
SOUTH CAROLINA COOPERATIVE FISH & WILDLIFE RESEARCH UNIT



ANNUAL REPORT

2021

In 2021, the South Carolina Cooperative Fish & Wildlife Research Unit continued to engage our cooperators to address natural resource questions and issues. Unit scientists advised and mentored graduate students in both M.S. and Ph.D. programs, taught graduate classes, and provided technical assistance to cooperators.

South Carolina Cooperative Fish & Wildlife Research Unit



260 Lehotsky Hall
Clemson University
Clemson, SC 29634

Phone: 864-656-0168
www.f.usgs.gov/coopunits/unit/SouthCarolina

Cooperators:

U. S. Geological Survey
Clemson University
South Carolina Department of Natural Resources
U. S. Fish and Wildlife Service
Wildlife Management Institute

TABLE OF CONTENTS

COOPERATORS AND PERSONNEL	4
COORDINATING COMMITTEE	4
UNIT PERSONNEL.....	5
COLLABORATORS.....	7
GRADUATE EDUCATION	9
CURRENT STUDENTS.....	9
RECENT GRADUATES.....	9
CURRENT & RECENTLY COMPLETED RESEARCH	9
PUBLICATIONS	17
JOURNAL ARTICLES 2017-2018	17
THESES AND DISSERTATIONS 2017-2018.....	Error! Bookmark not defined.
REPORTS & DATA RELEASES	19
ACTIVITIES.....	19
TEACHING	19
TRAINING	Error! Bookmark not defined.
PRESENTATIONS AND SEMINARS	19
SERVICE.....	19
AWARDS AND HONORS	20
PRESS / PUBLIC OUTREACH	20

COOPERATORS AND PERSONNEL

COORDINATING COMMITTEE

United States Geological Survey

Jonathan Mawdsley, Chief, Cooperative Research Units

John Thompson, Deputy Chief, Cooperative Research Units

Barry Grand, Regional Supervisor, Cooperative Research Units

South Carolina Department of Natural Resources

Robert Boyles, Director, South Carolina Department of Natural Resources

Emily Cope, Deputy Director for Wildlife and Freshwater Fisheries, South Carolina
Department of Natural Resources

Billy Dukes, Chief of Wildlife, South Carolina Department of Natural Resources

Ross Self, Chief of Fisheries, South Carolina Department of Natural Resources

Clemson University

Keith Belli, Dean, College of Agriculture, Forestry and Life Sciences, Clemson University

Paula Agudelo, Associate Dean of Research, College of Agriculture, Forestry and Life
Sciences, Clemson University

Todd Petty, Chair, Forestry and Environmental Conservation, Clemson University

Wildlife Management Institute

Steve Williams, President, Wildlife Management Institute

UNIT PERSONNEL

Patrick Jodice, Unit Leader, U.S. Geological Survey, and Professor, Department of Forestry and Environmental Conservation, Clemson University

Luke Bower, Assistant Unit Leader-Fisheries, U.S. Geological Survey, and Assistant Professor, Department of Forestry and Environmental Conservation, Clemson University

Beth Ross, Assistant Unit Leader-Wildlife (through March 2021), U.S. Geological Survey, and Assistant Professor, Department of Forestry and Environmental Conservation, Clemson University

Brenna Byler, Administrative Assistant, South Carolina Cooperative Fish & Wildlife Research Unit and Department of Forestry and Environmental Conservation, Clemson University

Pamela Michael, Post-Doctoral Research Associate, South Carolina Cooperative Fish & Wildlife Research Unit and Department of Forestry and Environmental Conservation, Clemson University

Kathy Hixson, Post-Doctoral Research Associate, South Carolina Cooperative Fish & Wildlife Research Unit and Department of Forestry and Environmental Conservation, Clemson University

Yvan Satgé, Research Specialist, South Carolina Cooperative Fish & Wildlife Research Unit and Department of Forestry and Environmental Conservation, Clemson University

Welcome



Luke Bower

Dr. Luke Bower has joined the SC CRU as a Fisheries Scientist. We look forward to Dr. Bower developing his research and teaching program at Clemson University.

Farewell



Beth Ross

Dr. Beth Ross resigned her position with SC CRU, moving to a position with our partners at the US FWS. We are grateful for her contributions to the research and teaching mission of the SC CRU during her five years with us. The impact of her research, teaching, and partnership will last for years to come.

COLLABORATORS

Clemson University

Robert Baldwin, Department of Forestry and Environmental Conservation
Kyle Barrett, Department of Forestry and Environmental Conservation
Troy Farmer, Department of Forestry and Environmental Conservation
Cathy Jachowski, Department of Forestry and Environmental Conservation
David Jachowski, Department of Forestry and Environmental Conservation
Richard Kaminski, James C. Kennedy Waterfowl and Wetlands Conservation Center
Brandon Peoples, Department of Forestry and Environmental Conservation
Robert Powell, Parks, Recreation and Tourism Management
Matt Brownlee, Parks, Recreation and Tourism Management
Thomas Rainwater, Department of Forestry and Environmental Conservation
John Rodgers, Department of Forestry and Environmental Conservation
Shari Rodriguez, Department of Forestry and Environmental Conservation

South Carolina Department of Natural Resources Cooperators

Jay Cantrell, Assistant Big Game Program Coordinator
Jamie Dozier, Tom Yawkey Wildlife Center
Christy Hand, Wildlife Biologist
Michael Hook, Small Game Program Coordinator
Molly Kneece, **Waterfowl Biologist**
Mary Catherine Marin, Wildlife Biologist
Mark McAlister, Wildlife Biologist, Tom Yawkey Wildlife Center
Charles Ruth, Big Game Program Coordinator
Felicia Sanders, Wildlife Biologist
Mark Scott, Fisheries Biologist
Michael Small, Assistant Small Game Program Coordinator
Amy Tegeler, Bird Conservation Coordinator
Janet Thibault, Wildlife Biologist

Federal Agency Cooperators

Laurel Barnhill, USFWS
Sarah Dawsey, USFWS Cape Romain Natural Wildlife Refuge
Dean Demarest, USFWS
Deborah Epperson, USGS WARC
Lance Garrison, NOAA/NMFS
Jeff Gleason, USFWS
Heath Hagy, USFWS
Kristin Hart, USGS

David Haukos, USGS Kansas Cooperative Fish and Wildlife Research Unit
Scott Johnston, USFWS
Mona Kalil, USGS
Meg Lamont, USGS
Susan Loeb, Southern Research Station, USFS
Jim Lyons, USGS
Rebekah Reid, USFWS
Anthony Roberts, USFWS
Emily Silverman, USFWS
John Stanton, USFWS
Melanie Steinkamp, USGS
Craig Watson, USFWS Ecological Services, Charleston, SC
Tim White, BOEM
Randy Wilson, USFWS
Bureau of Ocean Energy Management
USFWS Region 4, Cape Romain Natural Wildlife Refuge
USFWS Migratory Bird Program
USFWS Ecological Services
USFS Southern Forest Experiment Station
National Park Service, Congaree National Park
Smithsonian Migratory Bird Center

Private Sector Cooperators

Nemours Wildlife Foundation
Society for the Conservation and Study of Caribbean Birds
Terra Mar, LLC

Cooperating Scientists from other Colleges, Universities, and Institutes

Erik Blomberg, University of Maine
Lisa Ferguson, Wetlands Institute
Auriel Fournier, Illinois Natural History Survey
Christian Hagen, Oregon State University
Chris Haney, Terra Mar, LLC
Autumn-Lynn Harrison, Smithsonian Institute
Hannah Madden, Ecological Professionals, St. Eustatius National Parks
Hannah Nevins & Brad Keitt, American Bird Conservancy
Ernst Rupp, Grupo Jaragua, the Dominican Republic
Mark Woodrey, Mississippi State University
Susan Zaluski, Jost van Dyke Preservation Society, British Virgin Islands
Elise Zipkin, Michigan State University

GRADUATE EDUCATION

CURRENT STUDENTS

Michael Adams, M.S. Wildlife & Fisheries Biology (Advisor: Ross)

Janelle Ostroski, M.S. Wildlife & Fisheries Biology (Advisor: Ross)

Mikayla Thistle, M.S. Wildlife & Fisheries Biology (Advisor: Ross)

Bradley Wilkinson, Ph.D. Wildlife & Fisheries Biology (Advisor: Jodice)

CURRENT & RECENTLY COMPLETED RESEARCH

Habitat Use and Breeding Ecology of Bachman's Sparrow in a Wiregrass-free Longleaf Pine Ecosystem in South Carolina

Investigators: Beth Ross (SC CRU)

Student: Mikayla Thistle (M.S., Clemson University)

Sponsors: SC DNR

Dates: 2019-2021

Variation of Chronology of Wild Turkey Gobbling in the Upstate of South Carolina

Investigators: Beth Ross (SC CRU)

Student: Janelle Ostroski (M.S., Clemson University)

Sponsors: SC DNR

Dates: 2019-2021

Effects of Forest Management on Early-Successional Avian Species in South Carolina

Investigators: Beth Ross (SC CRU)

Student: Michael Adams

Sponsors: SC DNR

Dates: 2020 – 2022

Spatial & Disturbance Ecology of Eastern Brown Pelicans in the South Atlantic Bight

Investigators: Patrick Jodice (SC CRU)

Student: Bradley Wilkinson (Ph. D., Clemson University)

Sponsors: USGS and Bureau of Ocean Energy Management

Dates: 2017–2021

Gulf of Mexico Marine Assessment Program for Protected Species

Investigators: Patrick Jodice (SC CRU), Jeff Gleason (USFWS), Chris Haney (Terra Mar LLC), Pamela Michael (Clemson University), and Yvan Satgé (Clemson University)

Sponsors: US FWS and Bureau of Ocean Energy Management
Dates: 2017-2021

Ecology and Conservation of the Endangered Black-capped Petrel

Investigators: Patrick Jodice (SC CRU) and Yvan Satgé (SC CRU & Clemson University)
Sponsors: BirdsCaribbean, Neotropical Bird Club, SC CRU
Dates: 2018-2021

Variation of Chronology of Wild Turkey Gobbling in the Upstate of South Carolina

Wild turkey is a highly popular game species harvested primarily during the reproductive season. Due to the popularity of the species, there have been substantial efforts to establish sustainable harvest regulations while balancing hunter satisfaction. Hunter satisfaction is strongly correlated with hearing vocalizing males, or “gobbling”, thus wildlife agencies have used gobbling data to evaluate regional gobbling peaks and population responses to hunting activity and harvest.

Gobbling activity and associated habitat selection has been increasingly assessed through deployment of autonomous recording units (ARU), yet *post hoc* processing of audio data has been time-intensive particularly due to high false positive rates and streamlining this process would benefit future research. Our project goals are to assess upstate South Carolina gobbling chronology using monitoR as an alternative auto-recognition software and incorporate detection data from monitoR into occupancy models to inform management decisions. We created two templates to detect relatively soft and loud gobbles, resulting in different false positive rates for each template due to associated sensitivity.

We deployed 38 ARUs during 2019-2021 which collected daily recordings from March 1 to May 30. Preliminary analysis of 2019 data suggest probability of occupancy increasing with elevation, while template type and distance to water affected probabilities of detection and false positives. More

robust analysis of single and multi-season occupancy models will be conducted in the coming months.



Habitat Use and Breeding Ecology of Bachman's Sparrow in a Wiregrass-free Longleaf Pine Ecosystem in South Carolina

Through much of its range, Bachman's Sparrow (*Peucaea aestivalis*) uses the wiregrass (*Aristida* spp.) dominant understory typical of longleaf pine (*Pinus palustris*) forest. The central South Carolina Coastal Plain, however, lies within the "wiregrass gap" where longleaf pine understories are absent of wiregrass and instead are dominated by bluestem grasses (*Schizachyrium* spp. and *Andropogon* spp.), bracken fern (*Pteridium aquilinum*), and shrubs. Habitat use of Bachman's Sparrow in this region has yet to be studied and declining Bachman's Sparrow populations necessitate a better understanding of habitat selection processes and population dynamics across regional habitat types. The goal of this study is to describe breeding season habitat use and breeding ecology of Bachman's Sparrow in the unique wiregrass-free longleaf pine ecosystem of Tom Yawkey Wildlife Center, Santee Coastal Reserve, and Washo Reserve, South Carolina to inform best management practices for Bachman's Sparrow. The objectives of this study are to (1) identify management treatments and landscape scale characteristics that Bachman's Sparrows select for home ranges, (2) identify vegetation characteristics that Bachman's Sparrows select for nest-sites, (3) quantify nest-success, (4) relate nest-site selection to reproductive success, and (5) collect preliminary data on movement and survival of Bachman's Sparrow within a wiregrass-free ecosystem

During the 2020 and 2021 breeding seasons, we conducted repeated visit point count surveys to estimate the effects of habitat management and forest stand characteristics (e.g. prescribed burns, basal area, stem density) on Bachman's Sparrow abundance, apparent survival probability, and recruitment rates. We also located nests to identify vegetation composition and structure characteristics that Bachman's Sparrows select for nest-sites. To determine if habitat selection in our study population was adaptive, we monitored nests and related nest-site selection to nest survival rates by comparing

habitat characteristics related to selection with those related to survival. We also opportunistically color banded adult male and nestling Bachman's Sparrows in order to collect preliminary data on movement and survival of Bachman's Sparrows within the wiregrass-free region.

As Bachman's Sparrows are adapted to frequently burned, ephemeral habitat, we expect that time since last burn will be the greatest predictor of home range selection. We expect that Bachman's Sparrows will select nest sites that have intermediate grass cover as well as bare ground. These understory conditions will provide ample cover and nesting substrate but allow individuals to easily move and escape from the nest site. Although data collection and analysis is not yet complete, preliminary analyses from 2020 suggest that Bachman's Sparrows select nest-sites that have intermediate grass cover compared to available nest-sites. However, nest survival rates showed no clear relationship to any measured covariates. The results of this study can be used to inform region-specific management plans and restoration of degraded habitats, which often lack typical understory species like wiregrass, to increase Bachman's Sparrow abundance and reproductive success.



Early successional habitat monitoring for ruffed grouse and golden-winged warblers.

Early-successional habitats are a critical habitat type for ruffed grouse (*Bonasa umbellus*) and golden-winged warblers (*Vermivora chrysoptera*). In the southern Blue Ridge Ecoregion, early-successional habitats have declined over the last 70 years, and the extent of which ruffed grouse and golden-winged warblers occupy these habitats at the edge of their ranges is unknown. The goal of this project was to assess the status and distribution of golden-winged warblers and ruffed grouse in the southern Blue Ridge Ecoregion. We also aimed to determine how management of early-successional habitats influences presence/absence of ruffed grouse and golden-winged warblers on public lands, and to evaluate the use of Autonomous Recording Units (ARUs) to detect and monitor both species.

Using a conditional occupancy design, we surveyed for ruffed grouse (March 15th – April 30th 2020 and 2021), golden-winged warblers, and associated indicator species (May 5th – June 30th 2020 and 2021) at sites representing varying degrees of timber harvest management and controlled burning intensity. ARUs were placed at sites with and without positive detections of our target species. In 2020, ruffed grouse were detected at one site. In 2021, ruffed grouse were detected at seven sites. In 2020, prairie warbler occupancy was the greatest among indicator species ($\Psi = 0.976$).

Our models failed to converge due to their nearly ubiquitous occupation of study sites. Field sparrow occupancy was estimated at $\Psi = 0.656$ and was positively influenced by shrub cover and visual obstruction yet negatively influenced by perimeter-to-area ratio of the occupied patch. Common

yellowthroat warbler had the lowest occupancy estimate among indicator species ($\Psi = 0.334$) and this estimate was positively influenced by percentage of grassland at the 1-kilometer scale. This project will help inform habitat management and conservation of early-successional species and provide guidelines for future monitoring protocols.



Spatial & Disturbance Ecology of Eastern Brown Pelicans in the South Atlantic Bight

As a nearshore marine predator and species of conservation concern, Brown Pelicans (*Pelecanus occidentalis*) in the southeastern United States constitute a valuable study population for investigating coastal ecological systems. Despite occupying a highly visible and elevated trophic position in estuarine and oceanic ecosystems, movement parameters describing habitat use patterns, foraging behaviors, and migratory corridors are undeveloped at multiple spatial and temporal scales. This study aims to resolve these information gaps by outfitting adult pelicans breeding in the South Atlantic Bight with high-resolution GPS satellite transmitters, which will provide accurate locational data throughout the annual life-history cycle.

In addition to habitat use patterns, both natural and anthropogenic disturbances will also be investigated

to provide baseline risk assessments. These include the impacts of large-scale meteorological events such as hurricanes, reporting concentrations of perfluoroalkyl substances (PFAS) in eggs of pelicans based on urban habitat use, oil spill risk assessment modeling, and using pelicans as a system for exploring the mechanisms underlying partial migration.

To date, 86 adult pelicans have been equipped with satellite transmitters in both South Carolina and Georgia. Upon the completion of various life-history stages, maps will be generated showcasing breeding ranges, migratory pathways, wintering locations, and site fidelity at colonial, subpopulation, and population structures. This information will greatly expand our knowledge of this species in the Atlantic, and complement prior research recently conducted on Brown Pelicans in the Gulf of Mexico.



Brown Pelican

Gulf of Mexico Marine Assessment Program for Protected Species

The Gulf of Mexico (GoM) is simultaneously one of the most ecologically important and industrialized marine ecosystems globally, yet limited seabird research has occurred in this region. The Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS) is a federal partnership between the Bureau of Ocean Energy Management, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the National Oceanic and Atmospheric Administration that seeks to fill historic information gaps regarding species composition, distribution, and abundance in the northern GoM.

From April 2017 to September 2019, we conducted seabird surveys on 14 pelagic cruises as a part of GoMMAPPS. Surveys took place on 293 ship days representing 2,300 hours of observer effort and 41,700 km of transects during all four seasons. GoMMAPPS surveys substantially enhanced seabird survey coverage of northwest and southwest regions of the GoM in spring and southwest and south-central regions in the summer.

We tallied 9,347 detections of 44,029 seabirds representing 44 species and identified 85.9% of observed seabirds as species. We characterized the origins of species using the northern GoM and found that most were not locally breeding. The majority breed in locations within the northern interior of continental North America, the southern GoM, or the Caribbean, demonstrating that the northern GoM supports both local and migratory species from distant ecosystems throughout the year.

We modeled the probability of occurrence based on habitat suitability for 24 species using Program MaxEnt, a machine learning technique that uses observations and a set of environmental covariates. To assess potential macro-scale exposure to oil and gas activities, we calculated the proportion of highly

suitable habitats in proximity to oil platforms. Of the 24 species analyzed, 14 had $\geq 20\%$ of their highly suitable habitat located within 10 km of a platform. Nine species had $> 50\%$ of highly suitable habitat within that proximity.

Analysis of seabird survey data is ongoing and will be combined with survey data for marine mammals and sea turtles to provide an extensive multi-taxa assessment. These results will inform future oil and gas planning on the U.S. Outer Continental Shelf as well as agencies and other stakeholders involved in management and conservation of protected species found in the Gulf of Mexico.



Ecology and Conservation of the Endangered Black-capped Petrel

The Black-capped Petrel (*Pterodroma hasitata*) has a fragmented and declining population, is considered Endangered throughout its range, and is under consideration for listing under the Endangered Species Act by the U.S. Fish and Wildlife Service. The only confirmed breeding sites have been located in the mountain ranges of Hispaniola, where habitat loss and degradation are continuing threats. Other nesting populations may still remain undiscovered but, to locate them, laborious in situ nest searches must be conducted over expansive geographical areas. To focus nest-search efforts more efficiently, we partnered with US-based American Bird Conservancy to track adult petrels from their U.S. non-breeding areas to unknown breeding grounds in the Caribbean. We also partnered with Caribbean NGOs Grupo Jaragua and Environmental Protection in the Caribbean to (I) estimate the characteristics of Black-capped Petrel nesting habitat and (II) model suitable nesting areas in the Caribbean region using openly available environmental datasets.

In Spring 2019, we captured 11 Black-capped Petrels along the western edge of the Gulf Stream east of



Cape Hatteras, North Carolina. Unlike the two previous efforts to individually track petrels (2014 and 2018) which deployed tags at nest sites, this effort sought to capture birds at sea and subsequently track their movements. We equipped 10 petrels with solar-powered satellite trackers and followed them for an average of 102 days (SD: 78.2). Most individuals ranged from 28.4 – 41.2 degrees latitude, with two recorded trips to Hispaniola. Thorough observations of these tracks strongly suggest that these individuals visited nesting areas at the onset of the nesting season. Compared to birds tracked from breeding sites in 2014 and 2018, the current use areas at sea appear similar to use areas during post-breeding periods, but dissimilar to use areas from 15 trips recorded during known breeding periods. Future studies include nest searches in suspected nesting areas, a revision of the published distribution and range for the species, an analysis of the marine habitat during the non-breeding season, and genomic sequencing of prey DNA.

Using significant environmental characteristics of Black-capped Petrel nesting breeding habitat (such as altitude, distance to coast, or vegetation), our nest habitat model highlighted possible nesting habitat in areas not previously considered suitable on Hispaniola. In contrast, areas in the central Dominican Republic that were thought to be suitable for petrels were not highlighted by the model. In the Caribbean, the model showed possible suitable nesting habitat in Cuba, Jamaica, Dominica, and Saint Vincent. Based on model results, we estimated the total area of suitable nesting habitat for Black-capped Petrels on Hispaniola and documented severe habitat loss due to hurricanes and forest fires, and encroachment from agriculture, in these areas. Yvan Satgé holds a Black-capped Petrel captured at sea off Cape Hatteras, NC and outfitted with a satellite tracker. (D. Lebbin 2019)

PUBLICATIONS

JOURNAL ARTICLES and TECHNICAL REPORTS 2018-2020

* = graduate student author

- Blomberg, E.J., B.E. Ross, C.J. Cardinal, S.N. Ellis-Felege, D. Gibson, A.P. Monroe, and P.K. Schwlenberg. Conserving non-migratory birds in the United States: where has a century without the Migratory Bird Treaty Act left us? *Condor*. In Press.
- Bodinof Jachowski, C.M., B.E. Ross, and W.A. Hopkins. 2020. Evaluating artificial shelter arrays as a minimally invasive monitoring tool for the hellbender, *Cryptobranchus alleganiensis*. *Endangered Species Research* 41:167-181.
- Conners, M.G., ...B.P. Wilkinson..., J.A. Estes, & S.M. Maxwell. *In review*. Mismatches in scale between Marine Protected Areas and mobile marine megafauna. *Conservation Letters*.
- Dertien, J., S. Self, R. Baldwin, B.E. Ross, and K. Barrett. 2020. The relationship between biodiversity and proportional wetland cover varies across regions of the conterminous United States. *PLoS ONE* 15:e0232052.
- Fiorello, C., P.G.R. Jodice, J.S. Lamb, Y.G. Satge, K. Mills, M. Zicardi. 2021. Post-release survival of California Brown Pelicans following oiling and rehabilitation after the Refugio oil spill. *Journal of Wildlife Diseases* 57: 590-600. DOI: 10.7589/JWD-D-20-00171
- Fournier, A.M.V., J.E. Lyons, R. Randy Wilson et al. *Submitted*. Structured decision making to establish regional bird monitoring priorities. *INFORMS Journal of Applied Analytics*.
- Jodice, P.G.R., P.E. Michael, J.S. Gleason, J.C. Haney, Y.G. Satgé. 2021. Revising the marine range of the endangered black-capped petrel *Pterodroma hasitata*: Occurrence in the northern Gulf of Mexico and exposure to conservation threats. *Endangered Species Research*. <https://doi.org/10.3354/esr001143>
- Madden, H.*, M. Leopold, F. Rivera-Milan, K. Verdel, E. Eggermont, P.G.R. Jodice. *Submitted*. Reproductive success of Red-billed Tropicbirds on St. Eustatius, Caribbean Netherlands is affected by temporal and oceanographic factors, but not by factors at the nest site.
- Madden, H.*, Y.G. Satgé[^], B.P. Wilkinson, P.G.R. Jodice. *Submitted*. Foraging ecology of Red-billed Tropicbirds in the Caribbean during early chick-rearing revealed by GPS tracking. *Ibis*.
- Masto, N.M.*, R.M. Kaminski, P.D. Gerard, B.E. Ross, M.R. Kneece, and G.L. Wilkerson. 2020. Aerial strip-transect surveys to monitor autumn-winter waterbird abundance and distribution in South Carolina. *Journal of the Southeastern Association of Fish and Wildlife Agencies*. 8:89-100.

- Ottinger, M.A., T. Maness, J.K. Grace, R. Wilson, P.G.R. Jodice. 2019. Strategic Avian Monitoring Plan for the Gulf of Mexico: Avian Health Assessments. In Wilson et al. (eds.). Strategic Bird Monitoring Guidelines for the Northern Gulf of Mexico, Mississippi Agricultural and Forestry Extension Research Bulletin 1228, Mississippi State University.
- Plumpton, H.*, S. Gilliland, and B.E. Ross. Movement ecology and habitat use differences in Black Scoters wintering along the Atlantic Coast. *Avian Conservation and Ecology* 15:6
- Roberts, A.J., J.L. Dooley, B.E. Ross, T.C. Nichols, J.O. Leafloor, K.W. Dufour. 2021. An integrated population model to inform harvest management of Atlantic Brant. *Journal of Wildlife Management*. 85:897-908.
- Satgé, Y.G., E. Rupp, A. Brown, and P.G.R. Jodice. 2020. Habitat modelling locates nesting areas of the Endangered Black-capped Petrel *Pterodroma hasitata* on Hispaniola and identifies habitat loss. *Bird Conservation International* 1-18.
doi:10.1017/S0959270920000490
- Schindler, A.R.*, D.A. Haukos, C.A. Hagen, and B.E. Ross. 2020. A multi-species approach to manage effects of land cover and weather on upland game birds. *Ecology and Evolution*. 10:14330-14345.
- Schindler, A.*, D.A. Haukos, C.A. Hagen, and B.E. Ross. 2020. A decision-support tool to prioritize candidate landscapes for lesser prairie-chicken conservation. *Landscape Ecology* 35:1417-1434.
- Streker, R.A.*, J.S. Lamb*, J. Dindo, P.G.R. Jodice. *In press*. Fine-scale weather patterns drive reproductive success in the Brown Pelican. *Waterbirds*.
- Takahashi, F., F. Sanders, P.G.R. Jodice. *In press*. Spatial and temporal overlap between foraging shorebirds and spawning Horseshoe Crabs (*Limulus polyphemus*) in the Cape Romain - Santee Delta Region of the U.S. Atlantic Coast. *Wilson Journal of Ornithology*.
- Wilkinson, B.P.*, A.M. Haynes-Sutton, L. Meggs, & P.G.R. Jodice. 2020. High spatial fidelity among foraging trips of Masked Boobies from Pedro Bank, Jamaica. *PLoS ONE* 15(4): e0231654. <https://doi.org/10.1371/journal.pone.0231654>
- Wilkinson, B.P., A.R. Robuck, R. Lohmann, H.M. Pickard, & P.G.R. Jodice. Urban proximity while breeding is not a predictor of perfluoroalkyl substance contamination in the eggs of brown pelicans. *Science of the Total Environment*. *In review*.
- Wilkinson, B.P., P.G.R. Jodice. *Submitted*. Interannual colony exchange among breeding Eastern Brown Pelicans. *Journal of Field Ornithology*.
- Wood, J.M.*, A. Tegeler, and B.E. Ross. The effects of private forestland management on avian communities in the Southeastern United States. *Ornithological Applications* 122:duaa048

DATA RELEASES

- Jodice, P.G.R., and B.P. Wilkinson*. 2020. At-sea movements of Masked Boobies from Pedro Cays, Jamaica. U.S. Geological Survey data release, <https://doi.org/10.5066/P9AK95EG>, <https://www.sciencebase.gov/catalog/item/5e74e01ce4b01d50926c6352>
- Wilkinson, B.P., Jodice, P.G.R., and Robuck, A.R., 2021, Concentrations of Perfluoroalkyl Substances in the Eggs of Brown Pelicans from Charleston, SC (2019): U.S. Geological Survey data release, <https://doi.org/10.5066/P9SKDFZU>.

ACTIVITIES

TEACHING

- P. Jodice, Conservation Physiology (online), Fall 2020.
- P. Jodice, Unsolved Problems in Ecology, Fall 2020.
- B. Ross, Analysis of Fish and Wildlife Populations, Fall 2020.

PRESENTATIONS AND SEMINARS

Invited presentations

- Michael, P.E., J. Gleason, J.C. Haney, Y. Satgé, P.G.R. Jodice. 2020. Diversity and distribution of seabirds in pelagic waters of the northern Gulf of Mexico. Gulf of Mexico Oil Spill & Ecosystem Science Conference. February 3-6, 2020, Tampa, FL, USA
- B.E. Ross, Nicholas Masto, Christian Roy, Richard Kaminski, Jamie Dozier, Mark McAlister, and Joseph Woods. 2020. Integrating counts from aerial and ground surveys to estimate densities of waterfowl. Annual conference of The Wildlife Society, virtual.
- B.E. Ross, J.M. Wood, A. Tegeler. 2020. Data integration for ARUs and point counts. North American Ornithological Conference, virtual.

Contributed papers / Presentations / Posters

- Wilkinson, B.P., A.R. Robuck, R. Lohmann, H.M. Pickard, & P.G.R. Jodice. 2020. Perfluoroalkyl substances in the eggs of brown pelicans from South Carolina. 44th Annual Meeting of the Waterbird Society, Virtual.

SERVICE

- P. Jodice, Chair, World Seabird Union. 2015 – 2020.
- P. Jodice, Steering Committee Member, Gulf of Mexico Avian Monitoring Network.
- P. Jodice, Steering Committee Member, Atlantic Marine Bird Cooperative.
- P. Jodice, C-Chair Search Committee, Kennedy Director, Clemson University

P. Michael, Session Co-Convener, 3rd World Seabird Conference.

B. Ross, committee member, Kennedy Director, Clemson University

B. Ross, Secretary, The Wildlife Society, Biometrics Working Group.

B. Ross, Associate Editor, Wildlife Society Bulletin.

B. Ross, Associate Editor, The Condor.

Y. Satgé, Co-Chair, BirdsCaribbean Seabird Working Group. 2020 – 2025.

B. Wilkinson, Student Representative, Assistant Unit Leader Search Committee, U.S.G.S. South Carolina Cooperative Fish and Wildlife Research Unit, Clemson University, 2021.

B. Wilkinson, Social Media Coordinator (Twitter), Pacific Seabird Group, 2020-2021.

AWARDS AND HONORS

B. Wilkinson, Douglas R. Phillips Award for Graduate Student Excellence, Clemson University, 2020.

B. Wilkinson, Columbus Hammond Townsend Fellowship, Clemson University, 2020.

PRESS / PUBLIC OUTREACH

Outreach: Pelican paths: Seabird tracking in the South Atlantic Bight. Oconee Rivers Audubon Society, virtual. B.P. Wilkinson. March 2021.

Outreach: Storms on the horizon: Former success breeds conservation optimism for the brown pelican. Blog post, The Ethogram, University of California, Davis. Animal Behavior and Graduate Group. B.P. Wilkinson. August 2020.

Press: What do birds do in a hurricane? Hakai Magazine. J. Howard. 2020

