The Waterbird Society

44th Annual Meeting
Nov 9 – Dec 5, 2020
1st Virtual Gathering

Welcome from the President

I am pleased to welcome you all to the 44th Annual Meeting of the Waterbird Society! While I'm sad that we will not be able to meet in person in Texas this year, as planned, I am excited to be participating in a significant milestone for our Society - our first ever virtual meeting.

Vice President Patty Szczys and the meeting organizing committee have organized an excellent program that includes a variety of sessions, including a symposium on crane and stock ecology/conservation and a session featuring the research of our members from East Asia. We also have our very own Dr. Gail Fraser, Dr. Gopi Sundar and Dr. Peter Frederick as our plenary speakers this year.

This has been an unprecedented, uncertain and challenging year for all of us. Some of us, or our family or friends, may have contracted Covid-19. For most of us, the pandemic has affected our research, and our professional and personal lives to varying to degrees. This crisis has also highlighted social injustices and economic disparities that are inherent in some of our home countries. In the midst of this upheaval, I'd like to thank you all for taking the time to participate in this year's meeting.

Change can be a catalyst for self-reflection and new opportunities. For me, the past months have reinforced the imperative to continue working to achieve our Society's commitment to being fully inclusive and barrier-free, and to celebrate and draw on the strength of our diversity. This year's program includes a Diversity and Inclusion Panel event on November 19th; I encourage everyone to attend, listen/learn about your colleagues' experiences and perspectives, and participate in the discussion. Council and others have also drafted a Code of Conduct that formalizes many of the values that we already hold and will take effect for this year's meeting; please read it, embody it and I encourage you to provide feedback.

Another opportunity is the virtual format of our 2020 meeting – an experiment that we've discussed doing for some time. This format will never replace an in-person meeting. However, for an international society, with challenges for many to attend in person each year, it can become a way to enhance participation in our annual meetings and the Society. We'll be asking for your feedback and suggestions for improving this type of event in future.

Finally, this year we will be updating the Waterbird Society Strategic Plan. This document will chart our path forward and ensure that our society remains vibrant and relevant over the coming decades. There will be many opportunities to get involved in this initiative over the coming months, and I encourage you to participate and make your voices heard. We as Council are always looking for new people to actively participate in the society. I encourage everyone to attend our Business Meeting on December 5th to learn more about the strategic plan, our Society and how you can get involved.

I wish to personally welcome all students to our Society's annual meeting. Our Society has always valued students and we make a sincere effort to welcome you to the meeting and encourage your active and enthusiastic participation in our society. There is a Student and Early Career Scientist Social on November 12, and a Student Mentor Meet-Up on November 15. Likewise, a welcome to all members who are attending their first Waterbird Society meeting. I hope you will find it as rich and rewarding as my first meeting many years ago.

In closing, I want to thank all those who made this meeting possible. I thank the Society's officers, councilors, and committees for the many hours they volunteer to support our Society and keep us progressing forward to promote waterbird research and conservation. Thanks to Patty Szczys and the members of the meeting organizing committee for their adaptability and hard work in making this meeting possible.

I hope that everyone has a fantastic meeting!

Yours sincerely,

Dave Moore

Welcome from the Scientific Program Committee Chair

I'd like to extend a warm welcome to all participants of the 44th Annual Meeting of the Waterbird Society. Although we are not gathering in Houston, Texas as planned, we are excited for our virtual gathering.

An *ad hoc* virtual conference organizing committee was formed in July and we have been busy, meeting weekly since then. I'd like to thank the members of this organizing committee for their significant contributions and making this virtual meeting possible: John Anderson, Chris Custer, Daniel Catlin, Elizabeth Craig, Danielle D'Auria, Clay Green, Dave Moore, Sean Murphy, Caroline Poli, Jenna Schlener, Kate Sheehan, Kate Shlepr, Gopi Sundar, Anna Vallery, and Woody Woodrow.

Early in the planning process we realized the virtual format this year could assist in making this a truly international conference, so we are very happy to feature two scientific sessions occurring live from time zones in India and east Asia.

The program includes 45 oral presentations including 15 by students, waterbird art workshops, Diversity Panel Discussion, Student and Early Career Scientist Social, Meet the Editor of *Waterbirds*, Student-Mentor Meet-Up, and closes in December with the Business Meeting and Award Ceremony.

This year's meeting is promises to be an interesting and memorable one. I'm looking forward to seeing you all online!

Sincerely,

Patty Szczys

Chair, Scientific Program

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 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 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.

Instructions for Accessing Sessions, Events, and Slack

Looking for Conference Merchandise? Visit this link for a variety of t-shirts, hoodies, stickers, notebooks, and mugs! https://waterbirds.org/annual-meeting/merchandise/

Our Virtual meeting will take place on Zoom. Specific links for joining each session/event will be supplied under separate cover. It is essential to the success and security of our event that those links not be posted or shared.

Instructions for Zoom pre-registration:

- All attendees and presenters will be provided with a link to pre-register for each session/event. Please do not share these registration links, as they are how the Society is controlling access to the meeting.

- Once you click on the registration link, it will ask you to enter your email address and name. The name you provide will appear on the Zoom meeting and the email address is needed for Zoom to provide a second link directly into the meeting. This of this as similar to the two-factor identification used in so many apps.

- You can register for a session right up until the beginning of that session, it takes only a few seconds or a minute to complete the process and join the session/event.

- If you are presenting or moderating, please register at least 3 days prior to your session.

Attendees:

- Once you join the session/event on Zoom, please make sure your microphones are muted and your video is turned off. If you are presenting, wait until your turn to activate your microphone and video. The moderator will help with timing of this.

Code of Conduct

The Waterbird Society has a new Conduct Policy, that will be in effect during #WBSvirtual2020: https://waterbirds.org/council/policies-procedures/

Comment period open until 01 Dec. 2020 – comments, suggestions, improvements? -- please contact Dave (dave.moore2@canada.ca) or Patty (pszczys@gmail.com).

Any concerns or reports during #WBSvirtual2020? Please contact: Liz Craig (ecc79@cornell.edu), John Anderson (janderson@coa.edu) or Dave Moore (dave.moore2@canada.ca) for support.

The Waterbird Society strives to provide an open, respectful, engaging forum for sharing research and forming local, national and international partnerships in our work. Everyone participating in events sponsored by the Waterbird Society has the right to be free from discrimination, bullying, unlawful harassment, sexual misconduct, and violence. This Code of Conduct shares our community expectations and applies to all attendees and any others affiliated with Waterbird Society-sponsored events. We seek to empower all participants in our community to actively engage in creating a friendly, respectful and safe environment for all.

Keynote Speaker

Monday, November 9, 2020

Gail Fraser is a professor in the Faculty of Environmental and Urban Change at York University, where she teaches ecology and conservation science to non-science students. Fraser has worked on colonial nesting waterbirds for over two-decades: a MSc (North Dakota State University) on Forster's terns; a PhD (Memorial University of Newfoundland) on crested auklets (in the Aleutian Islands) and other field studies on thick-billed murres, Leach's storm petrels and Manx shearwaters in Newfoundland and Labrador. Currently, Fraser is working on double-crested cormorants and black-crowned night-herons in Ontario. Driven by an interest in seabird conservation, since 2002, she has also worked on policy-oriented research on the environmental management of offshore oil and gas extraction, primarily in eastern Canada. Her oil and gas research is published in a wide variety of science and policy journals including, Avian Conservation and Ecology; Journal of Environmental Assessment, Management and Policy; Marine Ornithology; Marine Policy; Marine Pollution Bulletin; and Canadian Public Policy.

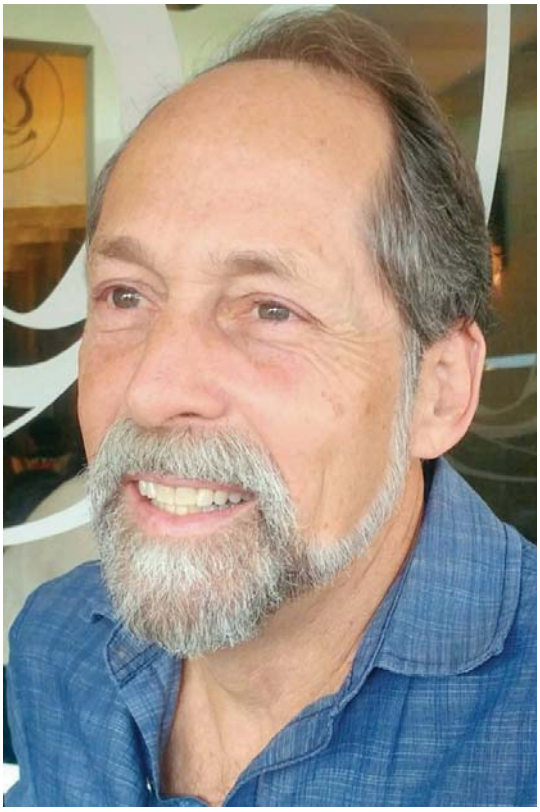
Plenary Speaker

Wednesday, November 11, 2020

Gopi Sundar is a scientist at the Nature Conservation Foundation with affiliations to the International Crane Foundation. Armed with a Ph.D. in Conservation Biology from the University of Minnesota, he is also the global Co-chair of the IUCN Stork, Ibis and Spoonbill Specialist Group. Gopi has over two decades of research and conservation experience with ongoing work in Africa, Asia and Australia. He is a National Geographic Explorer and was awarded the Zeiss Conservation Award for his efforts to conserve wetlands and waterbirds in India. Gopi serves on State Wildlife Boards and Supreme Court mandated committees in India working with elected representatives and senior bureaucrats towards improving wetland conservation. His current students are from institutions in China, USA, Nepal and India. Gopi is the first Indian Elected Board Member of the Waterbird Society. With his wife and colleague Swati, Gopi also manages a small organic farm, a butterfly garden, and enjoys sojourns to the wilderness when he is able to.

Plenary Speaker

Thursday, November 12, 2020



Peter Frederick is a Research Professor in the Department of Wildlife Ecology and Conservation at the University of Florida in Gainesville. His expertise is in wetland ecology, ecological restoration, ecotoxicology and coastal ecology. In his research program, wetland birds have been used intensively and extensively as indicators of ecosystem health, ecosystem function, and as guides for the spatial and temporal scale at which conservation and restoration should occur. His work has included vertical studies of long-legged wading birds in the Everglades (health, reproduction, foraging ecology, energetics, movement behavior, demographics, nutrient cycling), comparisons of wetland function at the ecosystem scale (Everglades, Miskito Coast, Okavango Delta, Brazilian Pantanal, Venezuelan Llanos), and measuring anthropogenic effects (human disturbance, nutrient pollution, powerlines, construction, contaminants, fire, invasive pythons). His work relies heavily on understanding mechanistic ecological interactions and extending learning from long term studies to large scale restoration projects.

The Waterbird Society Diversity Committee presents:

Diverse Experiences and Inclusive Conversations in Waterbird Biology: Panel Discussion

Thursday, November 19th from 1:00pm-4:00pm E.S.T.

Register for the Zoom meeting at:
https://us02web.zoom.us/meeting/register/tZMpde6hpjMsGNM4I_Ut4tSzfmUJbEwJwjaa

Panel Goals and Description

How have racism and racial bias manifested in the study and conservation of waterbirds? How has the lack of ethno-racial diversity, representation, and inclusion shaped the experiences of Black, Indigenous, and People of Color (BIPOC) individuals in these fields? A candid conversation centered on these issues will be illuminated by a panel of waterbird biologists speaking to their unique experiences, challenges, and motivations in their respective professions. The discussion will engage attendees during the live session in an effort to continue the conversation within The Waterbird Society, and across the academic, research, and public arenas that cultivate waterbird biology and conservation.

Panel Moderator: JAMILA BLAKE

Jamila Blake, AWB®, is the Professional Development Manager for The Wildlife Society (TWS) and has been on staff since 2017 when she started as a Wildlife Policy Intern. She received her B.S. in Wildlife Conservation and Ecology from the University of Delaware in 2016. Prior to joining TWS, Jamila worked with a variety of organizations, like American Bird Conservancy, The Florida Aquarium, Naturalists for the Rehabilitation of Snakes and Birds NGO in India, and the University of Delaware AGcelerate Enrichment Program. Jamila manages TWS' Diversity Initiatives, Wildlife Biologist Certification Program, Leadership Institute, and Awards. She works to develop mentorship programs within and outside of TWS, collaborates with members and partner organizations to cultivate diverse, equitable, and inclusive spaces for students and professionals, and engages in community outreach to promote learning and professional development.

Participant Moderator: MARISA TAKADA MARTINEZ

Marisa Takada Martinez is a Ph.D. Student in the Avian Ecology Lab at Florida Atlantic University. She received her M.S. at Texas A&M University and B.S. at Cornell University. Marisa's research focuses on ecological models for coastal wading bird habitat in South Florida and aims to support the conservation of avian populations and the natural resources they rely on. Marisa is an active member of the Waterbird Society where she serves on the Diversity Committee, and participates in her local Audubon Society where she enjoys connecting with her community through birdwatching and nature walks.

Panelists

JUITA MARTINEZ

RICARDO ZAMBRANO

DR. RENA BORKHATARIA

JUITA MARTINEZ is a 3rd year Ph.D. Student at the University of Louisiana at Lafayette with a B.Sc. in Zoology (w/ a minor in wildlife) from Humboldt State University. Her research focuses on Brown Pelicans, better known as #DinosaurFloofs on social media. Coastal Louisiana has been at the forefront of restoration activity since the 1990s and Juita's research aims to better understand the impacts of these human-caused habitat changes on the wildlife that utilize these spaces. In Juita's free time you can catch her exploring the great outdoors with her telephoto lens, capturing the split seconds in time when she encounters an animal or a landscape that is too good not to share! Juita also tries to do her part in uplifting and advocating for the BIPOC community through DEI (Diversity, Equity, and Inclusion) work, consulting and mentoring the next generation of scientists.

RICARDO ZAMBRANO has a Bachelor's Degree in Ecology, Behavior, and Evolution from the University of California, San Diego and a Master of Science Degree in Biology from Florida Atlantic University. Ricardo has nearly 30 years of experience as a wildlife biologist. He has radio-tracked coyotes in Yellowstone National Park, researched sea turtles in Mexico's Yucatan Peninsula, and is currently with the Florida Fish and Wildlife Conservation Commission. His main duties include the conservation, management and monitoring of endangered, threatened and declining species of wildlife in south Florida. Ricardo is a former Council member of the Waterbird Society and currently on four Waterbird Society committees.

DR. RENA BORKHATARIA directs the Doris Duke Conservation Scholars Program Collaborative, an undergraduate training program focused on increasing diversity, equity, and inclusion in the field of conservation. She earned a B.S. in Wildlife Management from University of Arizona in 1998, an M.S. in Zoology from North Carolina State University in 2001, and a Ph.D. from University of Florida in 2009 and was on faculty at University of Florida from 2010 - 2019. Her research program focused on population dynamics and habitat use of Wood Storks (*Mycteria americana*). She is currently a Courtesy Professor in the Department of Wildlife Ecology and Conservation at UF and lives in York, PA.

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The Diversity Committee thanks you in advance for your participation in this panel and for your dedication to personal learning surrounding Diversity, Equity, and Inclusion (DEI) within our society and the field of waterbird biology.

Kai Curry-Lindahl Award for Excellence in Conservation

Saturday, December 5, 2020


Jim and his son Don

This Year's Kai Curry-Lindahl Award goes to Jim Fraser!

Over the last two decades Jim and his extensive team of graduate students and post-doctoral fellows have studied the demography and conservation of Piping Plovers (*Charadrius melodus*) and other beach-nesting birds. Their contributions have been wide-ranging and form the basis for nearly all our understanding of the threats and consequences of those threats to the Piping Plover populations both in the Great Plains region of the United States, and on the east coast.

Jim has also provided interesting and creative ideas to the conservation of other at-risk species, including the Red Knot (*Calidris rufa*). He proposed that factors operating on the arctic-breeding grounds (patterns of lemming cycles) could well explain some of the declines in this endangered species. To put this in context, the still prevailing view is that the decline of this charismatic shorebird is intrinsically tied to the unsustainable harvesting of populations of horseshoe crabs (Limulus *polyphemus*). It took an act of bravery to suggest a possible alternative cause to the decline, especially in an issue where politics continues to play an outsized role.

Jim and his colleagues have also been involved with other contentious conservation issues, like a major bridge development that threatened a large colony of Royal Terns (*Thalasseus maximus)*. Through his advocacy and good science, an agreement was reached that resulted in a win-win situation, with new habitat created (and very quickly colonized) and a new bridge built.

Jim has an impressive legacy in waterbird biology. His funding successes have allowed him to address many waterbird conservation issues in creative ways, at the same time, training a new generation of technicians, and conservation biologists.

The Executive Council of The Waterbird Society is pleased to recognize Jim Fraser with the Kai Curry-Lindahl Award. This award calls attention to either a lifetime of singular efforts on behalf of the conservation or management of breeding waterbirds and their habitat, or to one outstanding example of such activity that has served as a model for future workers. It is named for one of the early pioneers in the conservation of vast areas of critical importance to freshwater colonial birds, not only in his native Europe but in Africa and Asia as well.

Jim is a Professor in the Department of Fisheries and Wildlife Sciences at Virginia Poly technic Institute and State University. Jim earned two Bachelor of Science degrees; SUNY Maritime College and the University of Idaho. His Masters and Ph.D. degrees were earned at the University of Minnesota in Fisheries, Wildlife, and Conservation Biology.

Jim will give the Kai Curry-Lindahl Award Lecture at our 45th Annual Meeting to be held in Texas in November 2021.

Conservation Publication Award Lecture

Saturday, December 5, 2020

Flávia Ribeiro is a biologist with a Master's degree in Ecology, Conservation and Management of Wildlife from Federal University of Minas Gerais, Brazil. Since 2005, she has been involved in the conservation of the Brazilian Merganser, a Critically Endangered species, conducting biological research and environmental education activities in the Serra da Canastra National Park region, working for the NGO Terra Brasilis Institute. She was a member of the advisory group of the National Action Plan for the Conservation of the Brazilian Merganser developed by the Brazilian government and is a member of the Threatened Waterfowl Specialist Group (WWT/IUCN) and Duck Specialist Group (IUCN). She is the author of the book 'The Brazilian Merganser in the Serra da Canastra - One of its Last Remaining Sanctuaries.

F. Ribeiro, L. Vanucci Lins, and F. H. G. Rodrigues. 2018. Reproductive Ecology of the Brazilian Merganser (Mergus octosetaceus) in Serra da Canastra National Park and Adjacent Areas, Minas Gerais, Brazil. Waterbirds 41: 238-246.

Overview of 2020 Annual Meeting

Monday, November 9, 2020

19:00 Keynote Speaker Gail Fraser, York University, Toronto, Canada *Offshore oil and seabird conservation: Lessons learned from the Canadian experience*

Tuesday, November 10, 2020

9:00 – 13:00 and 18:00 – 22:00 Council Meeting

Wednesday, November 11, 2020

8:30 Welcome and Announcements

9:00 Plenary Address Gopi Sundar, Cranes and Wetland Program, Nature Conservation Foundation, Mysore, India

10:00 – 12:00 Cranes and Storks

13:00 – 15:00 General Session

15:00 – 17:00 Climate and Conservation

19:00 – 21:00 East Asian Studies

Thursday, November 12, 2020

8:30 Welcome and Announcements

9:00 Plenary Address Peter Frederick, University of Florida, Gainesville, USA *Disentangling the real Everglades from its evil mercury-contaminated twin: a 35-year process*.

10:00 – 12:00 Conservation

13:00 – 15:00 Mapping and Monitoring

15:00 – 17:00 Tags and Movement

17:00 – 19:00 Student and Early Career Scientist Social

Friday, November 13, 2020

9:30 Welcome and Announcements

10:00 – 12:00 Survival and Reproductive Success

13:00 – 15:00 Population Genetics and Genomics

15:00 – 17:00 General Session Make-Up If Needed

November 15, 2020 Student Mentor Meet-Up

November 16, 2020

20:00 – 21:00 Anna Stunkle. Draw a Common Eider! Drawing provides a wonderful opportunity to develop your observation skills and further appreciate the beauty of waterbirds.

November 17, 2020

20:00 – 21:00 Lindsey Nielsen. In this virtual workshop we will explore the unique medium of scratchboard together. Also, a brief demonstration of two other fun printmaking techniques for you to try in the field!

November 19, 2020

13:00 – 16:00 Diverse Experiences and Inclusive Conversations in Waterbird Biology

How have racism and racial bias manifested in the study and conservation of waterbirds? How has the lack of ethno-racial diversity, representation, and inclusion shaped the experiences of Black, Indigenous, and People of Color (BIPOC) individuals in these fields? A candid conversation centered on these issues will be illuminated by a panel of three waterbird biologists speaking to their unique experiences, challenges, and motivations in their respective professions. The discussion will engage attendees during the live session in an effort to continue the conversation within The Waterbird Society, and across the academic, research, and public arenas that cultivate waterbird biology and conservation.

December 1, 2020

16:00 – 17:00 Meet the Editor of Waterbirds, Andrew Kasner

December 5, 2020

17:00 – 18:00 Business Meeting

18:00 – 19:00 Awards and Recognition Ceremony

Scientific Sessions

All times noted are ET/GMT-5

Underlined authors are presenting; student presenters are denoted by [*]

Wednesday, 11 November	
8:30	**Welcome & Announcements**
9:00	**Plenary Address - Gopi Sundar**
Cranes and Storks Live in India time zones (GMT+5:30)	
10:00	*WITHDRAWN*
10:20	[17*] **Environmental Niche Distribution Models of the Endemic Afrotropical Storks** Gula, Jonah, M. Clay Green, and Sarah Fritts
10:40	[18] **Effects of Disturbance on Ibibsill (*Ibidorhyncha struthersii*) in Sindh Valley of Kashmir Himalaya, India** Haq, Iqram Ul, Bilal A. Bhat, Khursheed Ahmad, Riyaz Ahmad, and Asad R. Rahmani
11:00	[33*] **Musical World of the Sarus Crane: Variation and Ecological Dependencies of Duets** Roy, Suhridam, and K. S. Gopi Sundar
11:20	[36*] **Risk of Overheating During an Acute Stress Response Varies with Body Size and Condition in the Altricial Young of a Subtropical Wading Bird** Shlepr, R. Kate, Sarah L. Milton, and Dale E. Gawlik
11:40	**Discussion**

Wednesday, 11 November	
	General Session
13:00	[40*] **Aleutian Tern Chick Diets in the Kodiak Archipelago, Alaska, USA** Tengeres, Jill E., Robin M. Corcoran, and Donald E. Lyons
13:30	[43*] **Perfluoroalkyl Substances in the Eggs of Brown Pelicans from South Carolina** Wilkinson, Bradley P., Anna R. Robuck, Rainer Lohmann, Heidi Pickard, and Patrick G.R. Jodice
13:40	[4] **Diving Deeper Into Tern Sleep: Exploring Sleep Behavior and Vigilance in Individually-Marked Common Terns (*Sterna hirundo*) Throughout the Daily Cycle** Arnold, Jennifer M., Ryan S. Hartman, Emily E. Case, Alexis Albu, Devin G. Tipton, and Stephen A. Oswald
14:00	[24*] **Inter-Annual Isotopic Niche Shifts of Three Breeding Alcids in Coastal Newfoundland with Varying Prey Biomass** Lescure, L., E. Jenkins, J. Gulka, and G. Davoren
14:20	[14*] **A Preliminary Study: Leach's Storm-Petrels and Their Weight Restricted Lives** Dubrow, Nathan A.
14:40	**Discussion**
	Climate & Conservation
15:00	[31*] **Adapting Venice to Rising Tides: A Multi-Functional Performance-Based Urban Design Approach to Flood Resilience** Osborn, Morgan N. and Hope H. Rising
15:20	[38*] **Effects of Climate-Mediated Changes in the Diet of a Threatened Gulf of Maine Seabird** Smith, Olivia and Elizabeth Craig
15:40	[2] **The Walrus and the Carpenter: Oyster Farms, Aquaculture, and Waterbirds in Eastern Maine, USA.** Anderson, John G.T.
16:00	[20*] **A Comparison of Within-Population Egg Variability in Two Species of Rails with Implications for Evolutionary Research and Conservation** Johnson, Emily W. and Susan B. McRae
16:20	[23] **Application of Value of Information to Prioritize Conservation Actions for the Eastern Black Rail on the Atlantic Coast** Lawson, Abigail J., James E. Lyons, Kevin Kalasz, Michael C. Runge, Amy Schwarzer, Michelle L. Stantial, and Mark Woodrey
16:40	**Discussion**

Wednesday, 11 November	
East Asian Studies Session Live in east Asian time zones - 8:00 Thursday (GMT+8)	
19:00	[9] **Tern Studies and Conservation Along the East Asian Australasian Flyway** Chan, Simba and Yat-tung Yu
19:20	[9] **Tern Studies and Conservation Along the East Asian Australasian Flyway** Yat-tung Yu and Chan, Simba
19:40	[22*] **Effects of Wind Speed and Direction on Black Tailed Gull (*Larus crassirostris*) Flight Height in Northern Hokkaido, Japan.** Kumagai, A., K. Kazama, K. Mikami, and Y. Watanuki
20:00	[26] **Bad Duck to Good Duck for Resolving the Lotus Field Netting Problem** Mashiko, Miyuki and Yasuhiro Yamaguchi
20:20	**Discussion**
Thursday, 12 November	
8:30	**Welcome, announcements**
9:00	**Plenary Address - Peter Frederick** **Disentangling the Real Everglades from its Evil Mercury-Contaminated Twin: a 35-Year Process**
Conservation	
10:00	[44*] **Nest Success and Beach Restoration: A Comparison of Three Beach-Nesting Birds in Coastal Louisiana** Williams, Kiah M., Katie Barnes, Sarah Bolinger, Erik I. Johnson and Caz M. Taylor
10:20	[45*] **Investigating the Sale, Purchase, and Collection of Federal Metal Bird Bands Among Waterfowl Hunters: Implications and Challenges for Waterbird Data Management** Wolford, J. Olivia
10:40	[3*] **Spatial and Temporal Distribution Patterns of Double-Crested Cormorants (*Phalacrocorax auritus*) and Other Species in the Penobscot River Estuary During River Restoration** Arno, E. Hallie and Justin R. Stevens
11:00	[10] **What's in the Future for Wading Birds Nesting on Marsh Islands in New Jersey?** Collins, Samantha A., Lisa M. Ferguson, Lenore P. Tedesco, and Brittany E. Morey
11:20	[6] **Relationship Between Metal Levels in Shorebirds and Crab Eggs During Migration** Burger, J., M. Gochfeld, and N. Tsipoura
11:40	[34] **Amassing and Use of the Consumed Plastics and Parasites Database for Waterbird Systems** Sheehan, Kate L.

Thursday, 12 November	
Mapping and Monitoring	
13:00	[29] **Mapping Habitat Suitability for the Eastern Black Rail Throughout the Atlantic Coastal Plain Using Maximum Entropy (MaxEnt)** Neice, Amberly A. and Susan B. McRae
13:30	[30*] **Cormorant Oceanography: Characterizing the *in situ* Ocean Environment Through Biologging** Orben, Rachael A., Dylan S. Winters, Adam G. Peck-Richardson, Greg W. Wilson, Dorukhan Ardağ, H. Tuba Özkan-Haller, Donald E. Lyons, and James A. Lerczak
13:40	[8*] **Assessing the Efficacy of Camera Technologies for Remote Monitoring of Shorebird Reproductive Success and Predator Communities on Metompkin Island, Virginia** Call, Mikayla N., Alexandra L. Wilke, Aylett Lipford, Zak Poulton, Emily D. Gardner, Ruth Boettcher, James D. Fraser, Daniel H. Catlin, and Sarah M. Karpanty
14:00	[21*] **Can Unmanned Aerial Vehicles and Novel Artificial Intelligence Techniques Improve Accuracy and Efficiency of Nesting Waterbird Monitoring? An Interdisciplinary Case Study in Maine** Kline, Logan R., Meredith Lewis, Lauren Maher, Alexander Revello, David Sandilands, Roy M. Turner, Daniel Hayes, and Cynthia Loftin
14:20	[25*] **Can UAVs Effectively Gather Population Data and Limit Disturbance of Colonial Waterbirds in Maine? Preliminary Observations and Next Steps** Lewis, Meredith, Logan Kline, Lauren Maher, Alexander Revello, David Sandilands, Daniel Hayes, and Cynthia Loftin
14:40	[37*] **Monitoring the Northernmost Black Skimmer Colony on the Atlantic Coast** Smith, Kayla, Liz Olson, Luanne Johnson, and Carolyn Mostello

Thursday, 12 November	
Tags & Movement	
15:00	[11] **Full Annual Cycle and Habitat Preferences of GPS-Tagged Urban Nesting Ring-billed Gulls (*Larus delawarensis*) from Hamilton, Ontario, Canada** Costa, Jeffrey and Dave Moore
15:20	[27] **Migration Routes and Winter Locations of North American Black Terns** Moore, David J. and Jeffrey N. Costa
15:40	[32] **Capturing the Movement Behavior of Individual Snail Kites to Understand Wetland Connectivity** Poli, Caroline and Robert Fletcher
16:00	[35] **Migration Routes and Wintering Locations of North American Black Terns (*Chlidonias niger*) from Across their Breeding Range, Revealed through Light-Level Geolocation** Shephard, Nicholas, Ann McKellar, Matthew Reudink, Dave Moore, Jeff Costa, Stephanie Beilke, and Erin Rowan
16:20	[12] **GPS Pinpoint Tags Have Transitory Effects on Ring-billed Gull Nest Attendance During Incubation** Costa, Jeffrey N., David J. Moore, Patrick Gilhooly, Moriah Greenhaw, James Quinn, and Olivia M.C. Trudeau
16:40	[5] **Should I Stay or Should I Go? The Decision of a Wilson's Plover in a Vanishing Landscape** Barnes, Katie B., Kiah M. Williams, and Erik I. Johnson

Friday, 13 November	
9:30	**Welcome, announcements**
Survival & Reproductive Success	
10:00	[13] **Least Tern Reproductive Success and Dispersal Following Complete Nest Loss Due to June Tropical Cyclones** Darrah, Abigail J.
10:20	[39] **Patterns of Adult Survival in a Struggling Shorebird Population Suggest Detrimental Effects of Predation** Stantial, Michelle L. and Jonathan B. Cohen
10:40	[42] **Survival and migratory timing of post-fledging piping plovers** Walker, K.M., D.H. Catlin, J.D. Fraser, S.M. Karpanty, and S.G. Robinson
11:00	[16] **Estimating Nest Productivity and Identifying Sources of Nest and Chick Mortality in Least Tern Colonies in the Outer Banks** Gallagher, Erin E. and Raymond M. Danner
11:20	**Discussion**
Population Genetics/Genomics & Connectivity	
13:00	[15*] **Population Structure of Black Skimmers (*Rynchops niger*) in North America** Finch, Rachael M., Katherine S. Goodenough, David Newstead, and Patricia Szczys
13:20	[1*] **Do Birds of a Feather Flock Together: Population Genetics of Yellow-nosed Albatross** Abeyrama, Dilini, Zach Dempsey, Peter Ryan, and Theresa M. Burg
13:40	[7*] **Population Genomics Elucidate Connectivity of Roseate Tern Populations in North America** Byerly, Paige A., Terry R. Chesser, Robert C. Fleischer, Nancy McInerney, Natalia Przelomska, and Paul L. Leberg
14:00	[19] **Migration Strategies and Global Connectivity of a Neotropical-Nearctic Migratory Shorebird** Herbert, John A. and Caz M. Taylor
14:20	[28] **Identifying Summer Locations of Lesser Black-Backed Gulls Wintering in Pennsylvania** Barber, Patricia, Daniel W. Brauning, and Sean P. Murphy
14:40	**Discussion**
Make-up Session If Needed 15:00 – 17:00	

Abstracts

Underlined authors are presenting; student presenters are denoted by [*]

[1*] Do Birds of a Feather Flock Together: Population Genetics of Yellow-nosed Albatross

Abeyrama, Dilini[1,3], Zach Dempsey[1], Peter Ryan[2], and Theresa M. Burg[1]

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The two species of yellow-nosed albatross, Atlantic (*Thalassarche chlororhynchos*) and Indian (*Thalassarche carteri*), are morphologically similar, however, they show some differences in behaviour and breeding range. We studied the genetic variation within and among the two species of yellow-nosed albatross using nuclear (microsatellite, Pema7 and Occa9) and mitochondrial (control region) markers. We analysed 354 samples from four breeding islands (Atlantic: Nightingale, Inaccessible, and Gough; Indian: Amsterdam) and bycatch samples from South Africa and New Zealand. Both types of markers differentiated the two species. Microsatellite and Occa9 nuclear markers revealed two genetically distinct groups within Atlantic yellow-nosed albatross, grouping birds from Nightingale and Inaccessible Islands together and separating birds from Gough Island. Nuclear markers confirmed that all bycatch samples were Indian yellow-nosed albatrosses, however, the bycatch birds from South Africa and New Zealand were distinct from each other and from birds breeding on Amsterdam Island, suggesting colony specific dispersal at sea. Both species are listed as endangered due to low reproductive success, limited number of breeding sites and large-scale threats such as commercial fishing. The results of our study help to build effective conservation and management plans for the two species.

[2] The Walrus and the Carpenter: Oyster Farms, Aquaculture, and Waterbirds in Eastern Maine, USA

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The decline of many traditional fin-fisheries in the Northeastern United States has lead to an increasing emphasis on near-shore aquaculture as a method to provide shellfish, finfish, and kelp. Aquaculture operations are increasing in both size and number, and inevitably lead to conflict among different users of the near-shore region, who may see “oyster farms” as unsightly blots on their view. In 2010 a local fisherman applied for a permit to operate an oyster farm in a small cove at the head of Mt Desert Island, Hancock Co. ME. The proposed site was within two miles of a regional airport, and abutting land-owners filed suit to block the permit, citing the perceived probability of increased bird strikes by aircraft approaching the cove. Studies of waterbird populations in the cove began in 2013. This paper reports the results of 7 years of monitoring. A total of 35 species of waterbirds have been recorded during the study period. Herring Gulls are consistently the commonest species in all seasons, rivaled by Bufflehead Ducks in winter months. The oyster floats did not attract large numbers

of loafing birds so long as preventer-spikes were attached to upper surfaces, although Common Terns can sit between spikes. Flying hawk decoys seemed to have no effect on roosting birds. As the oyster farm has expanded, and less care has been taken to maintain preventer spikes, increasing numbers of Double Crested Cormorants have used the floats as roosting sites from April through October. Total bird numbers and diversity in the cove are heavily influenced by seasonality and tide, and these factors are much more important than the presence or absence of oyster floats. There is little evidence that aquaculture operations are affecting total bird numbers, though some species may spend more time in the cove while floats are deployed. Birds roosting on floats create a potential public relations dilemma to the owners.

[3*] Spatial and Temporal Distribution Patterns of Double-crested Cormorants (*Phalacrocorax auritus*) and Other Species in the Penobscot River Estuary During River Restoration

Arno, E. Hallie[1] and Justin R. Stevens[2]

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While fish have been the main focus of the Penobscot River's restoration efforts, other species, especially seabirds, have benefited from both direct efforts and ecological influences. The Penobscot River has seen significant restoration efforts over the past twenty years, including dam removal, elimination of point-source pollutants, and restocking sea-run fish species such as Atlantic salmon and River Herring. We surveyed waterfowl along this river from 2011-2019 to explore patterns in abundance over space and time with a focus on Double-Crested Cormorants, the most abundant bird in the survey. We found an increase in fish biomass as well as Cormorant and Bald Eagle abundance over the survey period. Cormorant counts were both higher and more concentrated to the southern part of the river in late spring and summer where the rookery was located, although the increase in Cormorants did not appear to have a significant effect on fish biomass in that location. We did not find evidence for fish depletion by waterfowl; populations of both species seem to be driven by life history, habitat availability, and restoration efforts as opposed to predator-prey relationships, suggesting these species may have not reached their post-restoration carrying capacities. These data can inform Cormorant, Eagle, and other seabird management in the Penobscot River as well as provide ecological context for fish restoration efforts.

[4] Diving Deeper Into Tern Sleep: Exploring Sleep Behavior and Vigilance in Individually-Marked Common Terns (*Sterna hirundo*) Throughout the Daily Cycle

Arnold, Jennifer M.[1], Ryan S. Hartman, Emily E. Case, Alexis Albu, Devin G. Tipton, and Stephen A. Oswald

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Little is known about sleep and vigilance in terns despite nocturnal predators causing widespread breeding failure. Previously, we reported a multi-site study of nocturnal sleep posture and vigilance in incubating Common Terns, finding surprisingly large differences in sleep duration and vigilance that we hypothesized were due to individual predation risk (e.g., 64% of night with eyes open at the high-risk site versus 17% at the low-risk site). In 2019 predation pressure was reversed, as predators were present at the low-risk site while predation was minimal at the high-risk site. Here, we investigate changes in vigilance patterns under these new conditions, evidence for diurnal sleep compensation, and sex-specific nest attendance and behavior at these two sites. Data were extracted from 1-min time-lapse, trail camera images during 48-h continuous periods for 19 Common Tern nests during incubation. In the presence of predators, nocturnal vigilance more than doubled at the low-risk site (42% of night). Even though predation was much reduced at the high-risk site, breeding was disrupted by flooding and nocturnal vigilance increased 15% (to 79% of the night) and nocturnal sleep was reduced. Sexes shared nocturnal incubation evenly and were equally vigilant but only one partner attended the nest at night at the high-risk site (both partners attended the low-risk site 21% of the night), so we also explored behaviour at roosts. There was no evidence that reduced nocturnal sleep was compensated for during the day at nests: diurnal sleep was similar between sites (14-15% of daylight hours) and sexes (13-16% of daylight hours). Taken together with data we sampled more irregularly from a range of other sites, these results indicate that Common Terns modify their nocturnal vigilance and sleep behavior (but not diurnal behavior) in response to perceived individual predation risk and other environmental stressors may also play a role.

[5] Should I Stay or Should I Go? The Decision of a Wilson's Plover in a Vanishing Landscape

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Louisiana's rich and diverse coastal habitats are disappearing into the Gulf of Mexico because of complex and substantial erosion issues. Beach-nesting birds are among those impacted by coastal land loss and sea level rise, in addition to other threats, which could influence territory selection processes. We hypothesized that between-year site fidelity in Wilson's Plovers (*Charadrius wilsonia*) may be influenced by their previous year's breeding success, access to high-quality habitat, or both. Louisiana supports about 2,500 pairs of Wilson's Plovers, which is approximately 31% of the U.S. population. We banded adult Wilson's Plovers with field-readable codes to investigate survivorship, annual site fidelity, breeding productivity, and habitat use across multiple years in coastal Louisiana. Annual survivorship, accounting for imperfect detection, was 76.7% (SE 6.7%), and did not differ between sex, restoration status, or between years. For the surviving birds that returned each year, we used generalized linear mixed models to assess the significance of sex, breeding productivity, and distance to nearest mudflat in explaining variation in between-year site fidelity across 2017-2019. Our results indicated that males had a significantly higher probability (90.1%) of site fidelity in subsequent years compared to females (68.4%). Additionally, both sexes were more likely to be site faithful when territories

were closer to mudflats. Breeding productivity, however, did not predict variation in between-year site fidelity. Understanding these metrics has implications for future coastal restoration planning as we begin to understand species conservation needs and how these birds respond to large-scale restoration projects that directly impact these habitats.

[6] Relationship Between Metal Levels in Shorebirds and Crab Eggs During Migration

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Contaminants are of primary concern in coastal food webs. Along New Jersey's Delaware Bay shore, Horseshoe Crab eggs are one of the key components at the base of the food web when spawning crabs produce an abundance of eggs. This is a crucial food source for four species of shorebirds that must gain fat to fuel their flight to Arctic breeding grounds, as well as Laughing Gulls and other birds. Crab eggs also support fish, consumed by top-level predatory fish that are then consumed by egrets, eagles, ospreys and humans. We report temporal trends in feather levels of mercury and some other metals in shorebirds from early to the md-2010s, and examine levels of metals in blood of shorebirds and Laughing Gulls that are eating almost exclusively Horseshoe Crabs eggs during stopover at Delaware Bay. Crab eggs, and avian feathers and blood were collected in May from migrants, and analyzed in our laboratory with appropriate QA/QC. Although levels of some metals have remained stable or declined in eggs of Horseshoe Crabs since 1995, levels of mercury have decreased in some shorebird species since 1991, but not all. There is a significant correlation between levels of mercury in crab eggs and mean mercury levels in the blood of four species of shorebirds. Blood levels reflect local exposure during the weeks the birds feed in the Bay. Metal levels in shorebird feathers reflect sequestration of metals from blood during the winter molt in South America. Although all four species of shorebirds were feeding exclusively on crab eggs, Ruddy Turnstones which can dig out buried egg clusters, accumulated significantly higher levels of mercury in blood than the other three species. In the last several years, cold water temperatures have destabilized the timing of horseshoe crab spawning, leaving periods when eggs were less available. Global climate change, rising sea level, and changing weather patterns have impacted horseshoe crab spawning and may be de-coupled from shorebird migration timing. These factors jeopardize the co-evolved match between shorebirds and their food, and may impart exposure to mercury and other contaminants.

[7*] Population Genomics Elucidate Connectivity of Roseate Tern Populations in North America

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Anthropogenic disturbances such as population declines and habitat fragmentation are known alter dispersal patterns among subpopulations of wildlife, potentially leading to reproductive isolation that can contribute to reduced genetic diversity. While these effects are well-documented in terrestrial wildlife, barriers to dispersal of highly vagile taxa such as seabirds are less understood. Roseate Terns (*Sterna dougallii*) are a globally distributed seabird species, but populations tend to be patchy, and the species is declining across most of its range. In North America, the Roseate Tern subspecies *S. d. dougallii* is delineated into a federally endangered Northwestern Atlantic population and a threatened Caribbean population, both of which experienced major declines in the early 20th century. There is thought to be no gene flow between these two populations, an assumption based on geographic separation, morphological differences, and a lack of band returns; however, there may be potential for interbreeding, and the question of movement among these populations warrants further investigation. We investigated connectivity of Roseate Tern populations in North America to evaluate if historical population declines and habitat fragmentation have contributed to contemporary declines by inhibiting dispersal. We used SNP genomic markers generated via high-throughput sequencing to evaluate relatedness, population structuring, and population genomic parameters such as inbreeding among breeding populations of Roseate Terns in the Northeastern United States, Florida, and the Virgin Islands. We found strong evidence for differentiation between the Northeastern and Caribbean populations.

[8*] Assessing the Efficacy of Camera Technologies for Remote Monitoring of Shorebird Reproductive Success and Predator Communities on Metompkin Island, Virginia

Call, Mikayla N.[1,4], Alexandra L. Wilke[2], Aylett Lipford[2], Zak Poulton[2], Emily D. Gardner[1], Ruth Boettcher[3], James D. Fraser[1], Daniel H. Catlin[1], and Sarah M. Karpanty[1]

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Metompkin Island, a local and regional hotspot for breeding American Oystercatchers (*Haematopus palliatus*), supports over 100 pairs annually. American Oystercatcher productivity rates have recently declined, averaging 0.25 ± 0.06 (Mean ± SE) fledged chicks/pair from 2016–2018, compared to 0.73 ± 0.08 from 2002–2015. American Oystercatcher fledge rates seem to have declined more than hatch rates. Field-based monitoring by managers to identify these threats can be problematic because signs of nest failure are ephemeral, especially when monitoring intervals are ≥1 week in length, and chicks are often difficult to relocate. We deployed 27 cameras on Metompkin Island in 2019 to monitor American Oystercatcher nests. Additionally, we set up 11 cameras at active brood-rearing sites and 7 cameras along a transect parallel to the marsh edge to monitor brood survival and predator activity, totaling 45 cameras. Nest cameras improved accuracy over traditional field-based monitoring assignment of nest

fates and causes of failure by allowing for assignment of nest fate to nests marked "unknown" in the field. Nest cameras documented fifteen species involved in disturbance or predation events at or within sight of the nest. Transect cameras at the marsh edge also documented activity of non-shorebird species, including known and potential predators. Diamondback Terrapins (*Malaclemys terrapin; n* = 375; 116.46 capture events/100 camera days) were the most frequently encountered species on the transect cameras; although not known to be predators, the terrapins' presence did result in antipredator responses of adult American Oystercatchers with broods. Grackles (*Quiscalus* spp.; *n* = 311; 96.58) and Atlantic ghost crabs (*Ocypode quadrata*; *n* = 252; 78.26) were the second two most encountered species at the transect cameras. All cameras were beneficial for monitoring chick survival until fledging. While our cameras did not capture any chick predation events, they captured brood presence, potentially allowing for remote monitoring of brood survival if all broods are identifiable. One unexpected benefit of camera monitoring with direct management implications was improved understanding of human visitor use of the island and potential impacts to shorebird reproductive success.

[9] Tern Studies and Conservation Along the East Asian Australasian Flyway

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Seabird study is not a very active topic long the East Asian Australasian Flyway (EAAF), particularly in the warmer regions of the flyway. From limited literature and records we know the number of breeding seabirds has suffered a big decline in the last hundred years. However, basic information such as population estimation, migration routes and trends are still seriously insufficient. In 2006 the Seabird Working Group was established under the EAAFP (Partnership along the EAAF). Over the past 10 years we have been focusing studies and conservation efforts on tern species, particularly the Global Critically Endangered Chinese Crested Tern and the closely associated Greater Crested Tern, and also other species such as Aleutian Tern, Bridled Tern, Black-naped Tern, Roseate Tern, and Little Tern. We have supported restoration of crested tern colonies in China and Korea, and migration studies of crested terns in eastern Indonesia. We believe experience on other crested tern species in North America will be very useful to our work in Asia, and look forward to developing closer links with tern experts in America, Australia and the Pacific countries.

[10] What's in the Future for Wading Birds Nesting on Marsh Islands in New Jersey?

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Colonial nesting wading bird species (Ciconiiformes) in the coastal region of New Jersey are facing population declines. Ongoing aerial surveys show a decrease in the

number of active nesting colonies state-wide over the last 20 years, and habitat suitability appears to be a contributing factor to this trend. Research to investigate habitat suitability and nest success for these sensitive species is considered a priority for this region to provide recommendations on marsh island management and habitat enhancement plans near colony sites. We monitored species abundance, nest site selection and nest success for six wading bird species at two sites in Cape May County for the 2019 and 2020 nesting seasons (April – July). Two islands within the Seven Mile Island Innovation Laboratory (SMIIL), Gull Island and Sturgeon Island, host approximately 27% of nesting wading birds in New Jersey on decades-old dredged material placement areas, now dominated by *Phragmites australis* and *Iva fructescens*. Overall nest success for all wading bird species was higher on Gull Island (81%) compared to Sturgeon Island (64%), which experienced more overwash and avian predation. Changes in species abundance and nest success were evident within nesting areas between years and evidence of interspecific competition within nesting areas was apparent. With few alternative sites, habitat enhancement and management may be necessary to provide more suitable habitat for wading birds and improve reproductive outcomes. Collaboration with state and federal partners to beneficially use dredged material during maintenance dredging of navigational waterways is being implemented to create habitat for sensitive nesting wading bird species on Gull and Sturgeon Islands. Continued surveys of habitat use and nest success for wading birds in these areas will inform management efforts to help species adapt to current and future changes in habitat.

[11] Full Annual Cycle and Habitat Preferences of GPS-Tagged Urban Nesting Ring-billed Gulls (*Larus delawarensis*) from Hamilton, Ontario, Canada

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The miniaturization of technology has led to breakthroughs in life cycle analysis by allowing the movements of avifauna to be recorded in highly precise detail. A common global issue is to understand the ecology of relatively recent urban colonists such as gulls, to inform management and conservation decisions in relation to increasing populations. In Ontario, the Ring-billed Gull *(Larus delawarensis)* fills this role, as recently, there has been an increase in urban nesting on large roofs and other urban sites. The increase in urban-nesting gulls has led to various conflicts with humans such as general nuisance, property damage, economic losses and threats to human health and safety. As part of a larger study, the annual movements and habitat use of adults Ring-billed Gulls were examined by fitting 32 individuals with GPS tags (Lotek PinPoint GPS 240, n=10; Lotek PinPoint GPS VHF, n=7, Ornitela OrniTrack-10, n=15) at their breeding site in Hamilton, Ontario, Canada in 2019. Of the 32 tagged gulls, the full annual cycle was collected for 16 individuals, partial data for 10 individuals, and no data for 6 individuals. The migratory distance of the gulls ranged from 250km to over 1500km as some birds wintered in the Great Lakes region while others wintered as far south as Florida. Each individual had between 1-10 stopover sites where they frequented a variety of land types such as waterbodies, agricultural fields, urban plazas, waste management facilities and green spaces. The results highlight how

variable annual movements, and habitat usage was among individuals and highlight the adaptability of the Ring-billed Gull.

[12] GPS Pinpoint Tags Have Transitory Effects on Ring-billed Gull Nest Attendance During Incubation

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As part of a larger study on movement and habitat use by urban-nesting Ring-billed Gulls *(Larus delawarensis)*, we assessed the effects of global positioning system (GPS) pinpoint tags (PTTs) on adult behaviour and other short and long term reproductive endpoints. After the peak of clutch completion in 2019, we randomly assigned 3-egg nests to either tagged (n=31) or control (n=28) groups. During mid-incubation, a single adult at each study nest was captured and fitted with stainless-steel and field-readable plastic leg bands. Birds at tagged nests also received a PTT (Lotek PinPoint GPS 240, n=10; Lotek PinPoint GPS VHF, n=7, Ornitela OrniTrack-10, n=14), attached using a backpack harness, and weighing 10.0-10.5 g including harness material (1.8-2.2% of body mass). Nest attendance was collected for both pair members at each nest using cameras (photos at 5 sec intervals, mean duration = 2.5±0.1 [se] h, range = 1 – 5.2 h) during two time periods: (i) within 9 h of capture and (ii) an average of 6.3±0.3 days later (range = 3-9 d post-capture). We found evidence of a short-term effect of PTT attachment on incubation effort. On the day of capture, tagged birds spent less time incubating (32.5±7.7%), with compensatory behavior by their mates, than controls receiving bands only (48.4±6.4%). However, by approximately a week after PPT attachment, incubation effort was similar between tagged (56.1±7.2%) and control (56.5±7.6%) birds. There were no effects of PTT model or gender (tagged: 17 females, 14 males; control: 14 females, 14 males) on the proportion of time spent incubating. Hatching success did not differ between tagged and control nests in 2019. In the subsequent breeding season (2020), we did not detect differences in return rates, territory locations, clutch initiation dates, or clutch or egg size between tagged birds and controls. Tag effects in this study were transitory and limited to the immediate period following tag attachment. We recommend allowing gulls to acclimate to tags for a few days before movement data are collected.

[13] Least Tern Reproductive Success and Dispersal Following Complete Nest Loss due to June Tropical Cyclones

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Beach-nesting birds face numerous threats related to anthropogenic climate change, including sea level rise, shoreline erosion, and increased storm activity. The effects of tropical storms and hurricanes on breeding bird productivity depend on the timing of

storms within the season and species-specific response attributes including renesting probability. In this study, I compared Least Tern (*Sternula antillarum*) productivity on the Mississippi coast during two years with June tropical storms (2017 and 2020) to two years with storm systems occurring only after most colonies had fledged chicks (mid-July or later; 2018 and 2019). For storm years, I estimated renesting probability as the number of nesting pairs post-storm divided by number of nesting pairs pre-storm. I used logistic exposure methods to compare daily nest survival probability pre- and post-storm, and to compare nest survival probability during similar time frames in non-storm years. Both June storm systems resulted in complete nest failure and loss of all chicks aged less than 2 weeks post-hatch. Post-storm renesting rates were 7-41%. Nest survival probability decreased post-storm ($\hat{\beta}$ = -3.8, -4.7–-2.9 BCI), while in non-storm years, temporal effects on nest survival varied between years. Storm year productivity (0.07 - 0.0003 fledges per pair) was lower than non-storm years (0.54–0.28 fledges/pair). In both storm years, colonies mostly reformed at the same locations, with 20–23% of renesting occurring at new locations. In 2020, using banded bird resighting data, I compared pre- and post-storm colony use for 12 banded Least Terns for which nest location was documented or strongly suspected based on behavior. Five birds renested in their pre-storm colony and the other 7 moved a mean of 7.1km (range 6.1–7.6). In all cases of movement, birds left a colony that did not reform post-storm. The results of this study indicate that storms making landfall in June are detrimental to Least Tern productivity despite the potential for renesting. Anecdotal evidence suggests that avian predators were responsible for poor post-storm productivity, with storm debris potentially attracting predators including locally displaced colonial breeders such as Laughing Gulls (*Leucophaeus atricilla*).

[14*] A Preliminary Study: Leach's Storm-Petrels and Their Weight Restricted Lives

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I recorded the weights of Leach's Storm-Petrels (*Oceanodroma leucorhoa*) during the summer of 2020, while stationed on Great Duck Island, Hancock County, Maine, USA, in order to explore the dependencies on weight in which the species is so restricted by. Leach's Storm-Petrels are an abundant nesting species on Great Duck Island, with the most recent estimate being 16,159 +/- 6388 occupied burrows in 2019. While the adults were incubating, both individuals were banded with a federal metal band to identify each bird as they took their turn in the burrow. During incubation, the burrows were grubbed daily in order to obtain the weight of each adult for an entire feeding/incubation cycle. Once this cycle was completed, the burrows were left alone until the egg hatched. Once hatched, the burrows were checked every two days to assess the weight gained by the chick. During this time, game cameras were implemented to observe when adults returned to their burrows at night to feed their chick. Unfortunately, identifying the individual returning to the nest was not possible, as the adults enter the burrow, feed the chick, and leave in a short period of time, all under the cover of darkness. While some preliminary data suggests that adults lose considerable weight each day, and chicks gain similarly, further studies are necessary to look at the tradeoffs of energy put into the collection of food and the feeding of the chick.

[15*] Population Structure of Black Skimmers (*Rynchops niger*) in North America

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Population structure is highly variable and framed by a variety of biological processes, one of which being dispersal. High dispersal rates can result in mixing of populations causing weak population structure, while minimal dispersal can result in increased population fragmentation and strong population structure. Attempting to track dispersal through applied movement techniques would be cost prohibitive. Molecular techniques can now provide information on population structure that can assist with understanding population structure. Black Skimmers (*Rynchops niger*) are colonial seabirds that breed along sandy substrates along coasts and inland river systems across the Americas. No study has documented genetic variability or geneflow in North America for this species of High Conservation Concern, and only one small study has been reported from South America. The objective of this study was to optimize a panel of molecular markers to assess genetic variability within and among North American populations. Seventy-three individuals were sampled from three locations: San Diego, California (n=16), Gulf Coast of Texas (n=27), and Long Island, New York (n=30). Eight individuals were tested for 25 microsatellite loci to assess their utility and polymorphism for Black Skimmers. Of the 25 loci, nine were successful and were subsequently genotyped for all individuals. Population differentiation among sites was moderate (Global F_{ST} = 0.0363 and 0.0365) but skimmers sampled in California are significantly differentiated from those in Texas and New York (F_{ST} = 0.038, $P < 0.006$), pairwise D_{EST} values were all significant ($P < 0.005$; NY-TX 0.018, NY – CA 0.049, TX – CA 0.039), and STRUCTURE estimated the number of genetic clusters to be two or three. The clustering of individuals into 2-3 genetic clusters is consistent with our understanding of non-breeding distributions of North American Black Skimmers. Further, the distinctiveness of the California population could be a result of the more recent founding coupled with a small non-breeding distribution. Our assessment of genetic diversity and population structure can be combined with previous applied movement techniques, i.e. mark-recapture and telemetry studies to develop a holistic strategy to understand full annual cycle movements in relation to genetic structure.

[16] Estimating Nest Productivity and Identifying Sources of Nest and Chick Mortality in Least Tern Colonies in the Outer Banks

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Least Terns are a beach nesting species, and their breeding sites are especially vulnerable to both human and non-human impacts. Least Terns are listed as a species of Special Concern in North Carolina. We are assisting the National Park Service at

Cape Hatteras National Seashore to evaluate the efficacy of their existing Least Tern protection protocols by measuring daily survival rates for Least Tern nests and unfledged chicks and identifying human and non-human sources of nest and chick mortality. Data and observations were collected in the summers of 2019 and 2020 utilizing two monitoring methods: ground-nest counts and incubating-adult counts. Along with nest fate, we recorded data on potential sources of human and non-human nest mortality. We calculated daily survival rate (DSR) for Least Tern nests using nest survival analyses included in the R package RMark. Known fates were recorded for 35 nests in 2019 and 291 nests in 2020. 2019 sites included Cape Point West (n=25) and Cape Point East (n=10). These sites had an overall hatched percentage of 74.3%. 2020 sites at Cape Hatteras included Cape Point (n=55), South Beach (n=92), Ramp 23 (n=22), and north of Ramp 23 (n=4). Additional sites in Pea Island National Wildlife Refuge included Pole 47 (n=28), Pole 57 (n=24), and Oregon Inlet (n=66). In 2020, there was an overall hatched percentage of 74.2%; in Cape Hatteras, 71% of nests hatched compared to 80% in Pea Island. Preliminary estimates of DSR were near 1 for each season. This result is as expected given the relatively high rate of hatching success observed in the field. In 2021, we will implement additional methods to reduce potential sources of bias and increase sample sizes, and also monitor chick movements and mortality, which will help to understand overall colony productivity. Using both field observations and DSR analyses to identify the influence of human and non-human factors may help management agencies plan conservation actions at individual colonies and lend a better understanding of the greater meta-population dynamics at play regarding Least Tern nesting sites.

[17*] Environmental Niche Distribution Models of the Endemic Afrotropical Storks

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African storks are significantly understudied despite recognized declining population trends in parts of their ranges. A lack of knowledge about basic environmental requirements has precluded empirical conservation status assessments and action plans, which are especially important in the face of climate change and ongoing wetland degradation. We developed the first range-wide environmental niche models for six endemic African species–African Openbill (*Anastomus lamelligerus*), Abdim's Stork (*Ciconia abdimii*), African Woollyneck (*Ciconia miscroscelis*), Saddlebill Stork (*Ephippiorhynchus senegalensis*), Marabou Stork (*Leptoptilos crumeniferus*), and Yellow-billed Stork (*Mycteria ibis*)–to determine what variables constrain distribution. Locality data were collated from a variety of online databases and literature sources for each species, which were incorporated into models with climate and vegetation cover layers in the machine-learning program MaxEnt. Niche overlap among the species was evaluated using Warren et al.'s *I* metric (range: 0–1) in the program ENMTools to assess the extent to which niche partitioning occurs. MaxEnt models showed high predictive capacity for each species, indicating the input variables capture environmental distribution determinants well. Annual precipitation was the single most important variable for every species, followed by vegetation cover. All species showed near-identical responses to annual precipitation, with the highest

probability of occurrence between 500 and 1,000 mm and sharp declines in probability outside this range. Niche overlap between all species was significantly high (>0.9). These findings demonstrate the sensitivity of African storks to changes in annual precipitation, which is already evidenced by West African population declines following long-term drought. Further research should focus on ecological requirements at smaller scales given the variation in future climate predictions for different parts of Africa. Attention should also be given to how interspecific interactions with one another and their prey may influence regional population dynamics.

[18] Effects of Disturbance on Ibibsill (*Ibidorhyncha struthersii*) in Sindh Valley of Kashmir Himalaya, India

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The Himalayas, known for rich biodiversity are most affected ecosystems, witnessing threefold increase in temperature than global average for climate change, besides they also face heavy disturbance as a result of various anthropogenic activities. Human disturbance is often considered as a potential threat to biodiversity, affecting many animal species. The Ibisbill *Ibidorhyncha struthersii* is a riverine bird that lives in the Himalaya and Tibet, and faces increasing biotic threats. We conducted surveys along a high-altitude Himalayan river, Sindh and six sites based on the bird occurrence. Based on two year study, we found that sand and boulder mining was the biggest disturbance (38%, n=2268), followed by human presence (34.56%), livestock grazing (12%), and predation by natural predators and free-ranging dogs (9%). Other disturbances seen were by birds (4%) such as (black kite, jackdaw, yellow billed blue magpie) and movement of fishermen (3%).The disturbances per hour were higher at site III (2.61 disturbances / hour) and least at site IV (0.29 disturbances / hour) as the site III witnessed highest pressure from human activities like mining, fishing and tourism. We found that the Ibisbill flies longer distance due to human disturbance than non-human disturbance. The study is first ever scientific documentation that highlights the vulnerability of Ibisbill to increasing levels of anthropogenic disturbance in River Sindh. The protection of such habitats is vital for conservation and management of this species as none of these sites are included in protected areas.

[19] Migration Strategies and Global Connectivity of a Neotropical-Nearctic Migratory Shorebird

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After crossing an ecological barrier, migratory birds have depleted body condition and need to stop to refuel. During spring migration, migratory birds employ time-minimizing strategies to reach their breeding grounds as quickly as possible, but the tactic employed at individual stopover sites depends on the availability of high-quality habitat along the route. When high quality habitat is abundant along the migration route, birds will stop for short durations at high quality sites where they are able to refuel quickly. If habitat is limited on the migration route, birds will remain longer at higher quality sites compared to poorer quality sites, to optimize their flight range. We assessed the spring migration strategy used by a Neotropical-Nearctic migratory shorebird, semipalmated sandpiper (*Calidris pusilla*), at two sites with known relative habitat quality on the coast of the Northern Gulf of Mexico. Using a variety of techniques, we also investigated breeding and winter origins of the birds and subsequent migratory movements. We used automated radio telemetry to estimate drivers of variation in stopover duration and probability of departure from the two sites. We measured fuel load at capture, determined sex from genetics, and age from stable isotope signatures of feathers. We assigned approximate breeding region based on morphometrics as well as, for adults, winter provenance based on stable isotopes. Subsequent detections on the Motus radio telemetry arrays allowed us to calculate migration speed for some individuals as well as confirm some of the breeding and wintering region assignments. Stopover duration declined with fuel load as expected under a time minimizing strategy, but, after accounting for fuel load, stopover duration was approximately 50% longer at the higher quality site. Our models found no effect of age, sex, or breeding location on stopover behavior. Probability of departure was strongly affected by humidity and also by tailwind and visibility. Detections of our radio-tagged birds after departure indicated that birds that stopped at the higher quality site migrated faster. The Louisiana coast is an apparent hub for this species, as we the individuals were assigned to breeding and wintering regions throughout their ranges. Our study shows how high-quality, coastal wetlands along the Gulf of Mexico serve a critical role in the annual cycle of migratory shorebirds. These habitats are the first available stopover sites after crossing an ecological barrier and a nexus for this near-threatened species and likely others. Stopover behavior suggests that high quality habitat is limited north of the GOM in the continental U.S. during spring migration as well as along the Gulf Coast itself. As the threats to the Gulf of Mexico coast increase, protection of these already limited wetlands is vitally important.

[20] A Comparison of Within-Population Egg Variability in Two Species of Rails with Implications for Evolutionary Research and Conservation

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Where birds nest in close quarters or are at risk of brood parasitism, it is important for females to be able to recognize their own eggs. Selection can act on egg characteristics (size, shape, color, and spot pattern) leading to the development of maternally unique signatures. If eggs are distinctive enough, breeding females can be identified based on these distinctive characteristics in a monitored population. Being able to identify individuals based on their eggs would allow managers to track the longevity and return-rates of breeding females in a population in a minimally invasive

manner. We investigated aspects of egg variability using standardized clutch photos and egg measurements for 2 rail species with similar eggs. King Rail *Rallus elegans* egg data were collected via systematic searching of appropriate freshwater habitat for nests from 2011-2020 at Mackay Island National Wildlife Refuge in North Carolina. Common Moorhen *Gallinula chloropus chloropus* egg data were obtained from a 1991-1993 study of a well-documented wild population at Peakirk Waterfowl Gardens in Cambridgeshire, UK. In both studies, nests were monitored to determine their final fate and opportunistic captures of adults and chicks were conducted. All eggs were measured using dial calipers and when a clutch was completed a standardized photograph was taken. We investigated inter- and intra-clutch variation in egg patterning in both species. The primary objective was to determine if either or both species have egg pattern signatures that allowed us to assign maternity using the pattern detection and recognition program *NaturePatternMatch*. Preliminary analyses indicate *NaturePatternMatch* results were similar for both species in the rate of correctly matched eggs. Ongoing analyses are investigating how other egg characteristics, such as size, interact with patterning and if this increases matching potential.

[21*] Can Unmanned Aerial Vehicles and Novel Artificial Intelligence Techniques Improve Accuracy and Efficiency of Nesting Waterbird Monitoring? An Interdisciplinary Case Study in Maine

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Traditional avian survey methods have limitations in observer and detection errors and may cause disturbance to nesting birds. Recently, Unmanned Aerial Vehicles (UAVs) have been used in monitoring wildlife populations, including colonial nesting waterbirds. Lightweight, programmable for automated flight, and able to accommodate navigational and photographic instruments, UAVs offer solutions to limitations of traditional surveys such as minimizing disturbance created during ground surveys. These advantages also have costs, such as the amount of labor required to manually interpret recorded imagery. The development of automated image processing tools for object detection and classification with artificial intelligence offers promise, though issues persist in the application of this technology on a broad scale. The goal of our research is to develop accurate and efficient automated processes for estimating colonial nesting waterbird abundance in terms of species and behavior from plane- and UAV-based imagery as well as ground-based counts of bird populations within the Gulf of Maine region. In May-July 2020, we flew UAVs over populations of Double-crested Cormorants, Herring Gulls, Great Black-Backed Gulls, Common Eiders, and Great Blue Herons at various altitudes, resulting in imagery ranging in resolution from 0.3-2.6 cm/pixel. Subsequent ground surveys for applicable species collected

information on nest presence that will be used for validation purposes. Through an interdisciplinary effort combining the skills of ecologists, remote sensing technologists, and computer scientists, we will evaluate information gained at various plane and UAV flight altitudes by comparing manually interpreted bird species and behavior classification and counts against ground surveys. This will generate an understanding of sources and amounts of errors in population estimates developed from these survey platforms. Additionally, we are applying novel approaches to machine learning to algorithms that will segment plane- and UAV-based imagery and identify waterbirds to species and behavior. Finally, we will deploy an open-source, web-based application to facilitate automated image processing and bird identification for biologists and citizen scientists across the country. This highly collaborative effort has integrated graduate students in ecology, remote sensing, and computer science; teams of multidisciplinary undergraduates; faculty across multiple departments; and state and federal biologists.

[22*] Effects of Wind Speed and Direction on Black-Tailed Gull (*Larus crassirostris*) Flight Height in Northern Hokkaido, Japan

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As an island nation, Japan has a high potential for producing renewable energy through offshore wind farms. However, proposed locations for wind farms often overlap with areas which are important to breeding and foraging seabirds. Wind farms are thought to impact birds through an increase in barrier effects and risk of collisions. This study, as one of the first steps to examine the impacts of offshore wind farms in Japan, examines flight heights of Black Tailed Gulls (*Larus crassirostris*) in relation to wind conditions (i.e. direction and speed). The study sought to examine whether *L. crassirostris* flew at heights which placed them at high risk of collision with turbine blades (20-140m above sea-level) under certain wind conditions. The study also looks at whether flight patterns (e.g. take-off, hovering, and landing flights) were related to certain wind conditions. Over 60 *L.crassirostris* were tagged with GPS loggers (GipSy-5, Technosamrt, Italy and GipSy-Remote, TechnoSmart, Italy) over the course of the 2016 to 2018 breeding seasons at 5 different colonies in 2 locations: Rishiri Island and the coastal town of Esashi, both located in Northern Hokkaido. These loggers recorded GPS positions and flight height information every second. 107 flight tracks were recorded within a 1km radius from the 8 Automated Meteorological Data Acquisition System (AMeDAS) in Northern Hokkaido. Flight heights data (recorded every second) of these flight tracks were then compared with the wind speed and direction of the nearest hour recorded by the AMeDAS. A greater understanding between gull flight heights/patterns and wind condition could lead to a better understanding of not only the collision risks of *L. crassirostris* but also the barrier effect allowing us to examine how well these species will be able to maneuver between wind turbines and provide species-specific analysis of wind farm impacts.

[23] Application of Value of Information to Prioritize Conservation Actions for the Eastern Black Rail on the Atlantic Coast

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Value of information (VoI) evaluates the importance of different scientific uncertainties in the context of management. VoI is a useful approach in adaptive management, though the quantitative information needs are substantial. We used a new qualitative approach to estimating VoI to prioritize potential habitat management experiments designed to benefit eastern black rails (*Laterallus jamaicensis jamaicensis*) on the U.S. Atlantic coast. Thirteen different management experiments were identified by a group of black rail experts and habitat managers participating in an adaptive management workshop held in January 2020. Twenty-six workshop participants scored the experiments, which were stated as alternative hypotheses, based on their expert judgment about 1) the degree of theoretical foundation and empirical support in the literature, 2) relevance to management decisions, and 3) degree to which uncertainty could be reduced. Using the participant's scores, we calculated a qualitative VoI and assigned each hypothesis to one of four prioritization categories. More than half of the hypotheses (n=7) were designated as "Highest" priority, meaning that their theoretical foundations were highly uncertain but resolving the uncertainty was deemed relevant to management decisions and attainable. Two hypotheses were assigned to the "High" priority category, followed by Medium (n=1), and Low (n=3). Many of the hypotheses included uncertainties related to patch size, effects of vegetation management, and threshold effects of woody vegetation cover. Several hypotheses also focused on evaluating management treatments such as prescribed fire, irrigation, and microtopography creation. We discuss the qualitative VoI framework and its use in endangered species recovery planning -- for which the causes of population declines may be uncertain and the resources to implement conservation actions limited -- and highlight several of the proposed management experiments deemed most promising for eastern black rail conservation on the Atlantic coast.

[24] Inter-Annual Isotopic Niche Shifts of Three Breeding Alcids in Coastal Newfoundland with Varying Prey Biomass

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Variation in prey availability can lead to dietary shifts in seabirds, which in turn can be constrained by interactions with other species that rely on similar prey types. In coastal Newfoundland, Capelin (*Mallotus villosus*) is the primary forage fish species that migrates in high abundance from offshore into coastal areas to spawn during the

seabird breeding season. However, in association with varying oceanographic conditions, Capelin biomass as well as their timing of inshore arrival and spawning have become highly variable. We tested the hypothesis that the dietary niche of three breeding alcid species are influenced by inter-annual changes in Capelin availability. We investigated species- and assemblage-level responses of Razorbills (*Alca torda*), Atlantic Puffins (*Fratercula arctica*), and Common Murres (*Uria aalge*) to interannual variability of Capelin by combining ship-based measures of fish biomass and blood stable isotopes (δ^{15}N, δ^{13}C) to estimate seabird isotopic niche, as a proxy of dietary niche, during the chick-rearing period over three years (2017–2019). As predicted, isotopic niche breadth contracted and trophic position (δ^{15}N) increased as Capelin biomass increased, suggesting a higher reliance on Capelin with the exception of Common Murres where trophic position and niche breadth were relatively consistent among years. Niche overlap between species, however, did not consistently increase under higher Capelin biomass, as predicted. Razorbill and Atlantic Puffin isotopic niche overlap decreased from 13.6% to 0.0% in the year of highest Capelin biomass, suggesting increased niche partitioning, while overlap between Common Murres and Razorbills increased from 18.3% to 61.5%, predictably suggesting decreased niche partitioning when resources were unlimited. At the alcid assemblage-level, trophic diversity increased with lower Capelin biomass, suggesting a greater reliance on alternative prey. Overall, findings suggest that birds consume a wider variety of prey types to supplement their diet in years of lower Capelin availability, with the exception of Common Murres, and in some cases increase dietary niche overlap when Capelin biomass is high. These findings suggest these marine predators may tolerate climate-derived changes in prey availability to varying degrees.

[25*] Can UAVs Effectively Gather Population Data and Limit Disturbance of Colonial Waterbirds in Maine? Preliminary Observations and Next Steps

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Patterns of colonial waterbird declines, and their designation as indicators of ecosystem health, solidify the need for population monitoring. Gathering accurate estimates of abundance, distribution, and productivity are imperative to understanding the effects of environmental stressors on colonial waterbirds. Given the propensity of these species to congregate to nest, disturbances at colonies from ground surveys can be detrimental to large numbers of birds and may have a higher impact on populations. This, combined with the relative inaccessibility of sites and the time and expense of surveying, presents challenges to monitoring colonies. Advances in technology, along with increased accessibility, have led to exploration of alternative methods for surveying wildlife. The number of studies using unmanned aerial vehicles

(UAVs) or “drones” as a survey platform have increased in recent years. The benefits of using UAVs are numerous, as they offer high image resolution, reduce the potential of observers damaging chicks and nests, and may help limit survey-induced predation. However, suitable protocols regarding their implementation are not well developed for all species, and possible disturbances associated with UAVs, as well as a comprehensive evaluation of their utility warrant further study. From late May-July 2020, we conducted pilot flights of breeding waterbird colonies with UAVs at six coastal islands in Maine and one inland heron rookery site. Surveys were conducted at a range of heights above the ground, and colonies were monitored and filmed for flight responses to the UAV. Aerial imagery was also collected for each flight and mosaicked to estimate nesting bird abundance at colonies. The goals of our research are multi-faceted. First, we will evaluate how the use of UAVs affects the behavior of multiple waterbird species throughout the breeding season. Second, we will utilize aerial imagery collected at from multiple surveys during the breeding season to estimate breeding bird abundance, estimate productivity at the colony level, and evaluate the efficacy of UAV technology in surveying colonial waterbirds in Maine. This preliminary work aims to improve survey accuracy and efficiency through the development of species-specific protocols regarding the use of UAVs at waterbird colonies.

[26] Bad Duck to Good Duck for Resolving the Lotus Field Netting Problem

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Lotus root is one of the popular vegetables and is considering "good luck" in Japan as people can see into the future through holes in the roots’ cross-section; however, "bad luck" is occurring. Lake Kasumigaura, located about 60 km northeast of Tokyo, is surrounded by the largest producing area of 16,000 ha of lotus paddies. The area is semi-natural wetland and provides valuable foraging habitat for many waterbirds like herons, migratory shorebirds, and wintering ducks. The "bad luck" is the recent estimate indicating that waterfowl damage to lotus roots exceeds $2 million annually. Since 2004, many farmers set bird nets covering the paddies about 2 m height with 12-16 cm square mesh size on top and 4-12 cm square mesh size on each side, using partial financial support from the local governments. But many lotus fields have inadequate nets with opening somewhere. Birds could walk under the nets from the openings, and thus, over 2,000 birds in each year - from abundant Eurasian Coots and Common Teals to an endangered species Oriental White Stork - were found dead after entanglement in the nets after they tried to take off. We aim to resolve this "bad luck" situation and turn into "good luck" for both lotus farmers and waterfowls. Here we will present the following works that have just started: (1) interviewing farmers to clarify problems in managing current bird nets, (2) quantifying the amount of waterfowl damage to lotus roots, (3) recording the foraging behavior of waterfowls in lotus paddies at night, and (4) evaluating lotus paddies as habitat for waterbirds.

[27] Migration Routes and Winter Locations of North American Black Terns

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Black Tern (*Chlidonias niger*) populations have declined across their range in North America since the 1980s. The causes of this decline remain largely unknown, but factors during non-breeding may be important. Little is known regarding Black Tern non-breeding ecology, the locations of or conditions at staging and stop-over sites, or the distribution of over-wintering sites. To this end, we tracked full-cycle movements of Black Terns (n=14) nesting in Ontario and Michigan using geolocators. Birds used two pathways during migration: the Atlantic flyway (with staging in the Carolinas) during southward migration; the Mississippi flyway (with staging in the Gulf of Mexico) during the return trip north to wetland breeding sites. Most birds wintered on the coasts of Panama, but some ranged as far south as southern Peru. All birds used marine habitats in winter, with some individuals spending extended periods 'at sea'. This data will allow us to: (1) estimate the strength of migratory connectivity (part of a larger collaborative effort), (2) identify critical periods or locations during the annual cycle, and (3) inform where conservation actions should be directed during the non-breeding season.

[28] Identifying Summer Locations of Lesser Black-Backed Gulls wintering in Pennsylvania

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Fundamental biological information related to migratory connectivity is still lacking for many species in North America. For increasing populations of widely distributed species, filling critical knowledge gaps throughout their annual cycle improves our understanding of local drivers influencing disparate growth of different populations. Such is the case for Lesser Black-backed Gulls (*Larus fuscus graellsii*) wintering in eastern North America. From 2018-2020, we tracked Lesser Black-backed Gulls through the annual cycle by deploying solar-Argos tags on adults wintering in Pennsylvania. In total, 10 of 12 tagged birds provided data during the full annual cycle, including summer ranges and migration routes. All 10 individuals that moved north reached either Greenland or Baffin Island every year, except for one. Eight birds tracked went to the west coast of Greenland, and the remaining two birds spent at least part of the summer in Baffin Island, Canada. Our study is the first to track Lesser Black-backed Gulls in North America throughout their full annual cycle and connect Greenland breeding populations to the expanding and increasing winter populations in the eastern US. Understanding the migratory connectivity of novel, expanding populations is important as many species face new challenges in their environment, adapt, and disperse to new landscapes during the annual cycle.

[29] Mapping Habitat Suitability for the Eastern Black Rail Throughout the Atlantic Coastal Plain Using Maximum Entropy (MaxEnt)

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Identifying suitable habitat is of critical importance for data-deficient species of conservation concern. Modeling a species' distribution can be a powerful tool for predicting the location of additional habitat. The diminutive marsh dwelling Black Rail (*Laterallus jamaicensis*) has recently been put under the protection of the Endangered Species Act. For the first time, we used eBird data to create a habitat suitability model for the eastern subspecies focusing on the Atlantic coastal plain. Using a maximum entropy model framework (MaxEnt), we combined data contributed by citizen scientists as the response variable, and environmental data gleaned from the Esri databank as predictors. The ArcGIS map generated from the model indicated habitat suitability in areas known for Black Rail occupation and predicted others where no detections have been reported. Environmental factors that best predicted Black Rail presence were flooded areas with shrub and herbaceous vegetation, proximity to water, and flat plains. These environmental associations were congruent with characteristics of high marsh, a habitat type in which Black Rails have been found in this part of their range emphasizing its importance for the species. Habitat association studies conducted in other parts of the species' range that focused on smaller areas and used presence/absence survey data collected via species-targeted callback surveys identified similar habitat characteristics, confirming the validity of the model. The map generated by this model will inform land management decisions and habitat restoration efforts.

[30] Cormorant Oceanography: Characterizing the *in situ* Ocean Environment Through Biologging

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Seabirds use a diversity of marine habitats and thus offer scientists unparalleled access to these dynamic environments in the surface ocean. In addition to movement and biological data, biologging devices carried by seabirds can be used to collect *in situ* environmental data, effectively transforming seabirds into distributed environmental sampling platforms. Continued miniaturization of biologging devices, integration of multiple sensors, and customizable programming are all needed to facilitate collection of these ancillary data. To provide proof of concept and to refine environmental sampling via biologging devices we deployed three types of GPS-GSM biologging tags on Brandt's cormorants in the Columbia River estuary (Oregon, USA)

in summer 2019 (n=20). We characterized dive shape in order to identify benthic dives - to be used as depth soundings. We tested the feasibility of measuring wave height, period, and direction with tags equipped with 3-axis accelerometers and magnetometers when birds rest on the water's surface. Similarly, we estimated surface currents from consecutive GPS locations. From a small subset of dives we measured water temperature and the temperature difference at the air-sea interface, exemplifying the utility of integrating a fast-response temperature sensor onto biologging tags for marine animals. Combined, this suite of oceanographic parameters can be assimilated with satellite data products to increase the skill of numerical models in assessing environmental conditions in littoral regions around the globe.

[31*] Adapting Venice to Rising Tides: A Multi-Functional Performance-Based Urban Design Approach to Flood Resilience

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Venice, Italy, made up of 118 individual islands, has been a cultural hub for hundreds of years. Ships traveling between Europe and Asia often stopped at the ports of Venice where goods and culture were exchanged. The art and architecture located in this unique area is without equal. However, Venice was built in an area that was generally inhospitable for long-term growth. Over-extraction of groundwater and global climate change has resulted in ongoing relative sea level increases within the lagoon causing recurrent flooding of many iconic, commercial, and residential buildings, making their ground floors no longer ideal to thrive in. In order to combat flooding, the national government initiated the MOSE Project, which is composed of a series of storm surge gates and locks that would be deployed to block incoming high tide or "aqua alta" events. The construction of MOSE has taken longer and sea levels have risen more than expected since the project was first proposed. This, along with the cost of operation, narrow range of operation (deployed only between 1.1 and 3.0 m above sea level at the Punta della Salute tidal datum), and potential negative environmental impacts, make the MOSE no longer suitable as a long-term solution. There have been many studies or proposals with potential solutions, which, if properly evaluated, can be synthesized into a final solution that taps into the pros and addresses the cons of these alternatives. Through literature review and case study analysis, this project will distill indicators for evaluating the social, ecological, and economic resilience of these local alternatives and non-local precedents to benchmark best practices as building blocks for generating an optimized proposal that maximizes the aforementioned multi-functional performances. Both adaptation in-situ and proactive relocation of residents, wetlands, and the economy will be explored to help local stakeholders visualize the consequences of these two divergent approaches to flood adaptation allowing better determination of the most resilient path forward.

[32] Capturing the Movement Behavior of Individual Snail Kites to Understand Wetland Connectivity

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Functional connectivity, defined as the influence of the landscape on movement or flow of organisms, depends on habitat composition and animal responses to features of the landscape. However, as animals move among habitats, movement behavior and therefore selection of resources can differ in purpose and over time. Additionally, information on behavior is often not included in connectivity assessments, leading to a potential disconnect between connectivity estimates and actual movement. For the critically endangered Snail Kite, a wetland specialist, habitat selection during travel may differ compared to other behavioral states because traveling snail kites must move through non-wetland areas, often soaring at altitude. We therefore investigated the extent to which resource selection in Snail Kites differs during travel compared to other behaviors, and determined whether it is necessary to account for distinct behavioral states to fully understand connectivity. We collected GPS tracking information from 49 juvenile Snail Kites between 2018-2020 and validated connectivity from GPS-tagged birds against independently observed movements of color-banded Snail Kites. We found that birds are less selective during travel compared to other behaviors, and that between-patch habitat matters: considering resource selection (via least cost paths) was more important for understanding connections between wetlands than geographic isolation (straight-line distance). However, knowledge of behavioral state only improved connectivity estimates slightly. For snail kites, these results underscore the importance of wetland management for movement of birds, and show that the landscape can have strong impacts on populations and connectivity.

[33*] Musical World of the Sarus Crane: Variation and Ecological Dependencies of Duets

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Waterbirds are known for complex and elaborate behavioural displays. One such behaviour is duetting, which involves coordinated singing and stereotypical posturing of mated birds. All species of cranes including the Sarus (*Antigone antigone*) are known to duet, which is characterised by coordinated rapid utterances of individual notes from the male and female crane. In this study we explore whether duet structure can be used to identify crane pairs of different locations (with varying pair densities) and territory quality (with and without wetlands and canals). We recorded duets from 101 Sarus Crane pairs between September 2019 and March 2020 across three different Indian states, varying in breeding pairs densities (Uttar Pradesh > Gujarat > Haryana). We followed an *a-priori* design of 5X5 km grids and identified pairs with and without large and small wetlands and canals nearby its territory. We used Raven Pro 1.6.1, and R Studio 4.0.2. to obtain a range of measurements for each duet: minimum and maximum frequency, bandwidth, peak frequency, note duration, number of notes

sung, tempo, duet duration and duet coordination. We used Principal component analysis (PCA) and Generalized Additive Models (GAM) to understand if duet structure varied with location, and whether duet features were related with ecological attributes. Duets of Sarus Crane pairs varied with location due to differences in duet coordination, bandwidth and duration. Pairs in Gujarat alternated their notes more than other sites (Gujarat > UP > Haryana), and also had the least bandwidth compared to other two (Gujarat < Haryana < UP). Duet duration was longest for pairs in Gujarat, followed by pairs in UP and Haryana. GAMs revealed that duets were significantly more coordinated for pairs with higher quality territories (more wetlands). Number of notes in duet increased significantly with wetland availability and decreased with canal availability and number of pairs in grid. Duets appear to be a reliable way to identify pairs from different locations. Additionally, pairs with greater coordination in duets maintained higher quality territories suggesting that duet coordination may signal greater vigour.

[34] Amassing and Use of the Consumed Plastics and Parasites Database for Waterbird Systems

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Plastic pollution has now been found in every ecosystem in which it has been searched for, including within most species of wildlife. Microplastics are a common form of pollution that cycle through food webs, and although they are understood to induce few physical damages because of their small size, the potential for chemical contamination and subsequent adverse health effects remains a risk to waterbird populations. Like plastic particles that have been indirectly consumed – those moving through prey items rather than being directly eaten, parasites are often trophically transmitted and occupy internal body spaces where microplastic pollution also aggregates and transits. As such, there is a potential for parasites and plastics to also interact within the gastrointestinal tracts of their hosts. Here, we have a unique opportunity to assess the interactions of parasites and plastics as we have performed several surveys through 5 different study systems (a total of 4207 organ assessments), some where parasite assessments were completed (n=597), others where plastic assessments were completed (n=481), and 3 systems where both parasite and plastic surveys were performed (n=242). This combined database includes 78 species of waterbirds, of which, 24 species were assessed for both parasites and plastics. We find that the relationship between the abundance of these components appears to be system specific, where in some waterbird groups like pelagic species, there is no relationship between parasites and plastics ($p=0.66$, 95%, CI = -2.44 – 3.45), in nearshore seabirds there is a negative trend ($p = 0.095$, -0.39 – 0.03), and in freshwater habitats there is a positive trend ($p = 0.097$, -0.02 – 0.25). Because these trends appear to differ with system (and require additional samples to confirm the strength of the trend), a holistic approach for analysis is inappropriate and should be of targeted concern when additional studies are deployed. We encourage future collaborative efforts to increase the dataset and species represented within it, and will discuss ongoing and future opportunities for new components of the database to be expanded.

[35] Migration Routes and Wintering Locations of North American Black Terns (*Chlidonias niger*) from Across Their Breeding Range, Revealed Through Light-Level Geolocation

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Black Tern (*Chlidonias niger*) populations are declining across their range in North America. Although causes of decline still remain largely unknown, past studies suggest that conditions on stop-over and over-wintering locations may be important factors. Little is known about the migration timing, routes, stop-over sites, or the range and conditions of over-wintering locations of Black Terns. In addition, the strength of migratory connectivity across the breeding range is unknown. In 2016, we deployed 30 light-level geolocators on Black Terns breeding in Ontario and Michigan; 13 tags with full-cycle data have been recovered to date. During southward migration (2016-17), the Atlantic coast from the Carolinas to Florida stood out as a key funnel. Most birds wintered around Panama, but some as far south as Peru. Northward migration (2017), was mainly through the Gulf of Mexico with staging on the US coast. Between 2018 and 2019, we deployed an additional 48 geolocators at colonies in western Canada. To date, only a single geolocator from the west has been recovered. Despite the low recovery rate, this initial data has revealed interesting differences between the migratory patterns of North American Black Tern sub-populations, as well as migratory connectivity. Unlike eastern birds, southward migration (2019-2020) of the western Black Tern was through the central flyway with staging at inland waterbodies. However, an ultimate wintering location around Panama remained consistent across sub-populations. With data from across the breeding range, we will summarize the most important stopover and over-wintering sites used by Black Terns, and compare migration routes and timing from individuals both within and among breeding colonies. Results derived from across North America will allow us to estimate the strength of migratory connectivity and identify critical time periods or locations used during the annual cycle where this species is most limited. This data will inform where conservation actions during the non-breeding season should be directed.

[36*] Risk of Overheating During an Acute Stress Response Varies with Body Size and Condition in the Altricial Young of a Subtropical Wading Bird

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Species status assessments often necessitate data collection during the breeding season, a sensitive period within the annual life cycle of many birds. Though the adults of colonial-nesting species typically flee when researchers enter a colony, altricial chicks are confined to their nest or immediate surroundings. This immobility in chicks

is of note because it means that these individuals, which have physiological systems that are still being developed, may lose important behavioral means to regulating their internal body temperatures (i.e., huddling for warmth or shading by a parent to prevent heat gain). In hot climates, this puts chicks at greater risk of hyperthermia, especially during disturbance events. In this study, we investigated the relative risk of hyperthermia during acute stress response episodes by monitoring the altricial chicks of a wading bird, the Wood Stork (*Mycteria americana*), in southeastern Florida, USA. Marked nests at 3 stork colonies were visited weekly during the breeding season (Feb-May) 2019 and 2020 to record nest-level habitat characteristics, chick body morphometrics, and chick skin temperatures. We predicted that, of the two independent stress responses (acute stress response to disturbance (ASD): heat the core body *versus* hyperthermia response (HR): cool the core body), HR would be stronger at higher ambient temperatures and/or in chicks with a relatively small surface area-to-volume ratio (SA:V). We found that SA:V decreased with age, especially after age=1 week, until the chick was fully grown, age>4 weeks. Older chicks, which were predicted to be at greater risk of hyperthermia due to their smaller SA:V, were found to have hotter underwing (~core) temperatures overall and a strong HR signal with increasing ambient temperature (n=135 post-handling measurements). Additionally, paired pre- and post-chick handling measurements (n=47) showed that underwing temperature tended to decrease after chick handling when the ambient temperature was at or above the upper critical limit of the thermal neutral zone, confirming that the HR was stronger than the ASD at high ambient temperatures (heat index ≥90°F). Together, these findings suggest that older pre-fledglings face the greatest risk of hyperthermia, including during researcher disturbance events.

[37] Monitoring the Northernmost Black Skimmer Colony on the Atlantic Coast

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Black Skimmers (*Rhyncops niger*) are at the northern extent of their breeding range in Massachusetts and have nested sporadically in the state. In 2012 BLSK were documented nesting on the island of Martha's Vineyard for the first time and since then have established a productive nesting colony on the island. We began a collaborative banding project in 2017 and placed field readable bands on 3-12 chicks each season. As of the 2020 season, a total of 36 chicks have been banded and 15 individuals have been reported at least once along the Atlantic and Gulf coast after fledging. Re-sight information gathered from within the colony and from migration and overwintering sites will be used to better understand site fidelity, chick survival, dispersal, and population dynamics during this period of increase. This banding and re-sight effort is ongoing.

[38] Effects of Climate-Mediated Changes in the Diet of a Threatened Gulf of Maine Seabird

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The Gulf of Maine is warming faster than 99% of the world's oceans, making it an ideal site for studying the effects of climate-mediated shifts in prey distribution on seabirds. Atlantic butterfish (*Peprilus triacanthus*) is a prey species found in the diet of many Gulf of Maine seabirds and is shifting its distribution north as waters warm. The deep-bodied morphology of butterfish and the limited gape of seabird chicks can make swallowing this fish difficult. Our study examined a threatened Gulf of Maine seabird, the common tern (*Sterna hirundo*), and the implications of butterfish in their diet. We monitored the diet and survival of tern chicks on Seavey Island, NH during 2018 and 2019, building on a long-term dataset (1999-2019). Relative proportions of prey categories fed to chicks varied significantly across nests ($p<0.0001$, $p<0.05$) and between years ($p<0.0001$). Some chicks were never observed being fed butterfish, contrasting with other nests where 50% of the diet was butterfish. Butterfish took significantly longer for chicks to handle ($p<0.001$), but was also least likely to be swallowed ($p<0.001$) compared to other prey. These issues were reflected in survival; chicks that died were fed significantly more butterfish than fledged chicks ($p<0.05$). Consistent with regional shifts in butterfish distribution, relative proportions of this fish in the tern diet has significantly increased decadally (1999-2008 & 2009-2018; $p<0.05$), and is positively correlated with water temperature ($p<0.05$). In order to adapt to shifting prey distributions, terns will have to avoid unsuitable prey like butterfish. These data suggest that some terns are able to do so. Our findings provide insight into how seabirds are responding to changes in prey distribution and abundance, which will continue to transform as ocean temperatures proceed to rise.

[39] Patterns of Adult Survival in a Struggling Shorebird Population Suggest Detrimental Effects of Predation

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Physical cues from the environment are often used by animals to direct habitat choices. However, anthropogenic activity has turned many landscapes into ecological traps for endangered species, although such traps have mostly been examined from the point of view of reproductive output. Understanding natural and anthropogenic factors affecting adult survival and dispersal can greatly inform conservation strategies and allow for the projection of future growth as a function of management. We studied adult survival and dispersal rates for the New Jersey population of piping plovers, which has failed to increase despite regional population growth, using mark-recapture data from 2012–2019. We found that adult survival between 2012 and 2019 ranged from 0.62 [95% CI = 0.48, 0.74] to 0.85 [0.74, 0.92] for females and 0.65 [0.51, 0.78] to 0.89 [0.80, 0.94] for males. Juvenile survival ranged from 0.40 [0.30, 0.51] to 0.70 [0.57, 0.80]. Exclosed, abandoned nests were associated with lower survival rates, particularly for males. Further, we found that females that abandoned their first nesting

attempt of the season dispersed 10 times farther than males and females whose first nest attempts were lost predation or flooding. Dispersal distances of males and females that lost their last nest attempts of the season to predation and flooding (females,14.28 km [95% CI = 8.26, 20.54]; males, 1.43 [-4.04, 7.58]) were less than dispersal distances for individuals of both sexes that abandoned their last nesting attempt of the season (females, 21.78 [-3.02, 46.19]; males, 35.90 [9.09, 61.70]). Our results corroborate previous studies documenting adverse impacts of exclosure use on adult survival. Importantly, surviving mates (particularly females) emigrate from the breeding site, exacerbating the effect of mortality on local population viability. The results of our survival analysis can be used to support the refinement of decision support tools to provide better information for exclosure use decisions, as exclosures may be further contributing to an ecological trap for piping plovers.

[40*] Aleutian Tern Chick Diets in the Kodiak Archipelago, Alaska, USA

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Aleutian terns (*Onychoprion aleuticus*) are one of Alaska's most rapidly declining and mysterious seabird species, and the causes of their precipitous decline remain unclear. Due to low nesting propensity and hatching rates in recent years, there are few chick diet data available and it is unknown how chick diet is related to breeding success. From 2017-2020, we used trail cameras and video cameras to remotely monitor Aleutian tern nests at colonies across the Kodiak Archipelago, Alaska. Cameras were placed one meter from the nest, and programmed to take a picture at a timed interval and when motion activated. Thirty-three camera nests successfully captured chick feeding events. We documented 1,339 chick provisioning events over this four-year period. In all years, Pacific sand lance (*Ammodytes hexapterus*) and greenling (*Hexagrammos* spp.) were the most common prey types, and salmon (*Oncorhynchus* spp.) were observed in abundance at one colony in 2019. Both Pacific sand lance and greenling were present in chick diet during the 70s; however, capelin (*Mallotus villosus*) were present in much larger proportions then in our modern study. Declines of capelin in Aleutian tern diet track other seabird diets in this region and appear to reflect a reorganization of the marine forage fish community since the late 1970s. The long term implications of the loss of this valuable prey type for Aleutian tern productivity and population trajectory are uncertain but concerning.

[41*] WITHDRAWN

[42] Survival and Migratory Timing of Post-Fledging Piping Plovers

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Recovery efforts for imperiled populations often focus on breeding season research, however, full annual cycle studies are necessary to better understand factors influencing a population. The piping plover (*Charadrius melodus*) is a threatened migratory shorebird whose population decline was partially attributed to human disturbance. Breeding season monitoring and habitat protections from human use have occurred since listing. While adult survival, nest success, and reproductive output are well-studied, a relative knowledge gap exists from fledging to returning to breeding sites in the following year. Improving our understanding of the factors that influence first year survival and migrations could assist agencies in land management and habitat protection throughout the year. During 2013–2019, we studied piping plover fledglings on Fire Island and Westhampton Island, New York, where plovers populations have increased since Hurricane Sandy in 2012. We assessed the influence of pre-fledging factors, season, and week on post-fledging survival, migration probability, and return probability using a multi-state open robust design model. Post-fledging first-year true survival remained constant at 0.36 (95% CI: 0.31–0.42) across natal, migratory/wintering, and first-year breeding grounds. Fledgling migration occurred between July 1 and September 22 and peaked between August 15–23 (Ψ = 0.97, 95% CI: 0.92–0.98). Fall migration probability was negatively correlated with fledge date (β = -1.51, 95% CI: -1.11– -1.91). Second-year plovers returned to the breeding grounds from February 20 to May 8, with peak return in late April and early May (Ψ = 0.55, 95% CI: 0.41–0.70). Given that fledglings remained on their natal grounds for more than a month before migrating, we highlight the need to protect breeding habitats until late September. Such changes could improve the ability of juvenile birds to forage, prospect for future breeding sites, and roost prior to migration. In future years, if the population increases and reproductive output follows, habitat protections beyond the chick-rearing season may increase survival of post-fledging piping plovers.

[43*] Perfluoroalkyl Substances in the Eggs of Brown Pelicans from South Carolina

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Coastal waterbirds living at the interface of terrestrial and marine systems may be subjected to comparatively higher levels of anthropogenic pollution than species occupying only one domain given the diversity of inputs into nearshore habitats. Exposure to chemical stressors may also be particularly acute when wildlife is proximal to urban centers for all or part of the annual cycle. Perfluoroalkyl substances (PFASs) are a class of manmade chemical compounds recently recognized to be widespread in both human and wildlife populations, including seabirds. We examined the eggs of brown pelicans (*Pelecanus occidentalis*), an iconic nearshore seabird, from three colonies near Charleston, South Carolina, for PFAS contamination. We expected that eggs from colonies located closer to Charleston Harbor, an area with high PFAS loads in sediment, fish, and other marine predators, would contain comparatively more PFAS than eggs from colonies located further from the urban environment. Of the 24 compounds analyzed, 16 were found in more than half of the sampled eggs. PFOS was the most abundant compound across colonies, with concentrations ranging from 48 – 546 ng/g wet weight. Approximately 15% of sampled eggs were above threshold concentrations for exhibiting reductions in hatching success. Four compounds exhibited colony-specific differences, although this was not correlated with distance to Charleston Harbor. Given the foraging range of brown pelicans during the breeding season, individuals may be acquiring PFAS contaminants from multiple sources along the coasts of both South Carolina and Georgia. Overall, PFAS concentrations in the eggs of brown pelicans from the Charleston region are near the highest reported for seabird eggs nationally, representing a potentially significant source area for this class of contaminants.

[44] Nest Success and Beach Restoration: A Comparison of Three Beach-Nesting Birds in Coastal Louisiana

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Louisiana is losing land at an alarming rate, and beach-nesting birds are on the front lines. The Coastal Protection and Restoration Authority has implemented beach restoration programs to protect communities from the detrimental effects of erosion and flooding as well as create new habitat for wildlife. In order to evaluate the effects of beach restoration on reproductive success, we followed the nests of 263 Wilson's Plover (*Charadrius wilsonia*), 1559 Least Tern (*Sternula antillarum*), and 152 Common Nighthawk (*Chordeiles minor*) to their fates in southeast (SE) and southwest (SW) Louisiana from 2015 to 2019. We calculated daily nest survival (DNS) estimates and compared fates between three restored and six unrestored sites. Nests with unknown fates were excluded from analyses. For Wilson's Plover, in SW Louisiana during years with storms, DNS at restored sites was higher than at unrestored sites. For Least Tern, in SE Louisiana during years without storms, DNS at unrestored sites was higher than at restored sites. The low number of Least Tern nests at SE unrestored sites, coupled with high predation and low hatch success in SE restored sites supports this result. Lower DNS estimates for Common Nighthawk were still seen in both regions in 2017 and 2019, suggesting the same effect of storms on daily nest survival. These results

suggest that beach restoration helps to mitigate the impacts of storms, but in providing more nesting habitat for birds it may also provide habitat for predators.

[45] Investigating the Sale, Purchase, and Collection of Federal Metal Bird Bands Among Waterfowl Hunters: Implications and Challenges for Waterbird Data Management

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This project investigates the cultural significance metal bird bands have taken on within the waterfowl hunting community, and how this has impacted the way that sold and purchased bands might be reported to the U.S Geological Survey Bird Banding Laboratory (BBL). The BBL has been tracking migratory birds through the use of metal bird bands for a hundred years. Everyday people who encounter the bands can report the serial numbers online, contributing to a rich data set of thousands of sightings every year. With waterfowl hunters comprising the vast majority of bird band reports, metal bands have become a prized trophy among many waterfowl hunters. This has led to the proliferation of both genuine and fake metal bird bands on e-marketplaces such as Ebay, which can potentially complicate the integrity of the data reported to the BBL. Semi-structured interviews were conducted with BBL staff members, waterfowl hunters, and bird band sellers to gain deeper insight into this emerging challenge to waterfowl data management. An online survey also allowed for those who have previously reported a bird band to the BBL to discuss their engagement with bands and wildlife conservation. Utilizing an anthropological perspective, data was analyzed qualitatively to draw out common themes among participants. This included observations about the role of social media and hunting media in potentially shifting the priorities of hunting culture towards a higher valuation of bands; motivating factors for those who buy and sell bands for collections vs for display; and perceptions of how bands reflect the role of hunters in wildlife conservation in the U.S more broadly. Through continued analysis, this project seeks to provide data-based recommendations for continued data management at the Bird Banding Laboratory.

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