activities of 10 key enzymes in locomotory muscles (gastrocnemius and pectoralis) to identify biochemical changes associated with diving in pathways of oxidative and substrate-level phosphorylation and compared them across three groups of ducks - the strong diving sea ducks (*Mergini*, 8 spp.), the mid-tier diving pochards (*Aythiini*, 3 spp.), and the non-diving dabblers (*Anatini*, 5 spp.). Relative to dabblers, both diving groups had increased activities of succinate dehydrogenase and cytochrome c oxidase, and sea ducks further showed increases in citrate synthase (CS) and hydroxyacyl-coA dehydrogenase (HOAD). Both diving groups had relative decreases in capacity for anaerobic metabolism (lower ratio of lactate dehydrogenase to CS), with sea ducks also showing a greater capacity for oxidative phosphorylation and lipid oxidation (lower ratio of pyruvate kinase to CS, higher ratio of HOAD to hexokinase). These data suggest that the locomotory muscles of diving ducks are specialized for sustaining high rates of aerobic metabolism, emphasizing the importance of body O<sub>2</sub> stores for dive performance in these species.

## [82] Pressey, Cameron<sup>1</sup>, Rebecca Schneider<sup>1</sup>, Alexa DeJoannis<sup>1</sup>, and Alexis Cardas<sup>1</sup>

<sup>1</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; [rebecca.schneider@myfwc.com](mailto:rebecca.schneider@myfwc.com)

### **Rooftop-Nesting Least Terns in Florida: Conservation Status and Predation Pressures**

Tar-and-gravel rooftops are important nesting habitat for shorebirds and seabirds in Florida. Counts from statewide abundance estimates indicate that almost 50 percent of Florida's least terns nested on rooftops between 2019 and 2021. Despite the importance of

this habitat, information regarding productivity and management options on rooftops is poorly understood. Further, there exist unique limitations and challenges for managing imperiled species that persist on anthropogenic structures that are actively used for residential or business purposes. This talk summarizes the Florida Shorebird Program's rooftop research and presents promising protection and predation management strategies that biologists may pursue for rooftop colonies.

### **[83] Schweitzer, Sara<sup>1</sup>, Albert Larry Bryan, and Bradley Wilkinson<sup>2</sup>**

<sup>1</sup>North Carolina Wildlife Resources Commission, North Carolina, USA; <sup>2</sup>Association of Fish and Wildlife Agencies; [sara.schweitzer@ncwildlife.org](mailto:sara.schweitzer@ncwildlife.org)

#### **Pilot study of Wood Storks nesting in North Carolina**

A nesting colony of Wood Storks (*Mycteria americana*) was detected in North Carolina (NC) in 2005, and currently seven colonies are monitored annually; thus, an established nesting population is present at this northern-most location. To understand migration patterns as well as nesting site and foraging habitat selection, we initiated a pilot project that fit two adult Wood Storks with a GPS and a satellite radio tag during spring 2015. Both storks exhibited strong fidelity to one colony site and traveled to nearby foraging sites daily. Each migrated south in early October and arrived in Florida (FL) in mid-October and mid-November, respectively. One stork did not return from FL and the other survived two seasons, returning North in mid-March and mid-April. This stork nested in the colony of capture one year and in a South Carolina colony, just south of the NC border, a second year. Most (95%) sites used during the breeding season were privately owned, as were the sites used during winter (56 to 72%). These preliminary data will help guide conservation of privately-owned lands, as well as larger studies of Wood Storks in NC.

### **[84] Scott, Martin<sup>1</sup>**

<sup>1</sup>HiDef Environmental Consultancy, Lillyhall, Workington, United Kingdom; [martin.scott@hedefsurveying.co.uk](mailto:martin.scott@hedefsurveying.co.uk)

#### **History of marine wildlife digital aerial surveying**

Aircraft scale digital aerial surveying of marine fauna has been a commercial entity for 15 years. It developed out of the need to improve on safety and data auditability, from visual aerial and boat surveys, and has since been refined numerous times. A prime driver has been the offshore wind industry which has provided funding (and sites) to push the boundaries of capabilities.

Larger survey areas, further offshore, with higher turbine designs have driven forward technologies and methods. New systems and techniques have improved data and our understanding of seabirds – but what next?

## [85] Seixas, Julia Silva\*<sup>1</sup>

<sup>1</sup>University of Georgia, Athens, Georgia, USA; [silvaseixasjulia@gmail.com](mailto:silvaseixasjulia@gmail.com)

### **From the Everglades to the Cities: Trade-offs of Urbanization to White Ibises (*Eudocimus albus*)**

The White Ibis (*Eudocimus albus*) is an increasingly urbanized wading bird in Florida. We have been studying the adaptation of ibises to urban environments for over a decade and we detected shifts in their landscape use, diet, disease dynamics, and movement patterns. In this presentation, we present an overview of our previous research on adult urban ibises, in addition to novel studies on their urban nesting population. We investigated productivity, nestling growth and diet, and *Salmonella* and avian influenza virus (AIV) dynamics of one urban and two natural ibis colonies in south Florida. A total of 64 and 67 nests were monitored until fledging via weekly nest checks in 2020 and 2021, respectively. The urban colony showed high nest success in 2020 (70.8%) and 2021 (76.4%). Additionally, a total of 77 urban and 39 natural nestlings were handled weekly from hatch until fledging to take measurements and collect biological samples. We failed to detect differences in the growth rates and body condition of urban and natural nestlings. Urban chicks consumed a mixture of anthropogenic (e.g., bread) and natural (e.g., invertebrates, fish) food as determined by stable isotope analysis, suggesting that urban nestlings are provided with the necessary nutrients and calories to grow and fledge. However, urban nestlings shed *Salmonella* at a much higher prevalence (52%, N=209 samples) than natural chicks (13%, N=60 samples). Seroprevalence against AIV was detected at ~99% and 89% at the urban and natural rookeries, respectively, which waned over time, indicating maternal transfer. In 2020, urban nestlings died suddenly, and 3/4 were diagnosed with West Nile virus (WNV) based on histopathology, immunohistochemistry, virus isolation, and PCR. Sera collected from 4/36 (11%) urban chicks in 2020 had anti-WNV antibodies, which were all likely maternally derived. Overall, our studies suggest that urban environments are suitable habitats for ibises but with important impacts to their health. We also highlight potential trade-offs for other urban species and encourage adopting a holistic approach to investigate the impacts of urbanization to wildlife.

## **[86] Senner, Paul: Winner of the Publication Award for Outstanding Contribution to Conservation**

[sennerp@gmail.com](mailto:sennerp@gmail.com)

### **Changes in Avian Community Composition at a Restored Floodplain Grassland in the Mekong Delta**

Reinstating flood pulse dynamics has been identified as a method for restoring biotic communities in altered riverine ecosystems. To explore the impacts of flood pulse management on wet grassland bird communities, we surveyed community composition at a restored floodplain grassland, Tram Chim National Park, in the Plain of Reeds region of the Mekong Delta. Survey sites were situated at different elevations, allowing us to sample the range of grassland habitats found in the study area. Our surveys coincided with three periods of decade-long water management; two surveys occurred during flood pulse water management, and another followed a decade of year-round high-water management. We used PERMANOVA and NMDS to compare avian community composition between these surveys and used foraging guilds to qualitatively assess the impact of water management separate from turnover in individual species. Community composition differed between all surveys at the lowest elevation site, with detection rates for species associated with ponded water, not grassland ecosystems, highest following high-water management. Some grassland species were absent following high-water management and may have been extirpated from survey sites. In the face of grassland loss and hydrological changes across the Mekong Delta, our surveys highlight the value of continued flood pulse management for supporting the conservation of wet grassland birds.

## **[87] Sharp, Alexander\*<sup>1</sup>, Dale Gawlik<sup>1</sup>, Michelle Petersen<sup>2</sup>, and Stephanie Romañach<sup>3</sup>**

<sup>1</sup>Texas A&M University Corpus Christi, Corpus Christi, Texas, USA; <sup>2</sup>Florida Atlantic University, Boca Raton, Florida, USA; <sup>3</sup>U.S. Geological Survey, USA; [asharp1@islander.tamucc.edu](mailto:asharp1@islander.tamucc.edu)

### **Seasonal patterns of urban habitat selection by Little Blue Herons (*Egretta caerulea*) in coastal Florida**

Urbanization alters animal movements by fragmenting habitats, introducing physical barriers to movement, and creating novel habitats. Despite urbanization being one of the most extreme forms of habitat modification, areas of low to moderate human development may promote increased avian species richness, due to greater resource availability or quality. However, novel habitats such as artificial wetlands may also pose risks to the birds in these systems. Understanding the importance of novel habitats to species that exist in both natural and urban habitats, and incorporating this into modern conservation plans is critical in sustaining populations in rapidly developing coasts. Here, we quantify selection of urban habitats over the full annual cycle using movement data from coastal Little Blue

Heron (*Egretta caerulea*). We attached satellite transmitters to 30 Little Blue Herons in the lower Florida Keys and the Charlotte River Estuary during the nonbreeding season of 2021-2022, collecting approximately 17,000 GPS locations from our tagged herons. We used Manly selectivity ratios ( $w_i$ ), a common measure of selection that estimates the use versus availability of specific habitats, paired with land cover data to determine selection of developed habitats during both the nesting and nonbreeding seasons. Selectivity ratios revealed that herons from Charlotte River Estuary used developed habitats proportional to their availability ( $w_i=1.23$ ,  $SE=0.33$ ) during the nonbreeding season but showed selection for developed habitats ( $w_i=1.59$ ,  $SE=0.42$ ) during the nesting season. Herons from the Keys showed strong avoidance of developed habitats during both the nonbreeding ( $w_i=0$ ,  $SE=0$ ) and nesting ( $w_i=0.09$ ,  $SE=0.07$ ) seasons. These data provide the first evidence of differences in urban habitat specialization between populations of Little Blue Herons. The recent exploitation of urban habitats is one of the factors cited for the proposed delisting of the Wood Stork (*Mycteria americana*) and is the primary reason for local population increases of urban specializing White Ibis (*Eudocimus albus*). Thus, as natural wetland coverage declines and urban habitats increase worldwide, the ability to quickly adapt to novel conditions may contribute to a species' long term population viability.

## **[88] Shealer, David<sup>1</sup>, Kristina Davis<sup>2</sup>, and Daniel Baldassare<sup>2</sup>**

<sup>1</sup>Department of Biology, Loras College, Dubuque, Iowa, USA; <sup>2</sup>State University of New York Oswego, Oswego, New York, USA; [david.shealer@loras.edu](mailto:david.shealer@loras.edu)

### **First Test for Assortative Mating by Body Feather Color and Brightness in Black Terns**

A previous study found weak but significant sexual size dimorphism in North American Black Terns (*Chlidonias niger surinamensis*), but no compelling evidence of assortative mating for any mensural characteristics measured on mated pairs. This led to speculation that if assortative mating occurs in this species, it may be a result of color or brightness of the body feathers. Using reflectance spectrometry and an avian visual model, we show that Black Tern males and females do indeed exhibit a subtle but statistically significant difference in brightness (males darker). Black Terns are not UV-sensitive, but the achromatic contrast between males and females is enough that it should be discernable during mate choice. Moreover, we found evidence of disassortative mating for reflectance among mated pairs, where more black and saturated birds tended to pair with more gray and unsaturated birds. There was no evidence of pairing based on overall brightness. This finding suggests that visual signals unrelated to structural characteristics may be important components in mate choice for Black Terns. The pattern of disassortative mating reported here was unexpected, however, and requires further study.

**[89] Sheehan, Kate L.<sup>1</sup> and Douglas Casey<sup>2</sup>**

<sup>1</sup>Frostburg State University, Frostburg, Maryland, USA; <sup>2</sup>University of Alaska Anchorage, Anchorage, Alaska, USA; [klsheehan@frostburg.edu](mailto:klsheehan@frostburg.edu)

**Avian Drivers of An Unexpected Parasite Outbreak: A Subarctic Lake in Seasonal Flux**

Naturally, birds serve as hosts to several suites of parasites, and those communities change seasonally as host geographic location (migration) and behaviors (dietary and mating) change. This is a consequence of changes in bird densities/contact rates with one another and their environment. Additionally, the food items they encounter change in space and time as they respond to spatial and climactic constraints. Finally, birds are also agents of dispersal for other organisms that drop propagules from body surfaces or excretions. An excellent natural laboratory occurs in subarctic lakes, where turnover of biomass changes drastically between seasons. Few birds are resident on Cheney Lake, Anchorage, Alaska during winter; however, several hundred birds inhabit or are regular visitors to this waterbody once the lake ice retreats in summer. As such, the fish and invertebrate communities look different from season to season, as thermal regimes shift throughout the year and avian predation rates are more frequent when birds are more abundant. Interestingly, the parasites in Cheney Lake follow similar patterns, where in the winter they are seldomly reported and small in body size – yet in summer, they are prolific, grow to gargantuan sizes, and are so abundant in the bird host that they pass through the body quickly and whole. Here, we review the seasons of Cheney Lake as documented over the last 3 years through the populations of its inhabitants, ranging from invertebrates, fishes, and avifauna. Additionally, we explore the utility of the tapeworm *Schistocephalus solidus* in the community as a mechanism to deliver energy and nutrients to the organisms of Cheney Lake, ultimately modulating biomass turnover and ecosystem processes.

**[90] Skov, Henrik<sup>1</sup>, Rune Skjold Tjoernloev<sup>1</sup>, Mike Armitage<sup>2</sup>, and Mike Barker<sup>2</sup>**

<sup>1</sup>DHI Group; <sup>2</sup>RPS Group; [hsk@dhigroup.com](mailto:hsk@dhigroup.com)

**Comparable avoidance behaviour of seabirds measured at three offshore wind farms in the Northwest Atlantic (US), United Kingdom (Scotland) and eastern North Sea (Netherlands)**

Strong evidence of collision mortality in seabirds or other groups of birds in offshore wind farms (OWFs) has been lacking due to absence of detailed empirical data from within OWFs. Three studies undertaken with similar advanced multi-sensor equipment (integrated high-resolution radar and powerful digital cameras) in the Northwest Atlantic (US), United Kingdom (Scotland) and eastern North Sea (Netherlands) show comparable trends in meso and micro avoidance behaviour which indicate that seabirds are exposed to lower risks of collision in OWFs than hitherto assessed. The spatial trends in the avoidance

behaviour of seabirds at all three sites show strong meso avoidance from 100 m distance from the tip of the rotors. As the seabirds approach to the tip of the blades the meso avoidance was displayed as a tendency to reduce flight speed, increase flight height and change of flight direction. The latter behavioural response transferred into a strong micro avoidance behaviour which was mainly manifested as a tendency to fly along the plane of the rotor with few individuals recorded crossing the spinning rotors perpendicularly. These findings were also substantiated by the fact that for the three sites only two collisions were recorded in the more than 20,000 bird videos collected during the three to five years of monitoring. The empirical data on seabird flight behaviour collected in these studies could in combination with high-resolution (GPS) tracking data provide calibration data for development of improved collision risk modelling approaches based on individual-based modelling. A calibrated individual-based collision risk model is now within reach and will be capable of describing seabird flight behaviour inside an OWF using realistic flight parameter values for seabird flight speed, orientation, and height.

## **[91] Slaton, Bonnie\*<sup>1</sup> and Paul Leberg<sup>1</sup>**

<sup>1</sup>University of Louisiana at Lafayette, Lafayette, Louisiana, USA; [bslato@gmail.com](mailto:bslato@gmail.com)

### **A Seabird Success Story: Resiliency of Brown Pelicans following Hurricane and Restoration**

Natural events like hurricanes affect nesting coastal avifauna by altering their habitats and consequentially impacting their breeding success. In addition to hurricanes, land loss due to erosion and subsidence limits suitable nest site availability for the Eastern Brown Pelican (*Pelecanus occidentalis*) on rapidly disappearing barrier islands of Louisiana. In 2021, Hurricane Ida traveled directly through three seabird nesting colonies in southeast Louisiana, including Queen Bess, Philo Brice, and Raccoon Islands. Habitat restoration efforts made by state and federal governments on two of these islands have increased the island elevation and total area available for breeding seabirds. In order to better understand the impacts of these major beach nourishment projects on the breeding success of pelicans. We examine island size, vegetation composition, mammalian predator presence and presence of red imported fire ants in 2022 and 2023. The comparison of pre- and post-storm conditions on restored and unrestored islands can inform future restoration practices and improve conservation outcomes.

## **[92] Soldo, Christy<sup>1</sup>**

<sup>1</sup>Florida Fish and Wildlife Conservation Commission, Florida, USA; [christy.soldo@myfwc.com](mailto:christy.soldo@myfwc.com)

### **Black Rail Detection Model using Deep Learning and Audio Analysis**



The Black Rail (*Laterallus jamaicensis*) is a secretive and elusive marsh bird known for its distinctive vocalizations. To enhance our understanding of its presence in complex habitats, like Lake Okeechobee, I present an approach using deep learning techniques for automated Black Rail call detection in audio recordings. My model leverages spectrogram analysis and convolutional neural networks to identify unique acoustic patterns indicative of Black Rail calls. The proposed model is trained on a diverse dataset of Black Rail calls and non-calls, ensuring robust performance in various environmental conditions. I created my model using Python programming language, more specifically TensorFlow, for efficient audio processing and model training. Validation of the model on extensive recordings demonstrates high accuracy in identifying Black Rail calls, even within noisy and reverberant environments.

### **[93] Spendelow, Jeffrey<sup>1</sup>**

<sup>1</sup>U.S. Geological Survey Emeritus, USA; [JeffSpendelow@hotmail.com](mailto:JeffSpendelow@hotmail.com)

#### **A preliminary look at comparative use of staging sites at Cape Cod National Seashore by Hatch Year Roseate and Common Terns from colony sites where these species nest sympatrically**

Roseate Terns (*Sterna dougallii*) nest sympatrically with Common Terns (*S. hirundo*) at several colony sites within the breeding range of the endangered NW Atlantic population of the former, but Common Terns nest at many more colony sites in this area than do Roseate Terns. These two species also migrate and winter together in mixed-species flocks, but there are differences in their relative abundance at staging sites in New York and Massachusetts and at wintering areas along the coast of South America. We will use 2017-2023 resighting data from Cape Cod National Seashore, Massachusetts, of Hatch Year birds of both species that were given plastic 3-character field-readable colorbands at several colony sites to the north and west of this location to examine the comparative use by these species of the staging sites at CCNS.

### **[94] Stadler, Tabitha<sup>1</sup>**

<sup>1</sup>Environmental Protection in the Caribbean; [director@epicislands.org](mailto:director@epicislands.org)

#### **Conservation Strategies at the Human/Seabird Interface in the Caribbean**

Addressing the root causes of threats to seabird populations often requires modifying human activities, which typically requires long-term behavior modification strategies. We describe examples of successful strategies to reduce human/bird conflict from within the

Antilles. The first is from Haiti, where community support for the Black-capped Petrel (*Pterodroma hasitata*) is fostered through economic development, pride campaigns, and sustainable agricultural education activities that benefit farming families while simultaneously protecting nearby forest nesting habitat for the petrel. The second is from the Grenadines, where poaching of seabirds is reduced through pride and education activities, training for enforcement agencies and policymakers, and recruitment of community members into the Grenadines Seabird Guardians, a citizen science volunteer patrol. The challenges encountered and lessons learned are discussed as well as planned activities.

**[95] Stenhouse, Iain<sup>1</sup>, Kate Williams<sup>1</sup>, Julia Gulka<sup>1</sup>, Edward Jenkins<sup>1</sup>, Holly Goyert<sup>1</sup>, Kate McClellan Press<sup>2</sup>, Caleb Spiegel<sup>3</sup>, and Timothy White<sup>4</sup>**

<sup>1</sup>Biodiversity Research Institute, Portland, Maine, USA; <sup>2</sup>New York State Energy Research and Development Authority, New York, USA; <sup>3</sup>U.S. Fish and Wildlife Service, USA; <sup>4</sup>Bureau of Ocean Energy Management; [iain.stenhouse@briwildlife.org](mailto:iain.stenhouse@briwildlife.org)

### **Developing guidance for pre- and post-construction monitoring to detect changes in marine bird distributions and habitat use related to offshore wind development**

Offshore wind development is rapidly increasing in the U.S. Atlantic, bringing a range of potential effects to birds in the marine environment. A Specialist Committee of subject matter experts, under the auspices of NYSERDA's Offshore Wind Environmental Technical Working Group, developed guidance for conducting studies of macro- to meso-scale changes in bird distributions and habitat use at offshore wind facilities. The purpose is to encourage well-designed, site-specific monitoring to answer carefully considered research questions and reduce uncertainty surrounding potential effects of development on marine birds. The committee is chaired by representatives of US federal agencies and includes experts from the US, Canada, and UK.

Guidance was developed using review of existing guidance, literature review, expert elicitation, and stakeholder engagement, and is intended to support the generation of scientifically robust data from site-specific monitoring of individual facilities, and use of consistently collected site-level data to better understand potential cumulative effects of displacement across projects. It identifies key research questions regarding displacement, attraction, and macro-to meso-scale avoidance, and provides an overall process for the selection of research questions, focal taxa, and data collection methods – including strengths and limitations of study methods, and designing studies to ensure adequate statistical power to detect effects. Specific recommendations on study design and data collection using observational surveys includes the use of Before-After Gradient (BAG) designs, study area size, percent coverage of the study area, specific field and analytical methods, and other considerations. Finally, the document includes recommendations on data consistency and transparency, to make the results of site-specific pre- and post-construction monitoring studies available for further use. Such data can inform meta-

analyses, cumulative impact assessments, and other large-scale assessments of offshore wind effects on marine bird populations.

Recommendations derived from this effort are intended for use by government and regulatory agencies, offshore wind developers and their consultants, and other stakeholders, with the aim of improving the quality of site-specific research and monitoring efforts, and increasing our understanding of displacement, attraction, and avoidance effects to marine birds from offshore wind development.

**[96] Stenzel, Candace<sup>1</sup>, Alexandra Anderson<sup>1</sup>, Richard Lanctot<sup>2</sup>, and Autumn-Lynn Harrison<sup>1</sup>**

<sup>1</sup>Smithsonian Migratory Bird Center, Washington DC, USA; <sup>2</sup>U.S. Fish and Wildlife Service, USA;  
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### **The Shorebird Science and Conservation Collective: Uniting Researchers and Conservationists across flyways and hemispheres to employ shorebird tracking data for conservation**

Over the past few decades, scientists across the Americas have used miniature technologies to track shorebird movements. Data have revealed the habitats that shorebirds rely on during their hemisphere-spanning migrations and how sites are connected. Tracking data holds great potential for conservation. However, there has been no single resource for conservation stakeholders to connect to this crucial information or to receive analytical assistance for on-the-ground conservation needs. The Shorebird Science and Conservation Collective is a new partnership of over 70 scientists who have contributed shorebird tracking data collected from over 3,100 individuals across 33 species to inform on-the-ground conservation action. The Collective serves a vital bridging function between scientists and conservation stakeholders by organizing and applying knowledge from shorebird science to address urgent conservation questions while ensuring data uses are approved by contributors. We will highlight partner case studies from our first year-and-a-half showing how shorebird tracking data have been requested and applied. Examples include supporting local outreach initiatives, providing guidance on locations and timing of freshwater deployments, and informing the siting of conservation easements. With this talk, we also will encourage discussion on other conservation and management initiatives that could benefit from this resource. The Shorebird Science and Conservation Collective is bridging the gap for effective shorebird management and conservation across the Western Hemisphere.

## [97] Stucker, Jennifer<sup>1</sup>

<sup>1</sup>Western Ecosystems Technology, Inc, USA; [jstucker@west-inc.com](mailto:jstucker@west-inc.com)

### **Results from testing - A Multi-Sensor Approach for Measuring Bird and Bat Collisions with Wind Turbines**

Offshore wind energy development is poised for rapid growth and expansion worldwide to meet green-energy targets. Understanding the potential magnitude of wildlife collisions at offshore wind facilities is important, because standardized carcass searches are impossible, and model-based estimates unvalidated. Collision monitoring systems can provide specific details about collisions, which are necessary to advance minimization strategies to reduce wind farm fatalities. Automated collision monitoring technologies can help inform and focus mitigation where needed. WEST leads a collaboration with the Netherlands Organisation for Applied Scientific Research and the National Renewable Energy Laboratory (NREL) to advance the validation of the WT-Bird® system for detecting and quantifying bird and bat collisions at offshore wind turbines. The effort is funded primarily by the US DOE's Wind Energy Technologies Office. The objective is to advance the WT-Bird® system to detect large, medium, and small bird and bat collisions during day and nighttime hours. Three major technological advancements from the project are to: 1) improve the sensors to detect collisions of small birds and bats, 2) integrate machine learning algorithms to process imagery data collected by the cameras, and 3) create a launching system to realistically simulate collisions. The updated system is designed to detect collisions including objects as small as 8 grams using acceleration sensors installed inside of the turbine blades. Independently operating cameras installed at the base of the turbine document bird and bat presence near the camera, and document collision events. The system was tested at a single turbine at NREL's campus using the projectile launching system, where the detection rate exceeded 70% across all size classes. Subsequently, the system was installed on the University of Minnesota turbine for trials with a WEST edge-AI system processing camera imagery to identify birds and bats within the camera view, and validated with independent ground-based fatality searches. The estimate from the WTBird® detections (18.46 fatalities) was within the 90% confidence interval of the ground-based estimate (16.88) with a difference in the point estimates of only 1.58 fatalities. Validating the system at an offshore wind farm is scheduled for 2024.

## [98] Sutherland, Kate

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### **Stable Isotope and Mercury Analysis of Black-capped Petrel (*Pterodroma hasitata*) Feathers to Investigate Trophic Position and Foraging Areas of Light, Dark, and Intermediate Forms**

The Black-capped Petrel (*Pterodroma hasitata*) is a threatened seabird with two color forms whose only documented nesting sites are in the mountains of Hispaniola in the Caribbean, and whose foraging range extends from the Caribbean and Gulf of Mexico northward to the northwestern Atlantic. These birds are incredibly difficult to study at sea or at their nesting locales, so I investigated the historical foraging ecology of these two forms and an intermediary by analyzing breast feathers from historic museum specimens at the North Carolina Museum of Natural Sciences collected between 1978 – 1989 for three stable isotope ratios ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ , and  $^{34}\text{S}$ ) and total mercury (THg) concentrations. There were no significant differences among the color forms of Black-capped Petrel, but significant differences in  $\delta^{15}\text{N}$  did exist by sex with females having a lower value than males. Average values of THg varied from 3.87 +/- 0.37  $\mu\text{g/g}$  (NCSM 9507) to 81.45 +/- 2.10  $\mu\text{g/g}$  (NCSM 9491) with high variability among feathers of individuals. This study provides a baseline for investigating stable isotopes and THg levels in Black-capped Petrels and other species of *Pterodroma* in the north Atlantic. More research is needed within the Gulf Stream's dynamic ecosystem to unravel these isotopic relationships, but the results from these specimens collected at different times over an 11-year period are consistent indicating a distinct foraging ecology in this species. I recommend that future studies focusing on levels of THg in seabirds, especially those using body feathers, use analysis of multiple feathers due to high intra-individual variation.

**[99] Szczys, Patricia<sup>1</sup>, Katharine Goodenough<sup>2</sup>, David Newstead<sup>3</sup>, and Rocio Mariano-Jelicich<sup>4</sup>**

<sup>1</sup>Eastern Connecticut State University, Windham, Connecticut, USA; <sup>2</sup>US Geological Survey. Louisiana Fish & Wildlife Cooperative Research Unit, USA; <sup>3</sup>Coastal Bend Bays and Estuaries Program, USA; <sup>4</sup>Vertebrados Instituto de Investigaciones Marinas y Costeras; [pszczys@gmail.com](mailto:pszczys@gmail.com)

### **Connectivity Among Black Skimmer Populations in North and South America: a population genetic investigation**

The Black Skimmer (*Rynchops niger*) is a charismatic representative of coastal-nesting waterbird communities in North America and freshwater riverine and coastal systems in South America that serve as an important link between terrestrial habitats and aquatic resources. Black Skimmer, like many waterbird species, are at high risk of decline at regional levels and globally influenced by a combination of threats including habitat loss, degradation of remaining habitat, and the synergistic effects of climate change and land use alteration.

Dispersal strongly influences individual fitness, genetic diversity and structure, and long-term resilience of populations in the face of environmental change, human impacts, and emerging pathogens. Because of this important ecological and evolutionary role, knowledge of regional and global dispersal patterns is critical for effective conservation and management.

We inferred dispersal by measuring genetic differentiation among breeding Skimmers at three North American sites and one site in Peru, South America. Using eight microsatellite loci, we estimated low differentiation between North American Atlantic- and Gulf- coast sites, greater differentiation between them and the Pacific site, and very strong differentiation between North America and a site in Peru. Analysis of a smaller dataset incorporated data for five sites in South America previously published by Mariano-Jelicich and Madrid (2014). This dataset confirms the strong North-South America differentiation and moderate differentiation among sites in South America in a pattern inconsistent with putative subspecies designations in South America.

Our results suggest a complex pattern of dispersal within South America that with a combination of telemetry and genetic tools could delineate subspecies ranges and identify fine-scale population connectivity. In North America, a detailed genetic study could investigate the hypothesis that Skimmers in South America are ancestral and experiencing range expansion along both coasts of North America, but our data is clear that dispersal among North and South America is extraordinarily infrequent.

**[100]** Flynn, Laura<sup>1</sup>, **Daniela Tabilo**<sup>2</sup>, and Ricardo Zambrano<sup>2</sup>

<sup>1</sup>Coastal Resources Group, Venice, Florida, USA; <sup>2</sup>Florida Fish and Wildlife Conservation Commission, West Palm Beach, Florida, USA; [Daniela.tabilo@myfwc.com](mailto:Daniela.tabilo@myfwc.com)

### **Are raised artificial bird nesting platforms feasible as alternative nesting sites for terns?**

The use of man-made structures for nesting by seabirds has been well documented and is increasingly common in Florida, USA. In some areas of Florida, the majority of nesting sites are now on artificial habitat such as roofs, bridges and construction sites. However, most of these sites are on private property making it difficult to monitor and manage. These sites are also prone to human disturbance and can be short-lived. In the Florida Keys, natural nesting sites for roseate terns (*Sterna dougallii*) and least terns (*Sternula antillarum*) are scarce due to changing landscapes from climate change and human development. As of 2023, only four roseate tern colonies remained in Florida, only one of which was on a natural nesting site. In the Florida Keys, all but one least tern nesting colony. were on artificial habitat in 2023. Creating artificial nesting habitat for seabirds at secure and accessible sites has been limited. The use of raised and floating nesting platforms has not been well studied or attempted. To increase nesting habitat for these two species, two large artificial bird nesting platforms were constructed in 2018 at the Key Deer National Wildlife Refuge on Big Pine Key, Florida. The benefits, challenges, lessons learned, and outcomes of nesting success are presented as preliminary data to help resource managers and researchers consider nesting platforms as a potential management option when natural sites are limited. Creating artificial nesting sites may be increasingly important in the future as the natural habitat for seabirds continues to decline in availability and quality.

**[101] Tatz, Matt\*<sup>1</sup>, Sonia Hernandez<sup>1</sup>, and Stacey Lance<sup>1</sup>**

<sup>1</sup>University of Georgia, Athens, Georgia, USA; [mjt41004@uga.edu](mailto:mjt41004@uga.edu)

### **Investigating the Relationship Between Mercury, Urbanization, and *Salmonella* spp. in the American White Ibis (*Eudocimus albus*)**

In nature, individuals are challenged simultaneously by both contaminants and pathogens, yet avian disease studies have seldom investigated this relationship. Methylmercury (MeHg), the toxic and organic form of mercury (Hg), is a common wetland contaminant that can bioaccumulate in birds and can cause immunosuppression, potentially increasing susceptibility to gastrointestinal colonization with enteric pathogens such as *Salmonella*. Immunosuppression can lead animals to start shedding *Salmonella*, shed at higher rates, or develop clinical disease when already infected. Previously, we found American white ibis (*Eudocimus albus*) that forage in high urbanization habitats shed a higher prevalence of *Salmonella* and have a less diverse gastrointestinal microbiome than those that forage in low urbanization wetlands. Florida has high annual atmospheric Hg deposition and unregulated vehicular Hg emissions which may contaminate urban habitats. Therefore, urbanized ibis may have higher Hg exposure and, subsequently, increased immunosuppression. We used a Direct Mercury Analyzer 80 (DMA-80) to analyze the Hg concentration of ibis feathers (n = 94) from individuals across capture sites (0.00 – 67.6% urbanization) in Palm Beach County, Florida, to determine if Hg is positively correlated with urbanization and the *Salmonella* status (shedding/not shedding) of ibis. We found Hg levels ranged from 0.22 – 8.47 mg/kg dw (PPM), consistent with levels previously found to negatively affect reproduction. Contrary to our expectations, Hg concentrations significantly decreased with increasing urbanization ( $R^2 = 0.327$ ,  $p = 0.026$ ,  $R = -0.608$ ), possibly due to high sulfate concentrations in low urbanization wetlands surrounding the Everglades Agricultural Area (EAA). There were no significant differences in Hg concentration between ibis shedding *Salmonella* and those that were not, among low ( $p = 0.622$ ), high ( $p = 0.758$ ), or overall ( $p = 0.596$ ) urbanization sites, suggesting immunosuppression caused by Hg has no impact on *Salmonella* infection or colonization. Together, our results indicate that urban water bodies may have less Hg bioavailability than wetlands surrounding the EAA and that Hg may not impact avian *Salmonella* dynamics.

**[102] Taylor, Liam\*<sup>1</sup>**

<sup>1</sup>Yale University, New Haven, Connecticut, USA; [liam.taylor@yale.edu](mailto:liam.taylor@yale.edu)

### **What do young seabirds get better at?**

Despite growing to adult size in their first year of life, nearly all seabirds delay reproduction for multiple years. The lives of young, pre-breeding seabirds remain among

the most poorly understood features of avian biology. As new tracking technologies emerge, however, we are finally approaching an era of studying young seabirds. To support this upcoming research, I review the four main hypotheses for what young seabirds do before they begin breeding: (1) develop general foraging skills, (2) develop central-place foraging skills, (3) develop territoriality and territories, and (4) develop pair-bonds. Using an empirical case-study of American Herring Gulls (*Larus argentatus smithsonianus*), I show how we can study these complicated processes using both direct behavioral evidence and indirect demographic evidence. I emphasize how a new focus on young birds reveals deeply neglected research topics (e.g., delayed plumage maturation) and urgent conservation concerns (e.g., recruitment dynamics) for waterbirds.

**[103] Taylor, Liam<sup>1</sup>, Robert Ronconi<sup>2</sup>, Hayley Spina, Megan Jones<sup>3</sup>, Brandon Ogbunugafor<sup>1</sup>, and Andrea Ayala<sup>1</sup>**

<sup>1</sup>Yale University, New Haven, Connecticut, USA; <sup>2</sup>Environment and Climate Change Canada, Canada; <sup>3</sup>Canadian Wildlife Health Cooperative, Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada;

### **Real-time monitoring of highly pathogenic avian influenza virus A(H5N1) at a seabird colony reveals details of wild disease outbreaks**

Because wild disease outbreaks are unpredictable, much of our research comes from cross-sectional surveillance or post hoc observations of mass mortality events. In 2021-2022, a Eurasian strain of highly pathogenic avian influenza (HPAI) virus swept across wild, commercial, and backyard bird populations in North America. During summer 2022, we were studying the life history of American Herring Gulls (*Larus argentatus smithsonianus*) at their breeding colony on Kent Island, New Brunswick, Canada. In June 2022, a laboratory-confirmed strain of HPAI A(H5N1) virus appeared in the study population. We thus had the unusual opportunity to monitor an avian influenza outbreak unfolding in real time across a wild seabird population. In contrast to mass mortality reported at other seabird colonies, we observed a self-limiting outbreak with < 10% mortality rate among Herring Gulls. Daily observations also helped characterize symptom progression, intraspecific carcass avoidance, and interspecific disease exposure routes among birds and marine mammals. From a research perspective, real-time disease monitoring raised new questions about disease ecology, evolution, resistance, and recovery in Herring Gulls. From a public health perspective, proactive monitoring of limited outbreaks at seabird colonies will be critical for tracking global virus transmission chains.



## [104] Thibault, Janet<sup>1</sup> and Felicia Sanders<sup>1</sup>

<sup>1</sup>South Carolina Department of Natural Resources, South Carolina, USA; [thibaultj@dnr.sc.gov](mailto:thibaultj@dnr.sc.gov)

### **Beyond Dreams & Donations; The Restoration of Crab Bank, a Seabird Nesting Island in Charleston, South Carolina**

Increased coastal storms and higher than average tides have reduced nesting and roosting habitat for coastal waterbird species. Crab Bank Seabird Sanctuary, located in the Charleston Harbor of South Carolina once supported over 5,000 pairs of colonial nesting waterbirds including Royal (*Thalasseus maximus*) and Sandwich Terns (*Thalasseus sandvicensis*), Brown Pelicans (*Pelecanus occidentalis*) and Black Skimmers (*Rynchops niger*), all species designated of "high" or "highest" conservation priority in the South Carolina Wildlife Action Plan. Waterbirds have been nesting on the island since the 1970s. Years of erosion accelerated by hurricanes reduced Crab Bank to a subtidal sandbar in 2017 and in 2018 no birds nested on the island. The U.S. Army Corps of Engineers' dredging of the Charleston Harbor, to allow transit of larger ships, provided an opportunity to restore Crab Bank. Because the cost of renourishing Crab Bank was not the least-cost disposal option of the dredged material, the South Carolina Department of Natural Resources (SCDNR) agreed to cost-share the project as the non-federal sponsor. SCDNR and a coalition of organizations, partners, and private citizens raised funds to cover the non-federal costs of construction. In 2021, the Corps restored Crab Bank to 32.6 acres by pumping 660,000 cubic yards of sandy material from the harbor channel onto the island's footprint; bulldozers shaped the material into dunes for suitable nesting habitat. The first season post-construction, 107 Least Tern, 283 Black Skimmer, 192 Gull-billed Tern and 8 pairs of American Oystercatcher successfully nested. An Unoccupied Aerial Vehicle (UAV) was used to monitor the extent and surface elevation of the island. The island's size and elevation have remained stable throughout the first year; it even avoided significant saltwater inundation during a recent hurricane. Beneficial use of compatible material from the U.S. Army Corps of Engineers' dredging projects provide opportunities to restore or augment waterbird habitat as was demonstrated by the successful restoration of Crab Bank.

## [105] Thórarinnsson, Thorkell Linberg<sup>1</sup>, Benjamin Merkel<sup>2</sup>, Adalsteinn Orn Snaethorsson<sup>1</sup>, and Yann Kolbeinnsson<sup>1</sup>

<sup>1</sup>Northeast Iceland Nature Research Centre, Húsavík, Iceland; <sup>2</sup>Akvaplan-niva AS; [lindi@nna.is](mailto:lindi@nna.is)

### **Wintering and Migration Strategies of Horned Grebes *Podiceps auritus* Breeding in Iceland**

The Horned Grebe (*Podiceps auritus*) population breeding in Iceland has gone through drastic changes during the last decades. The drivers behind these changes are unknown,

but when attempting to describe these it is important to understand the ecology of this migratory species throughout the whole year. While the breeding ecology of Horned Grebes is well documented, relatively little is known about the migration strategies and wintering ecology of this species.

The goal of this study was to describe the migration strategies and identify wintering areas of Horned Grebes breeding in Iceland in previously unknown detail.

We fitted geolocators to Horned Grebes breeding on two lakes in northeast Iceland from 2009 to 2012.

The results indicated that the grebes molted on freshwater lakes before gradually moving to sea and later migrate to the wintering areas. Most of the birds wintered at sea around the British Isles. However, surprisingly high variation in wintering strategies and little overlap of wintering areas was observed. Grebes tracked for consecutive years showed high wintering philopatry.

Individual grebes may be vulnerable to local environmental conditions, but the high variability in wintering strategies observed and relatively large non-breeding distribution range is expected to make the population generally less sensitive to local environmental conditions in the wintering areas for the long term.

**[106] Toms, Alli Hjort\*<sup>1</sup> and Diana J. Hamilton<sup>1</sup>**

<sup>1</sup>Mount Allison University, Sackville, New Brunswick, Canada; [ahtoms@mta.ca](mailto:ahtoms@mta.ca)

### **Movement ecology of late season migrant shorebirds in the Northumberland Strait Coast**

Each year the Northumberland Strait, Canada hosts large populations of southbound migrating shorebirds in late summer and fall. The region is vulnerable to effects of climate change, and it is essential that we understand migratory patterns as we work to mitigate risks to birds using the region. Birds that move through the region late in the season, when extreme weather poses a greater risk, have been understudied. To address this knowledge gap, we studied movement ecology and temporal changes in habitat use in three late season Calidrid sandpipers that have different migration patterns – White-rumped Sandpipers (WRSA, extreme long-distance migrants), Sanderling (SAND, medium-distance migrants) and Dunlin (DUNL, short-distance migrants). In 2021 and 2022, between August and October, birds outfitted with radiotracking tags at Petit Cap Beach, New Brunswick were monitored using the Motus Wildlife Tracking System. We examined regional movements, variation in habitat use, and length of stay. Of the three species, only DUNL exhibited multiple staging strategies in 2021, where some tagged birds remained on the Northumberland Strait and others moved to the nearby Bay of Fundy. In 2022, both

DUNL and WRSA exhibited multiple strategies, whereas SAND remain on the Strait in both years. In 2021, we found that WRSA and DUNL used habitat more evenly later in their staging period. In 2022, we found that WRSA used a greater diversity of habitats than both SAND and DUNL and used the habitat more evenly than DUNL. In 2021, we found evidence that WRSA used the region to fatten and then departed quickly. The other species were more flexible in their departure timing. The same result was not detected in 2022, but the region was hit by Hurricane Fiona in late September, which affected staging and fattening for birds present during the storm. Most shorebird species are declining, and this work will enhance our understanding of regional movements and habitat use by late season migrants, facilitating informed decisions on conservation priorities.

## **[107] Toulan, Carly<sup>1</sup>**

<sup>1</sup>Maryland Coastal Bays Program, Maryland, USA; [ctoulan@mdcoastalbays.org](mailto:ctoulan@mdcoastalbays.org)

### **Small island habitat loss drives Black Skimmer and Common Tern population declines in Maryland's Coastal Bays**

Aerial imagery collected in 1989, 2007, and 2019 was used to determine changes in available nesting island habitat in Maryland's Coastal Bays. Island shorelines were digitized to determine the total area and number of islands which was compared to population size of colonial nesting species Black Skimmers (*Rynchops niger*), Common Terns (*Sterna hirundo*), and Forster's Terns (*Sterna forsteri*). Between 1989 and 2019, there was a 54.7% decline in the area of islands that contained bare-sand nesting habitat for the birds. Island loss is attributed to sea level rise, extensive storms, development and shifting water currents. Population decline was greatest for Black Skimmers and Common Terns (99.4% and 81.96% respectively). Since Forster's Terns are not bare-sand dependent when selecting breeding colony sites, they experienced a lesser decline of 29.5%. These population declines are of great concern and habitat restoration practices such as island restoration and/or artificial island creation need to be pursued as management actions to maintain local waterbird breeding populations.

## **[108] Valentine, Kiara\*<sup>1</sup>, Katie Barnes<sup>2</sup>, Jonathan Lueck<sup>2</sup>, Jordon Mouton<sup>2</sup>, Jay Barras<sup>1</sup>, and Caz Taylor<sup>1</sup>**

<sup>1</sup>Tulane University, New Orleans, Louisiana, USA; <sup>2</sup>Audubon Delta, USA; [kvalentine1@tulane.edu](mailto:kvalentine1@tulane.edu)

### **What's happening to Beach-nesting Birds in southwest Louisiana? Novel Observations from the Field in 2023**

Long-term monitoring plays a major role in understanding population dynamics of ground-nesting birds, but research methods must adapt to changing conditions. In the 2023 breeding season, established protocols in southwestern Louisiana were used to monitor nest success and behavior of three beach-nesting species: least tern (*Sternula antillarum*), common nighthawk (*Chordeiles minor*), and Wilson's plover (*Charadrius wilsonia*). Here, we report on three novel occurrences observed during the season and their effects on monitoring protocols. First, we observed variation in egg development at three Wilson's plover nests where hatching of eggs within the same scrape occurred two or more days apart (usually hatch of the entire 2–3 egg clutch happens within the same day). In one of these nests, a large difference in body size between two hatchlings was observed. A potential cause may be the prolonged hot weather patterns and drought conditions experienced this year causing eggs to begin developing before incubation. Since frequent extreme heat events are likely to continue because of climate change, we recommend long-term monitoring and more research into the effects of extended hatching intervals. Second, we observed high night-time activity in Wilson's plovers with adults taking chicks into foraging areas at night. We are investigating whether this behavior is typical or is influenced by extreme weather regimes. We conducted preliminary nocturnal spotlighting surveys at one site to capture Wilson's Plover chicks for color banding and experienced high chick trapping rates. Lastly, black skimmers were observed nesting in relatively high numbers on the mainland, and at a site where the species has not been documented since the 1990's. However, since 2021, black skimmers have begun to sporadically nest on the mainland in southwest Louisiana, and often late in the season. We plan to continue monitoring this species to determine the factors influencing skimmer colony establishment.

**[109] Van Der Winden, Jan<sup>1</sup>, Camilla Dreef, and Yvonne Verkuil<sup>2</sup>**

<sup>1</sup>Jan Van Der Winden Ecology, Research & Consultancy; <sup>2</sup>University of Groningen, Groningen, Netherlands; [jvdwinden@hetnet.nl](mailto:jvdwinden@hetnet.nl)

### **Human-made archipelago “Marker Wadden” an example of a large scale novel freshwater wetland boosting bird populations**

Marker Wadden is a 1,300 ha artificial archipelago developed as novel freshwater ecosystem (Rewilding the planet, *Nature* April 2023). Unlike many other artificial wetlands it is created in the middle of a 700 km<sup>2</sup> inland freshwater lake Markermeer which has no natural dynamics anymore due to waterworks. After the embanking the lake turned from dynamic brackish water into fresh stagnant and turbid with declining bird diversity. This called for ecological mitigation. Of many mitigation projects, Marker Wadden is most eye-catching in size and design. The archipelago consists of basins of different sizes surrounded by sandy levees filled with silt from the Markermeer. The main goals are improving water clarity in Markermeer and at the same time it provides shallows, gullies and pioneer breeding habitat for birds, all influenced by wind tides. The reserve is promoted as bird paradise, with 12% accessible for ecotourism.

We studied colonization of bird species and communities. During the first five years (2017–2021) pioneer breeders soon represented significant portions of national breeding populations for nine species. Common Terns (*Sterna hirundo*) (> 1700 pairs) and some shorebirds were instantly numerous. Ducks and Black-headed Gulls (*Chroicocephalus ridibundus*) slowly colonized from year two onwards and in year five gulls became the most numerous breeding birds with 10,000 pairs. Staging birds like ducks (including 13,000 Eurasian Teal *Anas crecca*), shorebirds and Spoonbills (*Platalea leucorodia*) appeared in internationally important numbers. Herbivores and piscivores, e.g. ducks, geese, grebes and spoonbills, are still increasing. Birds with invertebrate diets, e.g. shorebirds and (dabbling) ducks, were initially numerous but decreased since year four.

We conclude that the archipelago has become a regional important site for breeding birds and an internationally important staging area for migrants. It adds mudflats, marsh vegetation and aquatic habitats with plants, fish and invertebrates to the open stagnant and turbid surrounding water. Artificial semi-dynamic habitats with expansions of mudflats and developed at a sufficiently large scale, clearly can mitigate the loss of natural pioneer habitat in freshwater ecosystems. We discuss the sustainability of such novel ecosystems.

**[110] Van Tatenhove, Aimee\*<sup>1</sup>, Erica Stuber<sup>1</sup>, and Clark Rushing<sup>2</sup>**

<sup>1</sup>Department of Wildland Resources, Quinney College of Natural Resources, Utah State University, Logan, Utah, USA; <sup>2</sup>University of Georgia, Athens, Georgia, USA; [aimee.van.tatenhove@usu.edu](mailto:aimee.van.tatenhove@usu.edu)

### **Modeling survival and connectivity of a migratory waterbird in a continuous-time framework**

American white pelicans (*Pelecanus erythrorhynchos*) are migratory colonial waterbirds that breed across the western and central United States, and winter in the southern United States and Mexico. Pelicans encounter markedly different anthropogenic impacts and environmental conditions across these regions and through time, from human development and pesticide use, to persistent drought and disease outbreaks. These heterogeneous conditions have likely produced the historical spatial and temporal variation in this species' population trajectories. Given these varied conditions, seasonal migratory connectivity between and within these regions has important implications for future population dynamics and survival. Even so, migratory connectivity, and therefore the impacts of spatially and temporally varied conditions on pelican populations, is poorly understood, and few attempts to quantify survival within and connectivity between these regions have been undertaken previously.

Here, we employ a novel continuous-time Bayesian multistate capture-recapture model on 60 years of band and wingtag recovery data from the North American Bird Banding Laboratory (BBL), to quantify movement and survival between summer and winter ranges. Continuous-time models offer greater computational efficiency than do discrete-time models, making it feasible to analyze large band recovery datasets within a Bayesian

framework. Additionally, capture-recapture data are typically modeled in discrete time, but band recoveries may occur at any point throughout the year, making continuous-time models more appropriate for these data types. We found that despite low migratory connectivity between summer and winter regions, annual survival varied regionally, likely due to spatial variation in environmental conditions and anthropogenic impacts. Our results offer important context for understanding historical pelican population dynamics, and may be used to inform current and future management strategies for American white pelicans across North America.

## [111] Verkuil, Yvonne<sup>1</sup>, Camilla Dreef, and Jan Van Der Winden<sup>2</sup>

<sup>1</sup>University of Groningen, Groningen, Netherlands; <sup>2</sup>Jan Van Der Winden Ecology, Research & Consultancy

### **The development of a breeding Pied Avocet population in a human-made freshwater archipelago: implications for management for pioneer birds**

Pied Avocets (*Recurvirostra avosetta*) are threatened birds in Europe as their pioneer breeding habitats are declining. Nowadays they mostly nest in saline environments, but historically they were found in freshwater inland ecosystems, which are currently rare. However, Marker Wadden, a recent, large-scale experimental wetland in the Netherlands (Rewilding the planet, *Nature*, [April 2023](#)) shows potential for this species. It is now among the larger areas in Western Europe providing inland freshwater pioneer habitats for breeding birds.

Marker Wadden is a human-made archipelago in the freshwater lake Markermeer which construction was started in 2016 and by 2023 covered 1,300 ha. A goal was to develop a freshwater wetland with wind tide, which functions would integrate ecosystem restoration, innovative engineering, and freshwater resource management). Ecological targets were not a priori defined, although an abundance of birds ("a bird paradise") was expected.

Immediately after the first levees were built, pioneer species such as Pied Avocets colonized this artificial ecosystem. By 2018 as many as 750 pairs of Pied Avocets raised on average 1.7–2 chicks. However, the main ecological issue is that the pioneer phase may be short-lived because floods are limited by the embankments and water level management of the larger lake, and the frequency of extreme events that reset habitats may be insufficient. The precocial chicks of Pied Avocets depend on open shallows and flats within the archipelago, and vegetation succession would therefore primarily affect the avocet breeding population.

In this talk we report on the development of the local breeding population of Pied Avocets between 2018 and 2023 in a national and flyway context, and zoom in on breeding success, distribution of adults and chicks over the archipelago, and feeding and vigilant behavior. We discuss the potential effects of successional changes, such as vegetation development,

water coverage and expansion of the bird community, and what we have learned about possible avenues for management for Pied Avocets.

## [112] White, Jeff\*<sup>1</sup>

<sup>1</sup>University of Miami, Coral Gables, Florida, USA; [jeff.white@bio.miami.edu](mailto:jeff.white@bio.miami.edu)

### **Isotopic niche of fjord breeding Fiordland penguins/tawaki**

Fiordland penguins (tawaki; *Eudyptes pachyrhynchus*) depend on reliable resource availability near their breeding colonies along the coast of southwestern New Zealand. GPS tracking has shown that tawaki exhibit a high degree of plasticity in their foraging behavior and range depending on the location of their colony. Our previous work has indicated that tawaki breeding at Harrison Cove, Milford Sound foraged almost exclusively within the fjord and exhibited higher whole blood carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotopes than those outside of the fjord. Here we build on these results and focus on two fjord complexes (Milford Sound and Doubtful Sound) to assess whether this pattern holds true across other fjord colonies. We analyzed  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values in red blood cells and plasma collected from tawaki (n=79) at 5 colonies during the 2021 and 2022 breeding seasons. Red blood cells and plasma collected during the chick guard stage allow an assessment of the diet consumed during the incubation and chick rearing periods, respectively. Our results show little variation in red blood cell  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values between fjords and among colonies. Plasma  $\delta^{13}\text{C}$  values were similar to red blood cells, but  $\delta^{15}\text{N}$  values were generally higher suggesting that diet composition may shift as the breeding season progresses. Overall, our data suggest that although tawaki exhibit different foraging behaviors depending on the colony's location, their trophic niche is similar across colonies. Unlike many penguin species, tawaki populations overall have increased in recent years, potentially due in part to more reliable foraging conditions during the recent La Niña period. However, colonies in the southern fjord complexes appear to be declining. Our future work will expand to assessing the foraging ecology of these southern fjord populations to identify potential factors contributing to their decline.

## [113] Willmott, Julia Robinson<sup>1</sup>

<sup>1</sup>Normandeau Associates, Inc, Gainesville, Florida, USA; [jwillmott@normandeau.com](mailto:jwillmott@normandeau.com)

### **New insights into the influence of turbines on the behavior of migrant birds: implications for predicting impacts of offshore wind developments on wildlife**

During both construction and operation, offshore wind developments may impact bird populations directly through mortality from collisions and indirectly through displacement,

which affects population fitness. Broadly, such birds include diurnal and nocturnal migrants moving to overwintering or breeding sites, and resident seabirds. Migrant shorebird and songbird species are of particular interest because they are small and often nocturnal, and little is known of their movements. Bird collisions with offshore wind turbines appear to be rare (Pettersson 2005; Desholm 2006; Skov et al. 2018), but relevant studies are very limited due to logistical difficulties, and, in particular, very little is known about collision impacts on small bird species. Here, we describe how multi-sensor systems deployed off the eastern coast of the USA have provided new data and insights into the effects of turbines on birds in the offshore environment and discuss implications for the wind industry.

More than 1000 bird individuals comprising at least 34 species, mainly shorebirds, gulls and at least 18 species of passerines, and more than 7000 insect events, were recorded by the two ATOM systems. A rich diversity of behaviors was observed among birds, including:

- Attraction of birds to turbines
- Micro-avoidance of moving turbine blades
- Sallying flights from perches on the turbines to hunt for flying insects
- Aerial foraging, with continuous flight to capture flying insects
- Gleaning insects from the turbine monopole
- Three raptor species were observed, including two that used the turbine structure as a perch for foraging sallies
- Resting on the turbine structure
- Patrolling within the vicinity of the turbine, below, within and above the RSZ
- Gliding on thermals

So far, after three seasons of observations, no collisions have been observed. Our observations largely result from the unexpected attraction of insects to the turbines, creating favorable conditions for foraging by insectivorous birds, which in turn provide a food source for predators. Additional study is needed to determine the primary causes of insect attraction. This technology complements insights into seabird movements at macro and meso scales collected by radar-based technologies.

**[114] Wong, Sarah<sup>1</sup>, Michelle Saunders<sup>2</sup>, and Carla Pamak<sup>2</sup>**

<sup>1</sup>Environment and Climate Change Canada, Canada; <sup>2</sup>Nunatsiavut Government, Newfoundland and Labrador, Canada; [sarah.wong2@ec.gc.ca](mailto:sarah.wong2@ec.gc.ca)

### **The Nunatsiavut Seabird Tracking Program: Understanding the year-round movements of seabirds breeding in Nunatsiavut waters.**

The waters of Nunatsiavut, NL support large numbers of breeding seabirds and provide an important food resource for Inuit beneficiaries. Eggs of gulls, Common Eiders and pigeons (Black Guillemot) are harvested at their colonies and pigeons and ducks are harvested in



the fall. Many of these migratory marine bird species overwinter great distances from where they breed and face increased pressures from anthropogenic activities and climate change. To better understand the potential risks these birds face outside of Nunatsiavut waters, the Nunatsiavut Government and the Canadian Wildlife Service initiated the Nunatsiavut Seabird Tracking Program. The goal of the program is to examine year-round movements of seabirds breeding in Nunatsiavut and collect additional information to better understand their foraging ecology and potential relationships to food safety while providing the opportunity for shared learning. The team, composed of federal and Nunatsiavut Government employees, work together to develop projects that address shared interests, identify appropriate colonies, develop capture techniques and learn banding, sampling and tagging techniques. Since 2021, the team has deployed geolocator (GLS) tags on pigeons from two communities, solar-powered GPS-PTT tags on gulls (Herring, Great-black Backed, Glaucous) and GLS tags on Thick-billed Murres, with plans to deploy tags on Common Eiders in the near future. Tracking results to date reveal the fine-scale post-breeding movements of three species of gulls tagged off Nain, and the discovery that pigeons breeding at colonies offshore of Nain overwinter in the Gulf of St. Lawrence. These results highlight the need to consider how industrial development in offshore waters much farther south of Nunatsiavut may impact the health of marine bird populations upon which beneficiaries rely.

**[115] Wilhelm, Sabina<sup>1</sup>, Christopher Ward<sup>1</sup>, and Madeline Sceviour<sup>1</sup>,  
presented by Sarah Wong**

<sup>1</sup>Environment and Climate Change Canada, Canada; [sabina.wilhelm@ec.gc.ca](mailto:sabina.wilhelm@ec.gc.ca)

### **Year 1 after the 2022 Highly Pathogenic Avian Influenza (HPAI) outbreak in eastern Canada: Assessing population impacts on seabirds breeding in Atlantic Canada**

The Highly Pathogenic Avian Influenza (HPAI) virus H5N1 is causing unprecedented mortality of wild birds around the world. In eastern Canada, during the summer of 2022, it was minimally estimated that over 37,000 wild birds were reported sick or dead, attributed to HPAI. Most mortalities were observed in seabirds, with the highest numbers reported in Northern Gannet and Common Murre, and lower mortality levels in large gulls (Herring, Great Black-backed, and Ring-billed Gulls), Double-crested Cormorant, Atlantic Puffin, and Black-legged Kittiwake. Monitoring the breeding colonies of impacted species in 2023 was deemed a priority to detect any evidence of continued mortality associated with HPAI and evaluate population changes to understand impacts of the 2022 outbreak. We present the results of 2023 population surveys in Atlantic Canada and associated population trends for all three Newfoundland Northern Gannet colonies (Cape St. Mary's, Funk, and Baccalieu Islands), three regionally important Common Murre colonies in Newfoundland (Funk, Gull, and Cabot Islands), a regionally significant Herring Gull and Black-legged Kittiwake colony in insular Newfoundland (Gull Island), all large gull and Double-crested Cormorant colonies in New Brunswick bordering the Gulf of St. Lawrence,

and the region's second largest Atlantic Puffin colony in insular Newfoundland (Gull Island). Remarkably, there was no evidence of HPAI persisting in colonies in 2023 where mortality was observed in 2022. However, preliminary results suggest that the 2022 outbreak did have colony-level impacts on Northern Gannets and Black-legged Kittiwakes breeding in eastern Newfoundland, and Double-crested Cormorants, Herring, and Great Black-backed Gulls breeding in New Brunswick. While thousands of Common Murres were observed dead or morbid during the 2022 outbreak, including at all three colonies surveyed in 2023, colony-level impacts one year after the outbreak have yet to be detected, likely due to the overall large breeding population. Similarly, the Atlantic Puffin population on Gull Island was not affected by HPAI, also likely due to the overall large breeding population. These results will be presented in the context of other current threats affecting seabirds breeding in Atlantic Canada, including oil pollution and climate change.

**[116] Zavalaga, Carlos<sup>1</sup>, Diego Gonzales-DelCarpio<sup>1</sup>, Cinthia Irigoín-Lovera<sup>1</sup>, Sebastián Lozano-Sanllehi<sup>1</sup>, Cristina Burga-Dominguez<sup>2</sup>, Lucero Chávez-Casanova<sup>1</sup>, Jessica Oliden-García<sup>2</sup>, Ricardo Espinoza-Huaroto<sup>2</sup>, and Fernando Mejía-Vargas<sup>2</sup>**

<sup>1</sup>Universidad Científica del Sur, Lima, Peru; <sup>2</sup>Sub-unidad de Extracción y Comercialización de Abono. Agrorural; [czavalaga@cientifica.edu.pe](mailto:czavalaga@cientifica.edu.pe)

### **Unprecedented mortality of Peruvian pelicans (*Pelecanus thagus*) during the 2022-2023 H5N1 influenza virus outbreak in Peru**

On 14 November 2022, the first confirmed case of the highly pathogenic avian influenza A(H5N1) virus was detected in northern Peru from dead wild Peruvian pelicans (*Pelecanus thagus*). Daily ground counts of carcasses were undertaken by rangers from November 2022 to March 2023 in 30 islands and headlands along the Peruvian coast within a Marine Protected Area (RNSIIPG). Mortality rapidly escalated in the RNSIIPG with a total of 10,404 dead pelicans counted between 3 November 2022 and 28 February 2023. Almost 95% of the impacted pelicans died in a three-week period (Nov-Dec 2022). A latitudinal analysis of dead pelican cases over time revealed that the disease spread from north to south. Ground counts of dead pelicans on beaches and other marine reserves in Peru obtained from governmental official sources (<https://www.dge.gob.pe/influenza-aviar-ah5>) indicated an extra 29,390 pelican carcasses in the same period. Thus, based on the maximum annual number of pelicans present before the H5N1 outbreak (N = 125,794 birds in August 2022), a minimum mortality rate of 32% is estimated. However, simultaneous aerial drone and ranger ground counts on two islands revealed that in the RNSIIPG ground counts may underestimate reported numbers by a factor from 1.3 to 3.6. This scenario, coupled to a recent strong El Niño, places Peruvian pelicans in a critical condition.

[117] Zhang, Ke\*<sup>1</sup>, Christopher Gulick<sup>1</sup>, Zoe White<sup>1</sup>, Kristen Wilson<sup>1</sup>, Samantha Wisely<sup>1</sup>, and Abby Powell<sup>1</sup>

<sup>1</sup>University of Florida, Gainesville, Florida, USA; [kezhang1122@ufl.edu](mailto:kezhang1122@ufl.edu)

### **Infection Rates of Avian Malaria in White Ibis and Tricolored Herons in the Southeastern US**

Avian Malaria (*Plasmodium*) and related pathogens (*Haemoproteus* and *Leucocytozoon*) are transmitted through blood-feeding vectors and are commonly found in birds, negatively impacting their health. Limited research has focused on haemosporidian infection in wading birds, which can travel long distances during their life cycles, exposing them to various vectors and potential multiple pathogen lineages. We assessed haemosporidian prevalence in two species, white ibis (*Eudocimus albus*,  $n = 97$ ) and tricolored herons (*Egretta tricolor*,  $n = 68$ ) captured at breeding colonies in coastal Alabama, USA, between 2020 and 2022. Using nested PCR, we amplified the cytochrome-b gene in *Plasmodium*, *Haemoproteus*, and *Leucocytozoon* genera. Subsequently, the PCR products were sequenced and compared to known lineages. We also deployed Argos transmitters on 50 individuals from each species to track their movements over their annual cycles. Our results showed infection in 41% of white ibis and 15% of tricolored herons. Prevalence was higher in adult & sub-adult ibis (62%,  $n = 34$ ) compared to their young (30%,  $n = 63$ ), implying both breeding and post-breeding sites as infection sources. However, this pattern was reversed in tricolored herons (juvenile: 18%,  $n = 45$ ; adult and sub-adult ibis: 9%,  $n = 23$ ). The pathogens identified in single infections displayed genetic similarity to reported lineages in Florida, USA, and São Paulo, Brazil, but our tracked birds did not visit the sites where these lineages were reported. We also observed 17 instances of potential multi-infections in both species. Future directions include exploring the genetic distinctions in our sequencing data versus previously reported lineages to potentially identify new lineages. Additionally, we plan to integrate migration data, pathogen prevalence, and vector distribution to investigate haemosporidian transmission patterns in these two species.

## Poster Abstracts

**Alphabetical by presenter (bolded names and emails in blue). Asterisks represent students participating in the presentation award competition.**

**[1] Barreat, Luis\*<sup>1</sup>** and Kevin McCracken<sup>1</sup>

<sup>1</sup>University of Miami, Coral Gables, Florida, USA; [luisanbarreat@gmail.com](mailto:luisanbarreat@gmail.com)

### **Molecular adaptation to hypoxia: the convergent evolution of myoglobin in tetrapods**

Following Krogh's principle, Kendrew set Sperm whale's Myoglobin (Mb) as one of the main models in molecular biology, exploiting its availability and conveniently high muscle concentration. The latter handy adaptation to hypoxia, which is highly correlated with the protein's net charge, has been described in diving birds (Anatidae, Alcidae, Gaviidae, Phalacrocoracidae, and Spheniscidae) and mammals, where Penguins exhibit the greatest of all.

After mining the NCBI's WGS database and gathering the myoglobin locus of 1786 tetrapod species, we modeled this trait *in silico* and reconstructed its evolution through Bayesian and Maximum Likelihood methods. Testing for convergent amino acid shifts and evolutionary rate changes associated with hypoxia resistance.

Clearly, an evolutionary pattern emerged: the independent accumulation of specific amino acids in specific Mb regions. That could possibly be involved in high muscular concentration, high oxygen affinity, potential novel metabolic functions, and could even question our basic 1:1 oxygen to Mb ratio assumption.

For instance, the remarkable emergence of Cys residues in birds (Penguins, Loons, Leaf Warblers, Rheas), mammals (Dugong and Manatees, Hippos, fossorial and semi-aquatic Eulipotyphla, hibernating Rodents), Turtles, Snakes (Sea Kraits), and Caecilians. Cys residues increase Mb's net charge and could possibly modulate its oxygen affinity through S-Nitrosation or regulate NO homeostasis.

As a final note on Krogh's principle, if Kendrew had used the Chinstrap Penguin's Mb instead of the Sperm Whale's Mb, with its three Cys residues, he would have easily solved the X-ray crystallographic phase problem attaching mercury atoms to its structure, thus avoiding years of frustration.

## [2] Fallsworth, Laura<sup>1</sup>, Drew Bender\*<sup>1</sup>, and Christy Carello<sup>1</sup>

<sup>1</sup>Department of Biology, The Metropolitan State University of Denver, Denver, Colorado, USA; [dbender6@msudenver.edu](mailto:dbender6@msudenver.edu)

### **Northern Shoveler site fidelity for winter large group feeding and the associated waterbird community in the Denver Metropolitan area**

Northern Shovelers (*Spatula clypeata*, hereon: Shoveler) are a dabbling duck found throughout the Northern Hemisphere. These ducks have been observed performing a type of group aggregate feeding behavior in the winter where large numbers of ducks move in a circular pattern to concentrate food. Our objectives were to determine if Shovelers show site fidelity for winter group feeding in the Denver Metro Area and if there is an association with Shoveler feeding and other waterbirds. We hypothesize that Shovelers will consistently feed in large groups at preferred sites throughout the winter and that we will find greater species diversity of other waterbirds at these preferred habitats. We collected bird count data for 65 waterbodies in the Denver Metro Area twice monthly from October 2022 through April 2023. We compared Shoveler preferred and non-preferred feeding habitat for waterbird abundance, species richness and species diversity (Simpson's Diversity Index). Statistical significance was determined using an unpaired Student's t-test. Of the 65 waterbodies, 17% had consistent Shoveler group feeding. Overall, we found statistically higher abundance ( $\bar{x}= 427.95\pm 678.99$ ,  $t=4.40$ ,  $p< 0.01$ ,  $df=128$ ), species richness ( $\bar{x}= 5.04\pm 3.50$ ,  $t= 3.98$ ,  $p< 0.01$ ,  $df= 132$ ), and diversity ( $\bar{x}= 0.41\pm 0.26$ ,  $t= 2.29$ ,  $p= 0.02$ ,  $df= 127$ ) of avian species at preferred waterbodies compared to non-preferred waterbodies (respectively:  $\bar{x}=72.51\pm 227.73$ ,  $\bar{x}=2.46\pm 2.72$ ,  $\bar{x}=0.25\pm 0.31$ ). Furthermore, we noted in our observations that diving ducks (81.25%) interacted more with Shoveler feeding groups than dabbling ducks (18.75%). The diving duck association with Shoveler feeding circles possibly suggests that large feeding circles may create a vortex under the water giving Shovelers access to the same resources as diving ducks. Shoveler preferred feeding habitat is indicative of important habitat for other waterbirds and understanding this preference will help guide future management decisions in a changing landscape.

## [3] Byrd, Lizi\*<sup>1</sup> and Douglas Casey<sup>1</sup>

<sup>1</sup>University of Alaska Anchorage, Anchorage, Alaska, USA; [hebyrd@alaska.edu](mailto:hebyrd@alaska.edu)

### **Avian Mortality Event in the Far Western Aleutian Islands**

In July – August, 2023, a comprehensive survey of land and waterbirds was undertaken in the Near Islands (Agattu I, Attu I, Alaid-Nizki I, Shemya I) located in the far Western Aleutian Islands archipelago. In conjunction with population assessments of coastal breeding birds made by staff and volunteers of the Alaska Maritime NWR, we surveyed and collected target species as part of ongoing studies on their population genomics and disease ecology. We detected on land and coastal kelp beds dead and dying individuals of

five of the breeding species (Common Murres *Uria aalge*, Glaucous-winged Gulls *Larus glaucescens*, Black-legged Kittiwakes *Rissa tridactyla*, Pigeon Guillemots *Cephus colomba*, Tufted Puffins *Fratercula cirrhata*). Symptoms of moribund individuals include difficulty in breathing and uncoordinated muscular movements. Other breeding species observed (Pelagic and Red-faced cormorants *Uria pelagicus*, *U urile*, Aleutian Tern *Onychoprion aleuticus*, Marbled and Kittlitz's Murrelet *Brachyramphus marmoratus*, *B. brevirostris*, Whiskered Auklet *Aethia pygmaea*, Horned Puffin *F. corniculatus*, Northern Fulmar (*Fulmarus rodgersi*) appeared unaffected, as were many individuals of the affected species. Preliminary investigation of affected and unaffected individuals indicate that the cause of mortality is likely the algal biotoxin saxitocin. The observations that not all species nor individuals were affected suggest that this was a minor HABs event, that it was the start of an algal bloom likely to increase, or that some individuals may have different tolerance levels of saxitocin exposure. We present the initial results of tests for algal toxins, HPAI, and other known avian pathogens known to affect Beringian and North Pacific seabirds.

**[4] Chaussadas, Doreen<sup>1</sup>, Sonia Hernandez<sup>1</sup>, and Jeffrey Hepinstall-Cymerman<sup>1</sup>**

<sup>1</sup>University of Georgia, Athens, Georgia, USA; [djc76509@uga.edu](mailto:djc76509@uga.edu)

### **Feeding innovation and urbanization in American White Ibises (*Eudocimus albus*)**

Urban environments are unpredictable and rapidly changing. Thus, urban wildlife is often assumed to show high neophilia and innovativeness. Indeed, urban dwellers must be able to recognize new resources and learn how to exploit them best. Yet, few studies exist on the topic, and tend to focus on a limited array of animal species, none on wading birds. We propose to use the recently urbanized American White Ibis (*Eudocimus albus*) as new model for behavioral adaptation to urban spaces. Indeed, ibises have colonized urban parks in South Florida in the 1960s, where their behavior shows stark differences with their natural counterparts, suggesting an ability for behavioral flexibility. For instance, our data shows that flocks of urban ibises rapidly start consuming a new food item (pellets) when exposed to it, even when having access to their usual anthropogenic food (bread) and natural preys (shrimps). Particularly in bigger flocks, which matches responses to novelty in other urban bird species. Hence, it appears that urban American White Ibises show high neophilia, a precursor to innovativeness. Thus, in order to investigate the role of innovativeness in urban ibises' success, we want to i) measure innovation in American White Ibises and ii) test if urban flocks show higher innovation rates than non-urban flocks. To do so, we designed a multi-solutions automated puzzle feeder, that we will expose to urban and non-urban ibises. These feeders reward individuals each time any of the four possible solutions is found. Doing so, we will be able to compare the performances of urban and non-urban flocks, but also test how the species responds to an entirely novel problem. We expect that while urban ibises will find more solutions - and faster - , natural ibises will

too be able to solve the puzzle. Although similar experiments were conducted in other bird species, to our knowledge, this is the first time it is conducted on a wading bird and applied to the topic of urbanization. We hope that this study will shed light on the cognitive abilities of wading birds but also help advance our understanding of avian urbanization.

## [5] Cook, Kara<sup>1</sup>

<sup>1</sup>Audubon Florida, Gibsonton, Florida, USA; [kara.cook@audubon.org](mailto:kara.cook@audubon.org)

### **Monitoring and conservation tools to increase success of tar-and-gravel rooftop nesting American Oystercatchers (*Haematopus palliatus*) in Tampa Bay, Florida**

American Oystercatchers (*Haematopus palliatus*) have been documented nesting on rooftops in Florida since 1988. Coastal development and human activities cause disturbance and reduce traditional beach nesting habitat. As a result, American Oystercatchers take advantage of the similar beach substrate on tar-and-gravel roofs. In 2021, 13 breeding pairs of American Oystercatchers nested on rooftops, representing 20% of the breeding population in Southwest Florida. Rooftop-nesting oystercatchers experience similar nesting threats as beach-nesting oystercatchers, including avian and mammalian predators, human disturbance, chicks falling off the roof, flooding on roofs, and high temperatures. Rooftop nesters were monitored by local volunteers for several years before Audubon Florida rooftop biologists began monitoring efforts in 2017. Rooftop biologists have since developed strategies to increase nesting success by implementing chick-shelters, fencing roofs to prevent chick falls, using cameras for monitoring, and concentrated monitoring by staff and volunteers.

## [6] Caldwell, Aliya<sup>1</sup>, Nathan Furey<sup>1</sup>, and Elizabeth Craig<sup>2</sup>

<sup>1</sup>University of New Hampshire, Durham, New Hampshire, USA; <sup>2</sup>University of New Hampshire, Shoals Marine Lab, Kittery Point, Maine, USA; [elizabeth.craig@unh.edu](mailto:elizabeth.craig@unh.edu)

### **Satellite telemetry reveals high-resolution Common Tern (*Sterna hirundo*) migration and overwintering tracks**

In recent years, improvements to wildlife tracking technology have made the fine-scale tracking of small seabirds possible. Such movement data can be used to investigate questions around space use, energy expenditure, and population dynamics among other topics. In the summer of 2022, we deployed solar-powered archival GPS tags (Pathtrack LTD NanoFix GEO +RF) on 10 adult Common Terns (*Sterna hirundo*) nesting on White and Seavey Islands, New Hampshire, USA as part of an ongoing project exploring breeding season space use and foraging movement dynamics. Tags were deployed using leg-loop harnesses, which typically remain affixed to the bird throughout the breeding season and fall off as a result of weight loss during Southward migration. Tags were programmed to

collect fixes at 20-minute intervals during April-September, and twice-daily fixes during October-March. GPS fix data were downloaded via UHF link when tagged birds were within range of a base station located on the breeding colony. In the Spring of 2023, one individual returned to the colony with its tag retained and functional, providing a full track of its movements during both migrations and overwintering. The data revealed that this bird departed for its Southward migration in mid-August, staged on Cape Cod, Massachusetts, USA and then flew across the Western Atlantic to the Northern coast of Venezuela. It then travelled Eastward along the coast of South America to arrive in mid-September at its overwintering location, Marajó Bay, Brazil, at the base of the Amazon River. The bird departed for its Northward migration in mid-May of 2023, resting briefly on the coast of North Carolina, USA before arriving at the breeding colony by the end of May. The bird's Southward migration spanned ~23 days while its Northward migration spanned ~18 days. These data provide unprecedented details describing Common Tern migratory movements, migration timing, and overwintering habits. Full exploration of the migratory habits of Common Terns breeding in the Northeastern USA will be best achieved by combining data from deployment of GPS tags designed for year-round retention with well-established banding and radio telemetry data.

**[7] Custer, Christine<sup>1</sup>, Paul Drummer<sup>1</sup>, and Natalie Karouna-Reneir<sup>1</sup>**

<sup>1</sup>U.S. Geological Survey, USA; [ccuster@usgs.gov](mailto:ccuster@usgs.gov)

### **Can we fingerprint PFAS sources using avian tissue concentrations?**

Per- and polyfluoroalkyl substances (PFAS) were first developed in the 1930s and have been used in industrial applications, consumer products, and as fire-fighting foams ever since. There are thousands of different PFAS depending on their intended use, and most differ in their toxicity and potential for risk to fish and wildlife. Because this class of chemicals has been used in so many products and applications it is ubiquitous in avian tissues worldwide. Because PFAS were found to be effective as a firefighting tool, production of aqueous film-forming fire-fighting foams (AFFF) ramped up in the 1960s after a deadly fire on an aircraft carrier. This point source has garnered much attention, but because it is not the only significant source, methods need to be developed to apportion sources more easily. The concentration (ng/g), and portion that perfluorohexane sulfonate (PFHxS) is of total PFAS in tree swallow (*Tachycineta bicolor*) tissues, can be used in this context. Non-AFFF sources tend to have fewer samples with detectable PFHxS and if present than it is at a much lower concentrations than sites with AFFF sources. Non-AFFF sites also tend to have a larger number of different PFAS present in tissues. Data on these two metrics will be presented from sites with different PFAS sources.



## [8] Guitart, Sarah<sup>1</sup> and Michelle Staudinger<sup>1</sup>

<sup>1</sup>University of Massachusetts Amherst, Amherst, Massachusetts, USA; [sguitart@umass.edu](mailto:sguitart@umass.edu)

### **A novel trail camera diet monitoring protocol and its capacity to reflect Common and Roseate Tern chick provisioning**

Consistent diet monitoring of seabird colonies is needed to understand shifts in prey availability and the resultant impact on populations. However, the current methodology of in-person monitoring by field technicians is resource-burdensome for managers, leaving many populations with intermittent diet data depending on island staff capacity. To address this data gap and assist colony managers, we developed a trail camera-based provisioning monitoring methodology in Buzzards Bay, Massachusetts, a region that supports a significant percentage of the Federally Endangered Roseate Tern (*Sterna dougallii*) population and Common Tern (*Sterna hirundo*) colonies. Trail cameras were mounted on both Common and Roseate Tern productivity plots on Bird and Ram Island at the beginning of the 2023 chick-rearing period. Plot selection was based on visual obstructions, disturbance levels, and the total number of nests. Common Tern camera plots were designed to cover as much ground as possible, create multiple viewing angles, and reduce blind spots. Roseate Tern camera plots focused on adult landing areas next to artificial nest structures. To compare the effectiveness of the trail camera plots, in-person and video-based monitoring stints (n = 24) were conducted on one camera plot per species throughout the chick-rearing period as well. Performance metrics of each monitoring method (visual in-person, trail camera, and video) were analyzed. Overall, the standard in-person monitoring methodology out-competed the two technology-based monitoring methods. However, trail cameras and continuous video recording performed well and had unique advantages. This research not only informs seabird colony managers of the capabilities of trail cameras as proxies for in-person observations, but also provides a protocol detailing successes and failures for future usage as a management tool.

## [9] Gwiazda, Robert<sup>1</sup>

<sup>1</sup>Institute of Nature Conservation, Polish Academy of Sciences, Kraków, Poland; [gwiazda@iop.krakow.pl](mailto:gwiazda@iop.krakow.pl)

### **Do fish size and fish density affect number of nests and fledglings of piscivorous and benthivorous grebes in carp ponds?**

Fish may significantly affect habitat use by birds, either as their prey or as competitors. Ponds reared by different common carp (*Cyprinus carpio*) cohorts can offer different food resources for piscivorous (Great Crested Grebe *Podiceps cristatus*) and benthivorous (Eared Grebe *Podiceps nigricollis*) grebes. One-year-old and 2-years old common carp can be food for Great Crested Grebe and 2- or 3-years-old common carp are competitors for Eared Grebe reducing food for them by foraging on bottom invertebrates. Carp ponds may be ecological traps for grebes where reproduction can be poor. The study was carried out on

30 fishponds in southern Poland with extensive fish production whose areas vary from 5 to 79 ha. The number of nests and number of fledglings independent of parents of Great Crested Grebe and Eared Grebe were counted on ponds during the breeding season. The following factors were collected for all ponds with nests of the studied grebes: pond surface, degree of coverage by plants with floating leaves, age of stocked common carp, mean biomass of fish and fish density. Data of fish in each pond was obtained from fishfarmers. A generalized linear model was used to estimate the importance of the studied factors on the number of nests and fledglings in piscivorous and bentivorous grebes. Important factors for nesting of the piscivorous grebe were age of carp and fish density in pond. Number of nests and fledglings decreased with the age of carp and increased with fish density. Parameters of fish (age of carp, fish density and mean biomass) turned out to be insignificant for bentivorous grebe. The pond size was important factors for number of nests and for number of fledglings of this species. Moreover vegetation cover was significant factor for number of nests in this species. This factor can be important for safety eggs and chicks. Results showed that piscivorous grebe, but not bentivorous grebe, choose breeding habitat taking into account the fish size and density.

## **[10] Hall, Katie\*<sup>1</sup> and John Anderson<sup>1</sup>**

<sup>1</sup>College of the Atlantic, Bar Harbor, Maine, USA; [khall25@coa.edu](mailto:khall25@coa.edu)

### **How to share a rock with a gull: Determining the impact of researchers on the Herring gull fledging success on Mount Desert Rock**

Mount Desert Rock is a 1-hectare island located 40 km south of the Maine coastline. The island is home to the Edward McC. Blair Marine Research Station, which houses 7 to 16 students and researchers from June until September each year. Of necessity, the station staff live in close proximity to the island's Herring gull (*Larus argentatus*) colony which currently consists of 253 nests. For the past three field seasons, researchers perform a 'chick check' in which chicks from select herring gull nests are weighed and monitored for mortality every day, weather permitting. To assess the impact of researcher's activities on nesting gull recruitment and survival, nests across the island were classified as falling into different disturbance regimes: (1) active disturbance ('chick check'; chicks handled once a day); (2) passive disturbance (researchers are in constant close proximity of the nests – within a few meters), and (3) low disturbance (nests are flushed by humans five times a month or less). The fledging success of all three groups was measured by observing nest mortality from either the station's boardwalk or the lighthouse. No statistical difference in fledging success was found between the groups; the fledging success across the colony is 1.235 (S.E.=0.0659; n=115). The implications of these results on future gull research are discussed.

## [11] Hill, Molly\*<sup>1</sup> and Liam Taylor<sup>1</sup>

<sup>1</sup>Ecology and Evolutionary Biology Department, Yale University, New Haven, Connecticut, USA; [molly.hill@yale.edu](mailto:molly.hill@yale.edu)

### **Evolutionary history of delayed plumage maturation in waterbirds**

Many lineages of waterbirds pass through a series of predefinitive plumages before exhibiting the definitive plumage of breeding adults. Yet few studies have investigated the evolutionary histories or ecological functions of delayed plumage maturation in these lineages. Here, we analyze the evolution of delayed plumage maturation across phylogenies of sea, shore, and waterbirds (including orders Gruiformes, Charadriiformes, Phaethontiformes, Gaviiformes, Sphenisciformes, Procellariiformes, Ciconiiformes, Suliformes, and Pelecaniformes). Using literature reports, we compile a dataset of plumage maturation and molt as well as developmental milestones such as age at first colony return and age at first reproduction. By using discrete phylogenetic models and ancestral state estimations, we ask how the evolution of delayed plumage maturation is associated with reproductive milestones in both colonial and non-colonial lineages. Our study uncovers multiple origins of delayed plumage maturation in waterbirds and a unique association between plumage development and colonial behavior in seabirds. Our dataset also highlights important gaps in waterbird research, including limited data on molt and colony behaviors in small populations and geographically isolated species.

## [12] Jackson, Will\*<sup>1,2</sup>, Kyla Ebersol<sup>1</sup>, Jennifer Arnold<sup>1,2</sup>, and Stephen Oswald<sup>1,2</sup>

<sup>1</sup>Division of Science, The Pennsylvania State University, Reading, Pennsylvania, USA; <sup>2</sup>Department of Natural Resources and the Environment, Cornell University, Ithaca, New York, USA; [wej5045@psu.edu](mailto:wej5045@psu.edu)

### **Understanding tern talk: Characterization and context of Common Tern calls at breeding colonies**

Understanding patterns in waterbird vocalizations can give clues to behaviors that have relevance for management-based research. Common Terns (*Sterna hirundo*) are colonial breeders that utilize a range of vocalizations (hereafter "calls") for social interaction at breeding colonies. In June and July 2023, we studied calls used by adult Common Terns breeding at three colonies in inland North America (Little Island and Willard Island, Oneida Lake, NY, and Gull Island, Presqu'ile Provincial Park, ON). We examined the frequency of calls in the field and in audio recordings made at the colonies. We observed behaviors in the field associated with each call to better understand call function and context. We also explored variation in call frequency between call types and across the daily cycle. We focused on five frequently heard calls: Kip, Advertising, Alarm, Attack and Fear, that were readily associated with specific behaviors, although there was much interindividual variation in calls and call use. Alarm and Attack were used in very specific social situations, whereas Kip and Advertising were used more broadly. There was generally good agreement

between in-field observations of call frequencies and those recorded simultaneously with audio recorders, although observers were able to detect more calls in audio recordings when listened to in a quiet environment than during observations in the field. Audio recorders thus offer a potential approach to log behaviors without necessitating extensive, on-colony observations. We also report our initial findings on variation in call frequencies throughout the daily cycle. Our results highlight how recording and observing vocalizations can lead to insights at breeding colonies.

### **[13] Johnson, Emily<sup>1</sup>, Alexander Blochel<sup>1</sup>, and Jerry Lorenz<sup>1</sup>**

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#### **An exploration of Roseate Spoonbill movement in Florida using cellular transmitters**

Roseate Spoonbill (*Platalea ajaja*) movement has been surmised from band re-sighting studies, but there is still little known about spoonbill dispersal, pre-nuptial wanderings, and broader habitat utilizations for Florida populations. Our study aims to better understand Roseate Spoonbill movement in Florida through the utilization of cellular transmitters, nest tracking, and continuous time stochastic modeling (Brownian Bridge). We have specifically targeted the most numerous population in Florida, the breeding population of Florida Bay. Adults are trapped either on nests or foraging grounds and fitted with cellular transmitters. Results show individuals have the ability to travel as far north at the Florida-Georgia border when not breeding. Preliminary analyses using program nestR and Brownian bridge modeling show great potential in better understanding Roseate Spoonbill movements within Florida Bay and beyond.

### **[14] Johnston, Haley\*<sup>1</sup> and Kevin McCracken<sup>1</sup>**

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#### **Diving at high altitude: O<sub>2</sub> transport in the Andean Rudy Duck sparks questions across fields of physiology, medicine, and behavioral ecology**

The Andean ruddy duck is the sole diving Anseriform on Lake Titicaca (3,812 meters). High altitude, cold air, and breath-hold diving create a unique set of physiological pressures influencing phenotype. The purpose of this report is to synthesize and reanalyze recent findings regarding O<sub>2</sub> transport in the Andean ruddy duck and highlight future research directions across multiple disciplines. We found the ruddy duck's physiology is divergent from the low altitude ancestor and from high altitude non-diving waterfowl. Studies involving Andean waterfowl showed high altitude diving birds (torrent duck and ruddy duck), have higher blood-O<sub>2</sub> carrying capacity than non-diving species. Unexpectedly, high altitude diving birds do not increase hb-O<sub>2</sub> affinity relative to the low altitude ancestor. Andean ruddy ducks also showed reduced physical and metabolic activity compared to their low altitude ancestor. Body temperature (T<sub>b</sub>) suppression was observed in high

altitude waterfowl, but not in the low altitude ancestor. The Andean ruddy duck showed the highest levels of  $T_b$  suppression of all species included in this review. Contrary to non-diving species at altitude, we found reduced vital capacity in high altitude diving species. The ruddy duck had the smallest vital capacity, tracheal dead space, and mass specific lung volume of all waterfowl species observed. Further study of high-altitude breath hold divers may lend understanding to Chronic Mountain Sickness – which is common among Andean people. Additionally, Hypoxic adaptations play a critical role in survival at altitude, and understanding these characteristics in the context of duck foraging efficiency and adaptability will be crucial in modeling how populations may respond to a changing ecosystem.

### [15] Linke, Megan\*<sup>1</sup> and Susan McRae<sup>1</sup>

<sup>1</sup>Department of Biology, East Carolina University, Greenville, North Carolina, USA; [linkem@students.ecu.edu](mailto:linkem@students.ecu.edu)

#### **King rail (*Rallus elegans*) habitat use in restored and managed coastal wetlands**

The king rail (*Rallus elegans*) is an obligate freshwater marsh specialist that is suffering population declines throughout its range. Globally, the king rail is listed as Near Threatened, and federally it is a species of priority conservation concern. King rail populations have endured habitat loss due to marsh drainage and land conversion. As their range contracts toward the coastal margins, king rails are increasingly exposed to climate change related assaults including hurricanes and associated storm surge, tidal inundation, and saltwater intrusion. The U.S. Fish and Wildlife Service has refocused their efforts to prioritize marsh management strategies in the refuge system that benefit wading birds. As part of this effort, we studied habitat use of king rails, a focal species at Waccamaw National Wildlife Refuge in coastal South Carolina. The site comprises wetlands associated with a system of rivers with strong tidal influence. Management strategies included prescribed burns, impoundment restoration and planting of rice. We conducted callback surveys to determine the abundance and distribution of king rails across managed and unmanaged units. We captured adult king rails and marked them with a unique combination of color bands for resighting breeders directly and using trail cameras. Nest finding and monitoring provided vital rates of reproduction. To identify microhabitat characteristics that breeding king rails select, we characterized habitat and conducted vegetation surveys at king rail detection points, nest sites, as well as at random wetland points. Trail cameras captured brood rearing and foraging behaviors, as well as shed light on the abundance and diversity of predators within our field sites. Our findings will help inform future management strategies that produce habitat characteristics that favor breeding king rails.

## [16] Lueck, Jonathon<sup>1</sup> and Erik Johnson<sup>1</sup>

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### **Reassessing the Use of the Secondary Shape and Color Pattern as Age Indicators in Yellow Rails**

The cryptic nature of Yellow Rails (*Coturnicops noveboracensis*) has led to a lack in understanding of molt patterns, aging, sexing characteristics. Understanding the age structure of Yellow Rail populations is important for conservation and management efforts because it offers insight into their life history and ecology. Although often used in the field to help determine the age of Yellow Rails, as of 2023, no published research has confirmed Pyle's use of feather shape or coloration in medial secondaries for this purpose. We analyzed 131 secondary 5 feathers collected from southwest Louisiana between 2017 and 2023. These birds were independently aged using molt limit criteria among the alulas and greater coverts (thus, secondary 5 feathers were either retained from the juvenile plumage or replaced during a definitive prebasic molt), and sexed using plumage and measurement criteria. We took two measurements of the feather tip angle at 0.5 and 0.25 cm and used the R package 'countcolors' to calculate the percentage of white on each feather. Feathers did not differ significantly in the amount white ( $n = 113$ ,  $P = 0.32$ ), or feather shape ( $P = 0.86$  and  $P = 0.96$ ) between definitive basic and formative-plumaged birds. Additionally, feathers did not differ between sexes in the amount of white ( $n = 116$ ,  $P = 0.09$ ) or by feather shape ( $P = 0.40$  and  $P = 0.87$ ). Our results do not indicate a relationship between medial secondary feather tip angle or feather coloration and the age or sex of Yellow Rails. Therefore, other more reliable indicators, such as molt limits, should be considered when aging and sexing yellow rails.

## [17] MacLaurin, Trevor<sup>1</sup>

<sup>1</sup>Trent University, Peterborough, Ontario, Canada; [trevormaclaurin@trentu.ca](mailto:trevormaclaurin@trentu.ca)

### **Migratory Propensity in American Oystercatchers**

American Oystercatchers are coastal obligate breeding birds ranging from Florida to Massachusetts, USA. Populations vary in their propensity to migrate from fully migratory in the North to non-migratory in the South, with partial migration occurring in populations at or near the centre of this geographic range (Murphy et al., 2017). Migration can put a significant toll on adult survival (Watts et al., 2019), including through encounters with inclement weather (Watt et al., 2021) and at stopover sites, if they lack the resources to provide fuel (Piersma et al., 2016; Chan et al., 2019). Thus, migratory behaviour may impact survival by changing the risks that birds experience across their annual cycle. Climate change has resulted in the increased frequency and intensity of storm events. These events may affect American Oystercatchers during migration and may alter deterministic factors surrounding migration (Visser et al., 2009). The propensity to migrate and the factors

affecting migratory behaviour is a significant knowledge gap for this species (Simons & Schulte, 2009). We aim to test the hypothesis that weather impacts the propensity for American Oystercatchers to migrate in Coastal Virginia and may vary depending on age, sex, and other individual characteristics. Given that older birds may already have a migration history, we predict that older birds will be more likely to migrate than younger birds. As males primarily benefit from early breeding territory establishment and because breeding seasons are becoming progressively earlier (Hällfors et al., 2020), we also predict that males will be less likely to migrate than females. We will examine individual characteristics and environmental factors influencing breeding of American Oystercatchers across the entirety of their range in Coastal Virginia. We will use satellite telemetry to document fine-scale movements of oystercatchers from their breeding grounds. We will put unique alphanumeric identification bands on American Oystercatchers to assist in assessing migratory behaviours. Understanding the factors influencing migratory behaviours in American Oystercatchers will allow us better to predict this species' future behaviours and ecology.

## **[18] Madigan, Ellie\*<sup>1,2</sup> and Collete Lauzau<sup>3</sup>**

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### **Black Skimmer (*Rynchops niger*) Diet as an Indicator of Ecosystem Health**

The Black Skimmer (*Rynchops niger*) colony at Big Marco Pass Critical Wildlife Area (CWA) in Marco Island, Florida has been severely impacted by a bacterial infection. An ecosystem-wide review of the colony and surrounding area is being conducted to discover potential contaminant pathways, however, there has been no research into the diet of the black skimmers. It was hypothesized that the vector in which the disease is being transmitted to the colony is through the fish the black skimmers are bringing to their colony. Based upon field observations the skimmers were not seen foraging as frequently at the locations proximal to the colony, but instead throughout Rookery Bay National Estuarine Research Reserve (NERR) and inland freshwater sources. To determine the usage of Tigertail Lagoon and the Gulf of Mexico for foraging habitat, photographs were taken of the skimmers bringing fish back to their colony. These photos were organized and used to identify fish to the nearest family. To assess local food availability, the lagoon adjacent to the colony, Tigertail Lagoon was seined at three different sites during all three tidal cycles. Photograph analysis shows the highest quantity of fish species for mate feeding were within the Killifish family (Fundulidae). However, results from seining the lagoon show a quantifiably higher availability of fish from the Sardine (Clupeidae) and Mojarra (Gerreidae) families. Therefore, it is unlikely that the skimmers are foraging directly next to their colony.

## [19] Marchionno, Joe\*<sup>1</sup>

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### **Assessing the Effect of Restored Oyster Reef Configuration on Shorebird Assemblages**

Global losses of coastal habitats and their adverse effects on biodiversity have accelerated the need to restore and conserve coastal ecosystems. Improving coastal restoration is crucial for shorebirds as they have experienced severe global population declines over the past several decades. Oyster reef restoration is a promising strategy for re-establishing critical ecosystem services that can rapidly enhance intertidal food webs, possibly benefiting shorebird communities. However, more information is needed about the influence of restored oyster reef spatial configuration on foraging shorebird assemblages. Here we provide an ongoing experimental approach to understand how oyster reef configuration influences the distribution of shorebird foraging guilds in the intertidal zone. We will examine the effect of three low-profile intertidal oyster reef configurations with varying perimeter-to-area ratios on macroinvertebrate abundance and distribution, shorebird abundance and distribution, and shorebird behavior. We hypothesize that reef configuration or perimeter-to-area ratio will have an effect on macroinvertebrate and shorebird assemblages. We predict that high perimeter-to-area reef configuration will positively affect shorebird behavior by providing refugia, an unobstructed view of potential threats, and forage opportunities to more shorebird species due to greater intertidal habitat heterogeneity compared to configurations with low perimeter-to-area ratio. The utilization of intertidal habitats by shorebirds depends on habitat characteristics like configuration and should be considered when examining community-level effects, conservation management, and restoration efforts.

## [20] Caldwell, Aliya<sup>1</sup>, Dorsey, Sharon<sup>2</sup>, Presented by Marisa Martinez

<sup>1</sup>Department of Biology, University of New Hampshire, Durham, New Hampshire USA; <sup>2</sup>Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia USA

### **LGBTQ+ in field ecology & research: barriers, challenges, and best practices**

Lesbian, gay, bisexual, trans, queer, and individuals with other marginalized gender and sexual identities (LGBTQ+) face barriers and risks in society. The various socio-cultural and structural barriers established by cis-heteronormative and heterosexist practices perpetuate the inequality, exclusion, and discrimination of LGBTQ+ individuals in field ecology and research in distinct ways. Here, we aim to summarize research on the impacts of, and mitigation techniques for, LGBTQ+ discrimination in STEM, with a particular focus on issues relevant to waterbird researchers. LGBTQ+ ecologists are four times more likely to report sexuality as a barrier to academic practice, and LGBTQ+ researchers face increased risk of violence in the field, sexual assault and harassment, and bullying. Additionally, LGBTQ+ undergraduates are significantly less likely to pursue STEM majors



than their cis-hetero peers, which reduces the number of individuals with these identities in the conservation pipeline. The mitigation of systemic barriers such as medical inaccessibility, housing insecurity, limited legal rights, and education inaccessibility requires collective inclusion, institutional change, and socio-political reform. Additionally, there are concrete actions that institution administrators and supervisors can implement to reduce risk and create a community of inclusion for LGBTQ+ individuals amongst field ecology practitioners. Institutions can consider requiring descriptive safety plans and field procedures that address local laws and policies; provide inclusive housing accommodations and bathroom access; and allow grant funds to be used for medical and personal needs of LGBTQ+ individuals. Supervisors can participate in the formation and implementation of field safety plans; be informed of cybersecurity risks and dangers of social platforms faced by LGBTQ+ individuals; regularly seek feedback; respect and support decisions around disclosure of identities; and consider self-disclosing if an identity within the LGBTQ+ spectrum is shared. LGBTQ+ ecologists can be empowered to prioritize their safety and well-being over data collection or field work; selectively disclose identity; be informed of reporting procedures; and connect with local LGBTQ+ communities or organizations. Reducing barriers to LGBTQ+ individuals' participation in ecology across institutional and interpersonal levels is possible through practices that ensure a safe, inclusive, and affirming environment.

**[21] McKellar, Ann<sup>1</sup>, Meredith Meeker<sup>2</sup>, Scott Fleming<sup>1</sup>, and Adam Smith<sup>1</sup>**

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### **Waterbird population trends fluctuate in relation to moisture levels across North America**

In order to understand the causes of migratory bird population declines and establish effective conservation strategies, we require knowledge of how changes to the environment are linked to changes in the abundance, distribution, or demography of populations. Such linkages can be examined through the use of large-scale, long-term avian databases, such as the North American Breeding Bird Survey (BBS), in combination with large-scale climate indices. The BBS has thus far been an under-utilized data source for waterbird species, in part due to the perceived notion that BBS indices are unreliable for colonial waterbirds. However, for some readily detectable waterbird species that nest in loose colonies on small wetlands, often close to roads, such as the North American Black Tern (*Chlidonias niger*), the BBS may be a valuable data source which produces statistically reliable population trends. Black Terns have experienced long-term population declines, and while causes of declines remain unclear, the species' reliance on shallow freshwater marshes during the breeding period suggests that effects of habitat loss and climate change on wetlands could play a role. Here we examined the influence of spring moisture (via the standardized precipitation evapotranspiration index, SPEI) on annual BBS counts using Bayesian

hierarchical generalized additive models (GAMs), with annual fluctuations around the GAM-smooth predicted by local spring SPEI. We uncovered strong spatial variation in population trends, with some regions showing increases and others showing decreases, suggesting spatial variation in drivers of population change. There was a clear and positive effect of moisture on annual fluctuations, with a predicted ~60% increase in Black Tern abundance in very wet years compared to very dry years. Overall, our results confirmed that there has been a long-term population decline since the 1960s, but suggest that recent (2004-2021) population trends are mostly stable and primarily driven by annual fluctuations in moisture. Ongoing wetland loss, primarily through drainage for agricultural land, coupled with climate extremes will become increasingly important for predicting population change in this and other wetland-dependent waterbirds.

**[22] Parno, Kimberly\*<sup>1</sup>, Glen Brown, Chrystyn Jones<sup>1</sup>, Erica Nol<sup>1</sup>, and Anne Ausems<sup>1</sup>**

<sup>1</sup>Environmental and Life Sciences, Trent University, Peterborough, Ontario, Canada; [kimberly.parno@trentu.ca](mailto:kimberly.parno@trentu.ca)

### **Inter- and intra-specific variation in the energetic state of Whimbrel (*Numenius phaeopus*) breeding in the Hudson Bay Lowlands in Canada**

Whimbrel (*Numenius phaeopus*), a large sub-arctic breeding shorebird, is facing rapid population declines for which the causes are not fully known. Studying the challenges, they face outside of the breeding grounds can be especially difficult, hindering conservation efforts. We used ptilochronology, a cost-effective and non-invasive technique in measuring feather growth rates (FGR), to study the energetic state of Whimbrel during moult. This energetic state is dependent on food availability and energy expenditure (e.g., increased with disturbance). We captured adult Whimbrel breeding in Churchill, Manitoba and collected secondary feathers from 2011, 2012, and 2023. Additionally, we collected feathers in 2023 at Burntpoint in Polar Bear National Park, Ontario. We compared FGR of Whimbrel by year, breeding location, nest fate, and sex. We contextualized these findings by comparing the FGR of Whimbrel with those of four other shorebird species: Lesser yellowlegs (*Tringa flavipes*) and Dunlin (*Calidris alpina*) caught during breeding in Churchill, Manitoba, Canada, and Sanderling (*Calidris alba*) and Ruddy Turnstone (*Arenaria interpres*) caught during staging in Cape May, N.J., U.S.A. We hypothesized that during moult, FGR is positively correlated with food availability and negatively correlated with disturbance; as increased food availability and decreased disturbance on moulting grounds reduces overall energetic demands thus freeing up energy for moult. We predicted that interannual variation in environmental conditions may affect FGR through changes in food availability. Furthermore, known differences in the timing of southbound migration between breeding locations (northern populations leave later than southern populations), nest fate, and sexes (successful males leave later than females and failed males), may affect arrival times at moulting grounds therefore experience different environmental conditions

during moult. Understanding the variation in the energetic state during moult is vital to inform effective conservation efforts.

### **[23] Pauly, Autumn\*<sup>1</sup>**

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#### **Should I Stay or Should I Go Now: The effect of site fidelity on breeding success of the Leach's Storm Petrel (*Oceanodroma leucorhoa*)**

Breeding seabirds with extended lifespans often exhibit strong mate and site fidelity. The Leach's Storm Petrel (*Oceanodroma leucorhoa*), provides a model for investigating the interplay between breeding failure, mate fidelity, and breeding success. This study examined the relationship between breeding success and banded bird returns, mate fidelity, and breeding success of Leach's Storm Petrels on Great Duck Island (GDI), situated off the mid-coast of Maine. Field observations were conducted over the period 2021 to 2023. The research focused on previously banded pairs, with data collection involving band numbers and breeding status, among other measured variables. Annual monitoring revealed a decline in site fidelity, with only 12% of individuals banded in 2021 returning in 2023, and 68% of burrows occupied by new individuals. Despite this, the breeding success of the colony in a given year exhibited a positive correlation with nest site and mate fidelity in the subsequent year. Among the 32 successful breeding burrows in 2023, 65.62% retained the original breeding pair from 2022, 21.87% retained one bird, and 12.5% had new occupants. Previous studies have shown that high rates of nest site fidelity and mate fidelity may be an indicator of positive population status. Fidelitous pairs demonstrated elevated breeding success rates. Despite the advantageous correlation between fidelity and breeding success, this study unveiled an overall decline in burrow activity concerning mate and site fidelity. The reasons behind this decline require further investigation. This research underscores the intricate dynamics of seabird breeding ecology, shedding light on the intricate relationships between mate fidelity, site fidelity, and breeding success. A deeper understanding of these connections is pivotal for effective conservation strategies and the preservation of seabird populations. Further studies are essential to unravel the underlying causes of the observed decrease in burrow activity, providing valuable insights into the ecological health of these breeding seabirds.

### **[24] Rodriguez, Paige\*<sup>1</sup> and Christy Carello<sup>1</sup>**

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#### **Food Source Availability as an Influence for Winter Foraging Site Selection in Colorado Northern Shovelers**

Colorado waterbody complexes represent important year-round habitat for the Northern Shoveler (*Spatula clypeata*). Colorado's unique ability to accommodate the various lifecycle requirements of the Northern Shoveler make the state a valuable location for conservation, as the species has been found to be highly sensitive to anthropogenic disturbance and particular about waterbody selection sites. It is unclear why Northern Shovelers only feed at specific waterbodies while other species of ducks are more widely distributed. To identify threats to Northern Shoveler preferred habitat and guide conservation decisions, it is important to understand habitat selection parameters. We hypothesize that if food availability dictates site selection in Northern Shovelers, then food sources present within the preferred waterbodies will differ from those found in waterbodies that are not preferred. We also hypothesize that additional waterbody parameters will differ between preferred and non-preferred waterbodies, such as aquatic plants, algae, fish stock, and abiotic properties. Our methods focused on surveying invertebrates present in four waterbodies which have been observed to be preferred feeding habitat by Northern Shovelers, and five waterbodies in close proximity which are largely ignored by the species. At each waterbody, water column sweep netting was performed five times during the summer months at randomly selected points to sample aquatic invertebrates. Invertebrate species collected were then isolated, identified, dried, and weighed to determine invertebrate species diversity, abundance, and biomass. At each waterbody, aquatic plants were surveyed via observation, and water quality data including pH, dissolved oxygen, salinity, conductivity, nitrates, and phosphates were measured. Finally, to assess potential competitors for food resources, we collected fish stock data for each waterbody from Colorado Parks and Wildlife. Preliminary data analysis suggests that differences do exist between preferred and non-preferred waterbodies, and we expect that completing our summer sampling and processing will show these differences to be significant.

## **[25] Schmit, Jess\*<sup>1</sup>**

<sup>1</sup>University of Arkansas, Fayetteville, Arkansas, USA; [jmschmit@uark.edu](mailto:jmschmit@uark.edu)

### **Understanding Migration Ecology and Strategies of Arkansas King Rails**

King Rails (*Rallus elegans*) are a secretive marsh bird species of conservation concern in Arkansas. Their population has declined over the last few decades due to habitat loss and wetland degradation, as well as agricultural practice changes that impacted their use of flooded rice fields. Freddie Black Choctaw West WMA has multiple pairs of breeding King Rails and offers an opportunity to investigate King Rails in Arkansas and determine how Choctaw West WMA functions as a source for other sites in Arkansas. This study will contribute to understanding the role migration may play in this population, especially in the face of global climate changes.

Our objectives are to determine King Rail migratory status at Choctaw West WMA and understand how this population fits in with other birds in the Delta region. We will determine King Rail migration patterns to and from Choctaw West and the Arkansas Delta by utilizing GPS transmitters to track movements in the annual cycle. From the migration data we receive from the tagged birds, we will be able to determine migratory movements and timing and understand site fidelity.

To determine migratory connectivity and types of movement during migration and breeding seasons, we captured and outfitted 23 adult birds with Argos GPS tags over the course of the 2022 and 2023 field seasons. By classifying data points received from tagged King Rails as wintering, migrating or breeding points and analyzing distance travelled, we can determine when birds are most active (local movements at Choctaw West), when/if the birds leave Choctaw West during migratory periods, and identify stopover locations.

In 2022, one bird migrated to Louisiana while the other tagged birds remained at Choctaw West WMA through the winter. In 2023, rails in the summer moved much more sporadically at Choctaw West WMA and other sites, possibly due to increased predation pressure and a drier season that reduced available habitat and resources at Choctaw West. We await the return of data points throughout the fall and winter to monitor additional movements.

## **[26] Shephard, Nicholas\*<sup>1</sup>, Ann McKellar<sup>2</sup>, and Matthew Reudink**

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### **Black Tern Productivity at Core versus Peripheral Colonies**

The Canadian Prairie Pothole Region (PPR) is often considered a "stronghold" for waterbird species. Despite this, productivity in the PPR, the core of the North American Black Tern (*Chlidonias niger*) breeding range, has yet to be studied. Research from the periphery of the range has shown that reproductive success among Black Terns is low. Despite this low success, peripheral populations are persisting, potentially due to immigration from source populations. As such, understanding source-sink population dynamics are critical for a species in decline like the Black Tern. It is imperative to understand how populations continue to persist despite low reproductive success. Understanding productivity in the core of the range is important, as these subpopulation interactions may reveal source-sink patterns. In this study, I will assess productivity at four Black Tern colonies across the North American breeding range. Thus far, productivity data has been collected from Black Tern breeding sites in Ontario, Saskatchewan, and British Columbia. In Ontario, 15-25 nests have been monitored from 2016-2019 at Tiny Marsh, a managed wetland within a provincial wildlife area. In Saskatchewan, 20-30 nests have been monitored from 2019-2023 at a stretch of marsh-fringed shoreline in Jackfish Lake, a large recreational lake. In British Columbia 16 nests were monitored in 2022 at two separate sites, McQueen Slough, a

wetland designated as DU conservation land, and Horse Lake, a large recreational lake. If core populations are acting as sources for peripheral sites, conservation and management of core populations may be more critical than is currently understood. If source populations are improperly managed, this could have detrimental effects that impact the entire North American breeding population. Alternatively, continuing population declines could be explained by insufficient productivity across the entirety of the breeding range. Understanding these patterns will not only lead to a better understanding of Black Tern productivity across the range, but will better inform which sub-populations require the most conservation effort.

**[27] Thistle, Mikayla<sup>1</sup>, Austin Jones<sup>1</sup>, Christy Hand<sup>1</sup>, Beau Bauer<sup>2</sup>, Mark McAlister<sup>1</sup>, and Jamie Dozier<sup>1</sup>**

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### **Using solar-powered irrigation to expand suitable habitat for Eastern Black Rails**

The Eastern Black Rail (Black Rail; *Laterallus jamaicensis jamaicensis*), a subspecies of Black Rail, is rare and localized throughout its range. As the smallest rail species in North America, Black Rails typically occupy wetlands with water levels ranging from saturated soils to very shallow standing water (less than four centimeters). The Eastern Black Rail was listed as threatened under the Endangered Species Act in 2020. The low availability of wetlands with consistently suitable water levels is thought to be contributing to population declines. In 2023, we installed solar-powered irrigation systems in two impounded marshes in coastal South Carolina with the goal of measuring the efficacy of using irrigation to create and maintain suitable water levels for Black Rails and to ultimately promote successful breeding and recruitment. In each study plot, we initiated monitoring using a 1-hectare grid-based design to map and measure habitat changes in water level, salinity, vegetation structure, and soil type with and without irrigation. We concurrently monitored Black Rail occupancy using call-response surveys and autonomous recording units. These results will aid in the development of future Black Rail habitat management and conservation at varying spatial scales. Additionally, the hydrology, vegetation, and Black Rail occupancy data collected during this study will be used to inform an irrigation model developed the Atlantic Coast Joint Venture Adaptive Management Project.

**[28] Tsipoura, Nellie<sup>1</sup>, David Mizrahi<sup>1</sup>, and Patricia Rafferty<sup>2</sup>**

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### **Beach Restoration and Bird Productivity at Stone Harbor Point, Cape May County, NJ**

Stone Harbor Point (SHP), an Atlantic coast barrier island in Cape May Co., is one of the most important habitats along the NJ coast for birds and wildlife. It is also a highly dynamic system that gets inundated during extreme high tides and large storm events. Between 2014 and 2016, elevation at the site was increased on 40 acres of beach habitat to decrease flooding risk, through a collaborative project and funding from a DOI/NFWF Sandy Resiliency Grant. To evaluate the success of this effort, NJ Audubon (NJA) and partners developed and implemented an intensive monitoring program to track change and persistence of restoration areas, along with the response of target bird species.

NJA monitored beach nesting birds at SHP during the 2017-2021 breeding seasons (April-August) to investigate reproductive success and determine impacts of changes in elevation on nest success and fledgling rate. Approximately 24-27 pairs of American Oystercatchers used SHP annually. Their productivity ranged widely, averaging from 0.04 chicks per pair (2017) to over 0.75 chicks per pair (2018 and 2019), above the 0.5 productivity goal set for this species. A combination of predation and flooding were the causes of nest loss and brood/young mortality. In years with frequent storms and flooding throughout the season the birds typically experienced lower productivity compared to years with one or two single storms, especially when storms events occurred early in the season. Similarly, differing levels of predator activity, both mammalian and avian between years resulted in annual differences in productivity.

Evaluating outcomes of restoration projects is critical to developing effective adaptive management strategies that yield greater benefits to target species. Thorough project assessment helps inform future decisions made by regulatory and natural resource management agencies and conservation entities about the value of any restoration approach.

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### **Rose Brush and Fescue Sward: The Vegetation of Two Herring and Black-backed Gull Colonies on Great Duck Island in the Gulf of Maine**

Great Duck Island is a 91-hectare island located 15 km south of Mount Desert Island in Hancock County, Maine. Two nesting colonies of Herring Gulls (*Larus smithsonianus*) and Black-backed Gulls (*Larus marinus*) have been established on Great Duck Island prior to 1989. Their nests have been counted consistently by students from the College of the Atlantic since 1999. Southern nest sites have also been mapped since then, with the most recent complete mapping of nest sites in both colonies occurring in 2023. As of this time, the number of nesting gulls in the northernmost of these colonies has been generally declining, and the southernmost has been increasing. The selection of nest sites in vegetated areas each spring is expected to be uneven and reflective of gull nesting preferences, and as nesting becomes denser, the distribution of vegetation may reflect an

increasingly gull-derived impact from frequent trampling and guano deposition. I surveyed 45 0.5 sq m plots in both colonies, divided into low and high nesting density areas based on kernel density estimation. An equal number of plots were also surveyed in meadow areas with no current gull nests in a convex hull around each colony. In total, 90 plots were surveyed between both colonies, showing a patchy distribution of vegetation in both colonies and several common assemblages of plant species, some of which occurred more frequently in correlation to certain nesting densities.

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**Tracking Fall Migratory Movement of Piping Plover Around the Coastal Virginia Offshore Wind Commercial Lease Area**

As the development of offshore wind facilities expands along the U.S. Atlantic coast, questions remain as to how turbines will impact migratory shorebirds. Given species-specific migratory ecology, the study of migratory routes around offshore wind facilities is necessary to inform risk assessments. The piping plover, listed as threatened under the Endangered Species Act, is a short-distance migrant that breeds in the north and mid-Atlantic states and provinces and winters along the Atlantic and Gulf shores of the southern U.S. and in the Caribbean. In 2020, the Coastal Virginia Offshore Wind-Pilot project became operational 27 miles (43 km) off Virginia Beach and Dominion Energy leased an area for a commercial-scale project. The Motus Wildlife Tracking System has stations across the world that use coordinated automated radio telemetry to track wildlife with uniquely coded VHF transmitters. In 2022, Dominion Energy installed two automated telemetry stations on the CVOW-Pilot wind turbines, fit with Yagi antennas. Between May 22 and July 11, 2023, we applied Motus transmitters (1 g) to 30 piping plover adults across four barrier islands on the eastern shores of Maryland and Virginia. Twenty-eight birds have retained their transmitters and data suggests they are currently along the coast north of the commercial lease area. We anticipate individuals migrating from mid-August to early September. After migration, we will estimate the proportion of tagged birds that pass through the commercial lease area, as well as summarize the timing and atmospheric conditions (wind speed, wind direction, precipitation, and visibility) of flights through the lease area.

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**Assessing Black Rail Distribution and Habitat in the Everglades: Implications for Conservation and Restoration Planning**



Human-induced global change has led to significant shifts in wildlife habitat and distributions, exemplified by the situation of the threatened Black Rail (*Laterallus jamaicensis jamaicensis*), a marsh bird recently listed under the U.S. Endangered Species Act. Compared to its historically extensive breeding distribution in the eastern USA and south into Central America, the species has experienced drastic population declines primarily due to wetland loss resulting from landscape transformation, climate change, and rising sea levels. Southern Florida, specifically the Everglades region, holds great potential as a stronghold for this species, yet limited data exist about its distribution there. This study aimed to establish a baseline of Black Rail presence in strategic areas of the Everglades, in collaboration with National Wildlife Refuges and other land managers, to inform conservation efforts and habitat restoration initiatives.

Call-response surveys were conducted at over 600 point locations from February through May in 2021 and 2022, using established USFWS protocols for secretive marsh birds. Surveys were aimed to assess occupancy and identify key habitat features; they started earlier than typical (February, versus April to June) to account for southern Florida's subtropical climate.

Preliminary results indicate at least 60 detections of Black Rail calls at 43 unique point locations across federal, state, and regionally-managed lands in the study area, including National (Big Cypress) and State (Fakahatchee Strand) Preserves, National Wildlife Refuges (Ding Darling, Loxahatchee, Ten Thousand Islands), and South Florida Water Management District areas (Southern Glades).

Ongoing data collection and analysis will further evaluate occupancy patterns and assess the importance of specific habitat characteristics. These findings will support future status assessments, adaptive management strategies, and the identification of priority areas for intensified study and protection. The information generated by this study is crucial for conservation planning, particularly for mitigating impacts of land use and climate change on wetland wildlife. It is important to note that the views expressed in this study are those of the author(s) and may not necessarily represent the U.S. Fish and Wildlife Service's perspective.

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### **Fledging Success and Natal Dispersal of Snowy Plovers (*Charadrius nivosus*) on a Barrier Island in Southwest Florida**

Sanibel Island, Florida supports a small population of state-threatened nesting snowy plovers (*Charadrius nivosus*) that has been closely monitored by the Sanibel-Captiva Conservation Foundation (SCCF) since 2002. Despite decreased numbers of nesting pairs in recent years, productivity has remained relatively consistent, indicated by chicks fledged per pair, and Sanibel remains a source population for other sites in southwest Florida. A

long-term banding and resighting project on Sanibel has provided valuable information regarding snowy plover fledging success, and more recent banding and resighting efforts have revealed natal dispersal data for juveniles. Advances in technology and communications have allowed for increased reports of banded individuals from outside Sanibel and expanded our understanding of snowy plover movements in the region. However, detectability of banded individuals may be hindered by limited accessibility and lack of monitoring effort at some interior nesting sites, both known and unknown. Of the 21 chicks banded on Sanibel between 2017 and 2022, 16 were confirmed flying before their last sighting on Sanibel, but only 7 were observed as breeding or potentially breeding adults in the subsequent nesting season. The average age of fledging was  $36.6 \pm 4.3$  days (range 31 - 45 days). Five of these individuals have been confirmed nesting, but only 2 of those have returned to nest at their natal site of Sanibel Island. Dispersal ranged between 0.35 km and 193 km, with the farthest being on Caladesi Island. The long-term monitoring of this population informs management decisions by identifying suitable nesting habitat and foraging areas to be protected for the benefit of beach-nesting birds and other coastal wildlife species. Due to the small sample size, future research should incorporate banding at other nesting sites to increase sample size and better our understanding of population dynamics across the southwest region.

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### **Cloudy with a chance of seagulls: the effect of weather conditions on fledging success in the Herring Gull**

Weather patterns can significantly impact the reproductive and fledging success of birds. This study aimed to investigate the influence of weather conditions on the growth rate and fledging success of Herring Gulls (*Larus argentatus*) nesting on Great Duck Island (GDI) and Mount Desert Rock (MDR), situated off the coast of Maine. Field observations were conducted during the 2022 and 2023 breeding seasons. Fledging success and growth curves were determined by conducting daily nest checks on each island. Nests were sampled from different areas of the colony each year to minimize disturbance.

During the 2022 field season, temperate and warm weather conditions predominated, characterized by minimal rainfall and fog. In contrast, the 2023 field season experienced a higher frequency of foggy and rainy days. Data analysis revealed that the mean fledging success rate for both years was similar. On GDI there was an average of 1.67 chicks fledged per nest in 2022 and 1.46 in 2023. There was a statistical difference in the distribution of the number of chicks fledged per nest in 2023, where there was an increase in the number of nests that fledged two chicks. MDR had an average of 1.65 in 2022 and 1.22 in 2023, with no significant difference in distribution.

This study highlights the relationship between weather conditions and seabird-fledging success. The consistent mean fledging success rate suggests a degree of resilience in the face of varying weather conditions. The observed change in chicks fledged per nest in the second year, despite less favorable weather conditions, raises questions about the potential adaptability of the Herring Gull to changing environments. Further studies should be conducted to comprehensively elucidate the impact of varying weather on the fledging success of breeding seabirds and to better understand the influence of other variables, such as disturbance. Understanding these dynamics is crucial for conservation strategies and ensuring the long-term survival of seabird populations in the face of our changing climate.

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