SOUTH CAROLINA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

ANNUAL REPORT

2012

In 2012, the South Carolina Cooperative Fish & Wildlife Research Unit continued its mission towards training new graduate students, developing new graduate level courses, and engaging our cooperators to address emerging natural resource issues in the State of South Carolina and throughout the United States. We have developed new research projects with federal, state, and NGO partners that contribute to our understanding and sustainable management of natural resources.

South Carolina Cooperative Fish and Wildlife Research Unit

2012 ANNUAL REPORT

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Cooperators:

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

Report by Joseph Tavano

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COOPERATORS AND PERSONNEL

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Patricia Layton, Director, School of Agriculture, Forest, and Environmental Science, Clemson University

Greg Yarrow, Chair Natural Resources Division, School of Agriculture, Forest, and Environmental Science, Clemson University

Wildlife Management Institute

Steve Williams, President, Wildlife Management Institute, Gardners, PA 17324

UNIT PERSONNEL

Scientists

Patrick Jodice, Unit Leader, U.S. Geological Survey, and Associate Professor, School of Agriculture, Forest and Environmental Sciences

Katherine McFadden, Assistant Unit Leader-Wildlife, U.S. Geological Survey, and Assistant Professor, School of Agriculture, Forest and Environmental Sciences

VACANT, Assistant Unit Leader

Staff

Carolyn Wakefield, Administrative Assistant

Joseph Tavano, Research Specialist

COLLABORATORS

Clemson University:

Jeff Allen, Director, SC Water Resources Center, Strom Thurmond Institute
Robert Baldwin, School of Agriculture, Forest, and Environmental Sciences
William Bridges, Mathematical Sciences
William Conner, School of Agriculture, Forest, and Environmental Sciences
Saara DeWalt, Biological Sciences
Patrick Gerard, Mathematical Sciences
Autumn-Lynn Harrison, School of Agriculture, Forest, and Environmental Sciences
Laura Jodice, Parks, Recreation and Tourism Management
Robert Powell, Parks, Recreation and Tourism Management
John Rodgers, School of Agriculture, Forest, and Environmental Sciences
Shari Rodriguez, School of Agriculture, Forest, and Environmental Sciences
Greg Yarrow, School of Agriculture, Forest, and Environmental Sciences

South Carolina Department of Natural Resources Cooperators:

Breck Carmichael, Special Assistant to the Director
Jay Butfiloski, South Carolina DNR
Jamie Dozier, Yawkey Wildlife Center
Du Bose Griffin, Marine Turtle Conservation Program
Felicia Sanders, Wildlife Biologist
Mark Scott, Fisheries Biologist
Mark Spinks, Wildlife Biologist
David Whittaker, Assistant Deputy Director, Marine Resources Division

Federal Agency Cooperators:

Laurel Barnhill, USFWS
Sarah Dawsey, USFWS Cape Romain Natural Wildlife Refuge
Scott Johnston, USFWS
Susan C. Loeb, Southern Research Station, USFS
Raye Nillius, USFWS Cape Romain Natural Wildlife Refuge
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John Stanton, USFWS
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Stacy Vander Pol, National Institute Standards and Technology
Jennifer Keller, National Institute Standards and Technology
Craig Watson, USFWS Ecological Services, Charleston, SC
Jennifer Wheeler, USFWS
Bureau of Ocean Energy Management
USFWS Region 4, Cape Romain Natural Wildlife Refuge
USFWS Migratory Bird Management Office
USFWS Ecological Services
USFS Southern Forest Experiment Station
National Park Service, Congaree National Park
Pacific Islands Regional Office, National Marine Fisheries Service

Private Sector and International Cooperators:

Avian Research Conservation Institute
The Nature Conservancy
Bahamas National Trust
Black Rock Forest Consortium
BioDiversity Research Institute
Defenders of Wildlife
El Colegio de la Frontera Sur Unidad Campeche, Mexico
Environmental Management Authority, Trinidad & Tobago
Georgia Sea Turtle Center
International Crane Foundation
Low Country Institute
National Fish and Wildlife Foundation
Nemours Wildlife Foundation
Society for the Conservation and Study of Caribbean Birds
St. Catherine's Island Wildlife Survival Center
St. Eustatius National Parks
The Nature Conservancy

Faculty Cooperators from other Colleges and Universities:

Peter Frederick, University of Florida
Will Mackin, Guilford College
Paul Nolan, Citadel
Clint Moore, University of Georgia
Richard Philips, British Antarctic Survey
John Speakman, Aberdeen University
Robert Suryan, Oregon State University
Dick Veit, City College of New York

GRADUATE EDUCATION

CURRENT STUDENTS

Juliet Lamb, Ph. D. Wildlife & Fisheries Biology (Advisor: Jodice)
Caroline Poli, M.S. Wildlife & Fisheries Biology (Advisor: Jodice)
Elizabeth Zinsser, M.S. Wildlife & Fisheries Biology (Advisor: Jodice)
Katie Keck, M.S. Wildlife & Fisheries Biology (Advisor: McFadden)
Abigail Lawson, Ph. D. Wildlife & Fisheries Biology (Advisor: McFadden)

RECENT GRADUATES

Samantha Collins, M.S. Wildlife & Fisheries Biology (Advisor: Jodice)
Lisa Eggert, Ph.D. Wildlife & Fisheries Biology (Advisor: Jodice)
Gillian Brooks, M.S. Wildlife & Fisheries Biology (Advisor: Jodice)

COURSES TAUGHT

WFB 861, Advanced Conservation Biology & Sustainability, Fall 2013, 3 Credits (McFadden)
AFLS 191, Research Internship (Undergraduate, Summer 2012, 2 Credits (McFadden)
WFB 861, Foundations of Ecology, Spring 2013, 3 credits (Jodice)
WFB 861, Ecology Reading Group, Spring 2012, 1 credit (Jodice)

RESEARCH

CURRENT PROJECTS

South Carolina alligator adaptive management strategies: Population dynamics, habitat utilization, and conservation threats

INVESTIGATORS:
Kate McFadden (SCCFWRU)
Derrell Shipes (SCDNR)

STUDENT:
Abby Lawson (Ph.D., Clemson University)

SPONSOR:
SCDNR

DATES:
January 2013 – December 2016

The South Carolina Department of Natural Resources (SCDNR) manages American alligator (*Alligator missippiensis*; hereafter alligator) populations as a commercial, renewable natural resource to support harvest programs on private and public lands. However, the alligator's dual roles as a controversial public safety nuisance, a flagship species for wetland conservation, and a valuable economic resource creates several management challenges. Additionally, development on South Carolina's coastal plain has continuously encroached upon existing alligator habitat, thereby increasing the potential for human-alligator conflict and habitat degradation. This project will develop an adaptive management strategy for alligators in the state of South Carolina that meets the needs of multiple stakeholders by ensuring the long-term viability of an ecological and economically important natural resource.

This project will estimate alligator abundance and critical habitat using historic and contemporary nightlight survey data from a variety of habitat types. We will make recommendations to improve current alligator survey methodologies to best reflect alligator abundance, distribution, and age structure in variable environments. Identification of habitat features that influence alligator distribution and abundance will enable the estimation of alligator occupancy in un-surveyed areas based on habitat characteristics using occupancy modeling. Additionally, we will collect stable isotope tissue samples from harvested alligators and prey items to better evaluate habitat use and examine potential habitat stressors; methyl mercury (MeHg) biomaginification, in particular. MeHg concentrations in alligators are predicted to be high due to their keystone predator status in wetland food webs; which has important implications for both wetland and human health, given the rise in popularity of alligator hunting in South Carolina. We will synthesize these results to develop a population model that will be used to simulate potential climate, development, and harvest scenarios on alligator populations as part of an adaptive management strategy.

Since project initiation in January 2013, we have worked with SCDNR to implement a revised nightlight survey design. Nightlight surveys will be moved from the current fall survey period (Aug. – Sep.) to spring (April – May) to overlap with the breeding season beginning spring 2014. During breeding, males and females are found in similar habitats that are amenable to nightlight surveys. Additionally, we are selecting new survey routes that provide optimal coverage of major alligator habitat types within the state that represent variable levels of harvest pressure.

Conservation of green and hawksbill sea turtles at Palmyra Atoll

INVESTIGATORS:
Kate McFadden (SCCFWRU)
Eleanor Sterling (AMNH)

PROJECT STATUS:
NOAA funded 2011 – 2013; funding renewal submitted for 2014

My research on endangered and threatened sea turtles at Palmyra Atoll began in 2008 and has several distinct research arms in varying state of completion. The major research goals/publications of which I am the lead author are listed below by manuscript title:

1) Health and metal exposure of green sea turtles at a relatively pristine foraging ground in the Central Pacific (in preparation for submittal to the Journal of Wildlife Disease, Summer 2013).

2) Stable nitrogen and carbon isotope ratios in multiple tissues of green sea turtles (*Chelonia mydas*): identifying temporal and spatial variability in foraging habits (in preparation for Marine Ecological Progress Series. Anticipated submission Fall 2013)

3) Variation in isotopic signatures of difference tissue types of green sea turtles at a foraging ground in the Central Pacific (in preparation for Journal of Experimental Biology & Ecology. Anticipated submission Fall 2013)

4) Home range, habitat use and foraging habits of green sea turtles at a foraging ground in the Central Pacific (in preparation for Marine Ecological Progress Series. Anticipated submission Winter 2013)

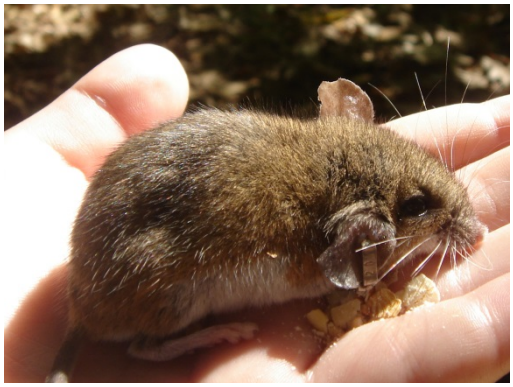
Loss of foundation tree species: Consequences for small mammal assemblages in oak forest ecosystems

INVESTIGATOR:
Kate McFadden (SCCFWRU)

STUDENT:
Katie Keck (M.S., Clemson University)

SPONSOR:
Black Rock Forest

DATES:
2008 - 2014



Foundation species control the functional ecology and ecological processes of an ecosystem. North American oaks are foundation species which are being decimated by a fungal pathogen, sudden oak death (SOD). The impact of SOD on other forest inhabitants is not well understood and this study addresses the effect of the environmental changes associated with SOD on small mammals in an oak-deciduous forest. The objectives of this project were to investigate the impact of a simulated pathogen attack on the small mammal assemblage of an oak-deciduous forest, to quantify the abiotic effects of SOD on the ecosystem, and identify which environmental variables most affect small mammal community assemblage structure and species diversity.

Oak trees were girdled to mimic the symptoms of SOD in an oak-deciduous forest in New York. Small mammals were trapped in a mark-recapture study for five years following girdling. Four experimental treatments: 100% oaks girdled, 50% oaks girdled, 100% non-oaks girdled, and a control were replicated three times. A suite of environmental variables were collected including coarse woody debris, leaf litter, percent vegetative cover, and a variety of temperature and precipitation measurements. I anticipate that small mammal species diversity will decrease due to changes in microhabitat conditions. I predict that specialist species abundance will decrease due to their inability to acclimate to the new environmental conditions and that generalist species abundance will increase due to the newly available niche space. I expect the probability of survival to decrease in plots where 100% and 50% of the oaks have been girdled. SOD is a destructive pathogen that is altering the composition of North American forests. Not only is SOD changing the trees, it is also impacting other forest inhabitants that fulfill important roles in the ecosystem. By determining the effect of pathogens on other members of the forest community, I will be able to determine if the devastation of SOD is greater than the oak trees it kills directly.

Behavioral and physiological ecology of seabirds

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Felicia Sanders (SCDNR)

STUDENT:
Caroline Poli (M.S., Clemson University)

SPONSOR:
SCDNR, USFWS

DATES:
January 2013 – December 2014

As part of a larger, longterm project that has focused on the conservation issues facing seabirds in South Carolina and the Caribbean, we are examining pre-existing data sets to gain a better understanding of the biological mechanisms that may underlie seabird population trends in these regions. We will primarily investigate behavioral and physiological ecology of Brown Pelicans at Deveaux and Crab banks in South Carolina. Beginning in the spring of 2013 the graduate student will analyze data sets collected by Dr. Lisa Ferguson during her Ph. D. research. The two primary data sets to be investigated include attendance of parent Brown Pelicans during early chick-rearing and energetics and condition of pelican chicks during early chick development. We will seek to assess the relationship between various metrics of chick condition (e.g. tick infestation levels, body condition index, and energy expenditure) and parental attendance patterns. Results should provide an enhancement of our understanding of early chick development and survival in pelicans and will build upon previous efforts (e.g. research conducted by L. Ferguson for her MS and PhD, research conducted by E. Sachs for her MS, and research conducted by L. Wickliffe for her MS).

We also will examine pre-existing data collected by the PI as part of his research efforts in the Caribbean. We will use activity and attendance data collected from geolocators to gain a better understanding of breeding and wintering ecology of Audubon's Shearwaters and White-tailed Tropicbirds. We will assess patterns in colony attendance and time at-sea in relation to environmental factors and breeding stage. Very few data exist with which to address such questions in Atlantic seabirds, and to date there are no investigations of such data for either of these two species. Results from this research effort will enhance our understanding of the behavior of these pelagic seabirds away from the colony and in so doing will inform conservation and management questions.

Development of a seabird colony atlas and register for the Southeastern U.S.

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Lisa Ferguson (Clemson University)
John Stanton (USFWS)

SPONSOR:
USFWS

DATES:
January 2013 – December 2013

There is no current atlas or database of seabird nesting sites for the entire southeastern U.S. (NC, SC, GA, Atlantic Florida). The Deepwater Horizon oil spill highlighted the critical need for such a product in each coastal region of the U.S. An atlas also would be valuable for marine spatial planning issues including but not limited to sighting wind turbines, scheduling and sighting sand-dredging and beach nourishment operations, managing recreation and access, and land/marine conservation planning.

We are developing a register (data, meta-data) and atlas (spatial inventory) of colony sites used by breeding seabirds throughout the study area (restricted to South Carolina, Georgia, and Atlantic Florida due to funding levels). Focal species will include but not be limited to breeding nearshore seabirds in the region (e.g. Brown Pelicans, Black Skimmers, Laughing Gulls, Royal Terns, Sandwich Terns, Least Terns, Gull-billed Terns, Common Terns). The atlas builds upon previous work of Jodice et al. to gather current and historical (ca. 1960) information and data on all seabird nesting and colony sites in the study area. All of the proposed work would occur in coordination with ongoing efforts of the World Seabird Union (of which Jodice is a key member) to develop World Seabird Colony Registers (i.e., we would ensure compatibility between the products).

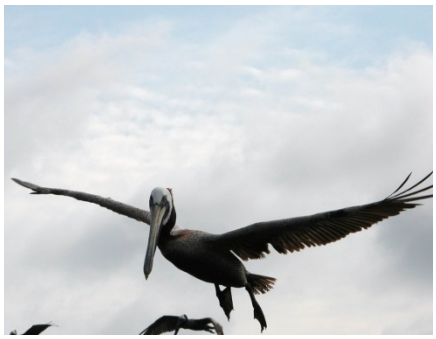
Eastern Brown Pelicans: Dispersal, seasonal movements and monitoring of PAHs and other contaminants among breeding colonies in the Gulf of Mexico

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Kate McFadden (SCCFWRU)

STUDENT:
Juliet Lamb (Ph.D., Clemson University)

SPONSOR:
Bureau of Ocean Energy Management

DATES:
August 2012 – December 2016



This study focuses on obtaining information about populations of brown pelicans across the northern Gulf of Mexico. Study objectives are to (1) document dispersal, seasonal and annual movements, seasonal home range, and site fidelity of marked adult brown pelicans among nesting colonies from the Gulf coast and (2) measure levels of contaminants in adult and nestling brown pelicans. Objective 1 will be addressed through satellite telemetry and objective 2 will be addressed through the acquisition of tissue samples (e.g. blood, feathers, eggs). The study will address information gaps relative to brown pelicans in the Gulf of Mexico and provide baseline ecological information. In particular, limited information is known regarding foraging behavior for this species and the general ecology of immature eastern brown pelicans in the northern Gulf of Mexico is also poorly understood. The project is not intended to be a post-spill study, but rather to address data gaps for the agency as it pertains to development of additional oil and gas projects in the Gulf. Research will build from and compliment previous and ongoing research efforts of the PI in the Gulf and in coastal SC.

We initiated field research in spring 2013. We purchased 60 satellite tags and began deploying tags in April at colonies in Louisiana. Tags are scheduled to be deployed during May 2013 at colonies in Texas and Florida.

Nest success and habitat use of Wilson's Plovers in South Carolina

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Felicia Sanders (SCDNR)

STUDENT:
Elizabeth Zinsser (M.S., Clemson University)

SPONSOR:
SCDNR

DATES:
January 2012 – December 2013

Wilson's Plover is a medium-sized plover associated strictly with coastal areas. The US Shorebird Conservation Plan list Wilson's Plover as a "species of high concern" in their prioritization of shorebird species according to relative conservation status and risk. Wilson's Plovers are listed as state threatened in South Carolina. SC DNR surveys from 2009 -2011 suggest approximately 300 pairs nest in SC and they are rare on beaches with development.

The major threat to the species in US appears to be loss of breeding habitat on beachfronts. On undeveloped barrier islands, human disturbance also appears to cause nest loss and abandonment of sites. Unfortunately little is known about most aspects of the life history of this species and therefore management and conservation efforts are limited in scope. Our goal is to examine the reproductive ecology of Wilson's Plovers in SC.

We studied nest success at two field sites, South Island and Sand Island, at the Tom Yawkey Wildlife Center in South Carolina. During the 2012 breeding season we monitored 39 nests over 103 days. A total of 17 nests hatched and 22 nests failed. The primary causes of failure were flooding and predation although abandonment and failure due to unknown causes also occurred. The average initiation date was 29 April 2012, the average hatch date was 18 May 2012, and the average failure date was 16 May 2012. The daily survival rate (DSR) of nests at South Island was 0.9748 and at Sand Island was 0.9652. The probability of success over a 25 day incubation period at South Island was 0.5289 and at Sand Island was 0.4124. We also measured DSR of nests within three habitat types. DSR was 0.9644 in immature dune, 0.9747 on the strand, and 0.9674 in the dune field. The probability of success was 0.4041 in the immature dune, 0.5275 on the strand, and 0.5236 in the dune field. Nest success appeared to be affected by location which left low lying nests at risk of flooding. Field work will continue in 2013.

Determining the movement patterns and habitat use of seabirds to support marine spatial planning in the northwest Atlantic

INVESTIGATORS:
Patrick Jodice (SCCFWRU)

SPONSOR:
USFWS

DATES:
January 2012 – December 2014

Although ship-based and aerial surveys are the standard methods used to measure abundance and distribution of birds at sea, each is a population-based survey that provides information without regard to the individual. While data from such surveys are sufficient for estimating abundance or distribution, additional data are needed to more fully understand the individual variability associated with the population use of an area and the impact that would have on marine spatial planning issues. We are deploying tracking devices to measure movement patterns of seabirds in the Caribbean, Gulf of Mexico, and Northwest Atlantic. Data from individual tracking efforts will allow us to assess variability in movements and use patterns and to measure features such as residence or first-passage time, fidelity to specific marine locations, and the relationship between marine use areas and colony of origin (which allows for any marine impacts to be assessed in relation to breeding locations and population trends at the breeding grounds). Our research builds upon tracking work we initiated in the Bahamas in 2008-2010 and also takes advantage of the Capacity Building project we initiated in the Caribbean.

To date we have deployed tracking devices on the following species: geolocators on Audubon's Shearwater in The Bahamas and Tobago; geolocators on White-tailed Tropicbird in The Bahamas; geolocators on Red-billed Tropicbird in Tobago and St. Eustatius; satellite tags, geolocators, and GPS tags on Masked Booby in Jamaica and Mexico. Data are being collected and analyzed. Cooperators in each country from federal agencies, Universities, and NGOs are providing logistical support for this research. All of these partnerships were developed through the Capacity Building Workshop we offered in June 2012.

Building international capacity for seabird science

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Lisa Sorenson, Ann Sutton & Will Mackin (Society for the Conservation and Study of Caribbean Seabirds)
Chris Haney (Defenders of Wildlife)
Jennifer Wheeler (USFWS)

SPONSOR:
National Fish & Wildlife Foundation

DATES:
January 2011 – December 2013

Caribbean seabirds are among the least studied of regional seabird populations with many pressing conservation needs, but the capacity to implement conservation measures is severely constrained. Lack of trained personnel, lack of knowledge of cost-effective methods to address threats and monitor effectiveness of measures, lack of funding for implementation combined with lack of awareness are limitations unique to regions like the Caribbean where the small sizes and small individual economies of its many nation-states simply do not allow for advances in seabird management to be easily made. In this region capacity is the fundamental obstacle to effective conservation. Increasing capacity is a fundamental approach to responding and mitigating the effects of the DWH oil spill.

The goal of this project is to compensate for lethal and sub lethal damages to Caribbean and Gulf of Mexico seabird meta-populations and their habitats caused by the DWH oil spill by building long-term, in-country capacity to address threats and effectively manage and conserve species and habitats. This project will promote immediate and long-term conservation at important sites throughout the region by (1) implementing immediate conservation projects at high-priority sites that also will serve as demonstration projects for a later capacity-building training workshop, (2) training key individuals (including protected area managers, scientists, and their partners who will themselves implement projects and act as trainers) during a multi-day capacity-building workshop, (3) supporting trained individuals by developing and implementing projects (to be supported by a small grants program) as well as long-term funding proposals. These activities will mitigate the effects of the DWH and permanently increase the capacity to address other short and long-term threats. The main activities will focus on assisting local practitioners to implement practical conservation activities addressing regional priority needs.

A class and field-based training workshop was held during June 2012 in San Salvador, Bahamas. Approximately 30 participants from throughout the Caribbean attended including scientists from Mexico and the U.S. Two field-based follow-up workshops were held in Jamaica in July and October 2012. Participants (n = 6 for each session) were trained in hands-on research and monitoring techniques for colonial seabirds.

Enhancing productivity of American Oystercatchers in Cape Romain National Wildlife Refuge

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Felicia Sanders

STUDENT:
Samantha Collins (M.S.)

SPONSORS:
USFWS, SCDNR

DATES:
Jan. 2010 – Aug. 2012

Oystercatcher Eggs

The Cape Romain Region (CRR) is located along the coast of South Carolina and supports over half of the breeding pairs (approximately 200 pairs) of American Oystercatchers (Haematopus palliatus) in the state. Research has shown that oystercatcher productivity in this area is low due to predation and over-wash from high tides and boat wakes. We assessed the feasibility of using headstarting as a means of reducing nest loss in an attempt to enhance reproductive success during the 2010 and 2011 breeding seasons. Apparent nest success of headstarted nests (52%) was higher than control nests (11%) along two study areas within the CRR. However, apparent brood success was higher for control nests (90%) compared to headstarted nests (27%). Although headstarting may improve nest success during incubation, it did not appear to ultimately enhance productivity within this region because of high rates of chick loss.

In addition to assessing the feasibility of headstarting, we also examined attributes of behavior and attendance rates of oystercatcher breeding pairs on nesting territories in two study areas of the Cape Romain Region. We recorded the percentage of time breeding pairs were present on nesting territories and the behaviors exhibited while present during low-tide foraging periods during incubation and chick-rearing. We found no significant differences in the rate of attendance or each behavior between breeding pairs with assigned headstart or control nests for incubation and chick-rearing. Attendance of breeding pairs was found to be significantly related to the nest success of control nests but was not found to be related to the brood success of chicks. Behavior of breeding pairs was often found to be significantly related to site during incubation and chick age during chick-rearing.

Analyses are complete and publications are being prepared. Reproductive success data from this project will be combined with data from previous efforts to produce a 5-year overview of Oystercatcher productivity in the region.

Survival rates of seabirds in oiled areas of the Gulf of Mexico

INVESTIGATORS:
Patrick Jodice (SCCFWRU)
Lisa Eggert (Clemson University)
Dave Evers (Biodiversity Research Institute)

SPONSOR:
USFWS

DATES:
Ongoing

Brown Pelican with satellite tag

This research is a component of the NRDA avian injury assessment at the Gulf of Mexico – *Deepwater Horizon Mississippi Canyon* oil spill and these data will serve as the primary measure of survival rates for the NRDA process for seabirds (pelicans, terns, skimmers) in the Gulf of Mexico. The primary objective is to determine the rate of mortality in sublethally oiled birds through the use of individual tracking studies. The primary species of interest are brown pelican (*Pelecanus occidentalis*) and black skimmer (*Rynchops niger*). The initial research area has included the coastal islands of Louisiana. Satellite tags with activity sensors and VHF tags with mortality switches were deployed to evaluate survival and movement of the focal species. Data collected will be used to estimate mortality rates of adult birds, determine movement patterns, and determine habitat use patterns. We also deployed satellite tags and VHF tags on reference (i.e., birds not impacted by oil) in South Carolina and Georgia. The data being collected also will improve our understanding of movement patterns and foraging habitat use of nearshore seabirds in the Gulf of Mexico and southeastern US which will benefit marine spatial planning and risk assessment for offshore energy development.

Field work is completed. Preliminary results of movement data have been presented at scientific conferences. Although a thorough analysis of these data has not yet been initiated, we are seeking funds to support analysis of movement data.

FUTURE RESEARCH DIRECTIONS

Innovative approaches to manage and reduce feral hog damage to agronomic systems, woodlands, and ecosystem services

INVESTIGATORS:
Kate McFadden (SCCFWRU)
Greg Yarrow, Shari Rodriguez (Clemson University)

PROJECT STATUS:
Proposal submitted for funding, NRCS

In response to growing concerns about the economic and ecological impact of feral hog populations among federal, state, and local leadership within the state of South Carolina, Clemson University seeks to develop novel management approaches to reduce feral hog damage. This project will utilize public surveys to identify areas/stakeholders with severe feral hog damage within the state. These sites will serve as pilot areas to further develop innovative camera trap tools to manage and reduce feral hog damage. This project will allow us to assess the effectiveness of a technical assistance and cost-sharing program (materials and equipment) to reduce feral hog damage on EQIP eligible producers' property. The results of this project will be used to develop a set of "best practices" management recommendations that will be communicated to natural resource managers, community members and the NRCS.

Wintering habitat assessment of Whooping Cranes

INVESTIGATOR:
Patrick Jodice (SCCFWRU)

COLLABORATORS:
International Crane Foundation
Nemours Foundation
USFWS

Photo: Ted Thousand

In 2001 the Whooping Crane Eastern Partnership began reintroducing Whooping Cranes in a new eastern migratory flock that migrates from Wisconsin to the southeastern United States. The Eastern Migratory Population (EMP) of Whooping Cranes now has over 100 individuals on the landscape, but is not yet self-sustaining. A primary need is to better understand the complicated processes that drive wintering habitat choice and subsequently breeding success of this population. Our team has identified a need to assess wintering ecology of cranes so as to better predict the types of habitats they may use and the quantity and quality of habitats that may be available throughout the EMP. We are developing a proposal to be submitted to various funding opportunities. The goal of the research is to enhance our understanding of wintering habitat use of Whooping Cranes so as to better inform decision-making as it relates to wintering habitat assessment and the development and protection of current and alternative wintering sites. Our objectives are to (1) Quantify wintering habitat use of adult Whooping Cranes at the patch and landscape scales from monitoring data collected for the EMP between 2001-2013, (2) Using habitat models created in objective 1, predict suitability of potential wintering areas east of the Mississippi River, (3) Solicit expert opinion to further inform the development of predictive habitat models for novel wintering sites east of the Mississippi River, and (4) Use a structured decision making framework to evaluate possible wintering habitat locations as identified in steps 2 and 3 above.

PUBLICATIONS 2012 - 2013

JOURNAL ARTICLES

Brooks, G.L.*, F.J. Sanders, P.D. Gerard, P.G.R. Jodice. 2013. Daily survival rate for nests and chicks of Least Terns (Sternula antillarum). Waterbirds 36:1-10.

Giles, M.M.*, P.G.R. Jodice, R.F. Baldwin, J. Stanton, M. Epstein. In Press. Spring migratory pathways and migration chronology of Canada Geese wintering at the Santee NWR.

Jodice, P.G.R., L.C. Wickliffe*, E.B. Sachs*. 2011. Seabird use of discards from a nearshore shrimp fishery in the South Atlantic Bight, USA. Marine Biology 158:2289-2298.

Jodice, P.G.R., J. Tavano, W. Mackin. In Press. Chapter 8: Marine Birds and Bats. In: Michel, J. (ed.). 2012. South Atlantic Information Resources: Data Search and Literature Synthesis. U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2012-xxx. 805 pp.

McFadden, K.W. and S. Meiri. 2013. Dwarfism in insular carnivores: a case study of the pygmy raccoon. Journal of Zoology 289:213-221.

Sterling, E., K. McFadden, K. Holmes, E. Vintinner, F. Arengo, and E. Naro-Maciel. 2013. Ecology and conservation of marine turtles in a Central Pacific foraging ground. Chelonian Conservation Biology (in press).

Vander Pol, S.S., D.W. Anderson, P.G.R. Jodice, J.E. Stuckey. 2012. East versus west: organic contaminant differences in Brown Pelican eggs from South Carolina, USA and the Gulf of California, Mexico. Science and the Total Environment 438: 527-532.

* indicates graduate student advisee

THESES AND DISSERTATIONS 2012 - 2013

Samantha Collins, School of Agriculture, Forest and Environmental Science, M.S. student, March 2010 – April 2012: *Reproductive Ecology of American Oystercatchers in the Cape Romain Region of South Carolina: Implications for Conservation*

Lisa Ferguson Eggert, School of Agriculture, Forest and Environmental Science, Ph.D. student, May 2006 – August 2012: *Conservation Needs of Nearshore Seabirds in the Southeastern US Addressed Through Habitat Use Surveys and Assessments of Health and Mercury Concentrations*

Jessica Gorzo, Dept. Forestry and Natural Resources, M.S. student, May 2009 – January 2012: *Avian Communities and landscape characteristics of golf courses within the Beaufort County sea island complex*

ACTIVITIES 2012 - 2013

TECHNICAL ASSISTANCE

USFWS and SC DNR Candidate Species Listing Process (Dec 19, 2012, Jodice & McFadden)

TRAINING ATTENDED

Training for Board Members of Nonprofits (Jodice 2013)

Motorboat Operator Certification Course (McFadden 2012)

TRAINING DELIVERED

June 2012, Building Capacity for Seabird Science and Management: Ecology, Conservation & Management, San Salvador Bahamas (6 days, 30 participants from the Caribbean region, Jodice)

June 2012, Summer Program for Research Interns, Clemson University (McFadden)

July 2012, Building Capacity for Seabird Science and Management: Practical Applications I, Pedro Cays, Jamaica (8 days, 6 participants from Jamaica, Jodice)

October 2012, Building Capacity for Seabird Science and Management: Practical Applications II, Pedro Cays, Jamaica (8 days, 8 participants from Jamaica, Mexico, Bonaire, Colombia, Martinique, British Virgin Islands, Jodice)

PRESENTATIONS AND SEMINARS

Invited Presentations

McFadden, K. 2012. Interdisciplinary tools for the conservation of sea turtles. Fort Johnson/College of Charleston/NOAA Seminar Series.

McFadden, K. 2012. The role sea turtles play in structuring marine ecosystems. Department of Biological Sciences Seminar, Clemson University.

Wakefield, E.D., and 50 authors including P.G.R. Jodice. 2012. A newly described seabird diversity hotspot in the deep northwest Atlantic identified using individual movement data. Pacific Seabird Group Annual Meeting, Honolulu, Hawaii.

Contributed Papers / Presentations / Posters

McFadden, K., E. Sterling, E. Vitinner-Betley, E. Naro-Maciel. 2012. The status of green sea turtles at Palmyra Atoll National Wildlife Refuge. US Fish and Wildlife Report.

Poli, C.*, P.G.R. Jodice. W. Mackin, J. Arnold, R. Phillips. 2013. Activity patterns of Audubon's Shearwaters breeding in The Bahamas. Pacific Seabird Group, Portland, Oregon [Poster]

Zinsser, E.A.*, P.G.R. Jodice, F. Sanders. 2013. Daily survival rates of Wilson's Plovers in South Carolina. Pacific Seabird Group, Portland, Oregon [Poster]

* graduate student advisee

SERVICE

Patrick Jodice:

Past-Chair, Pacific Seabird Group (Elected)
Board of Directors, World Seabird Union(Elected)
Chair Faculty Search Committee (Fisheries Ecologist), Clemson University
Internal Reviewer, Promotion and Tenure Committee, Clemson University
Graduate Student Studies Committee, Department of Forestry and Natural Resources, Clemson University
Team Leader, Individual Tracking Studies, Atlantic Marine Bird Conservation Cooperative
Reviewer (2012-2013) Deep Sea Research II, Journal of Field Ornithology, Marine Ecology Progress Series, Journal of Wildlife Diseases

Kate McFadden:

Coordinator for Scientific Strategic Planning, Wild Hog Task Force (Dec. 2012- present)
Scientific Chair, Palmyra Atoll Research Coordinator (Jan. 2013- present)
Secretary, Sigma Xi Research Society, Clemson Chapter (April 2013- present)
Member, Ecology Curriculum Committee, Clemson University (Summer 2012)
Member, South Carolina Chapter, The Wildlife Society (Dec 2011- present)
Reviewer (2012-2013), Acta Thereologica, Journal of Ecology, Oryx, Journal of Ocean Management, Journal of Small Mammal Conservation

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Media Relations

Clemson researchers to help design South Carolina alligator strategy

+1 Published: April 18, 2013

CLEMSON — The South Carolina Department of Natural Resources has tapped Clemson University researchers to assist in designing a conservation and management strategy for the state's alligator population.

image by: Clemson University

Clemson's South Carolina Cooperative Fish and Wildlife Research Unit will examine historical and current alligator population surveys and conduct field research to gain a more nuanced and complete picture of the state's alligator population.

The Clemson researchers will provide scientific support for the agency as it designs a long-term adaptive plan for harvesting alligators in a way that ensures their survival, identifies critical habitats and enhances economic benefits for landowners and alligator hunters.

The Department of Natural Resources currently issues 1,200 alligator harvesting permits per year under the Public Alligator Harvest Program for use during a season that runs from the second Saturday in September to the second Saturday in October.

"South Carolina benefits both ecologically and economically from its alligator population. This research will make it possible for us to adjust harvest numbers annually so that alligators remain an asset to the citizens of South Carolina," said Katherine McFadden, assistant leader of the South Carolina Cooperative Fish and Wildlife Research Unit and assistant professor in Clemson's School of Agricultural, Forest and Environmental Sciences.

Using field research and computer modeling, the Clemson scientists will verify the accuracy of current alligator surveys and make recommendations for how to improve future surveys and monitoring efforts.

The researchers also will determine how alligator populations are effected by specific habitat characteristics, such as water depth and vegetation type, and identify and quantify the impact of potential environmental stressors, such as drought and contamination.

Additionally, the researchers will monitor mercury levels in alligators as a way to understand the overall health of the ecosystem.

"Since alligators are non-migratory, long-living and near the top of the food chain, alligator health can be a window into ecosystem health," McFadden said. "Alligators also play an important role in influencing the overall ecological patterns of a region by altering the landscape."

The range of South Carolina alligators extends south and east on a line from North Augusta through Columbia to north of Bennettsville. The coastal counties of Beaufort, Berkeley, Charleston, Colleton, Georgetown and Jasper have the highest alligator population densities.

The four-year study is funded by a grant from the South Carolina Department of Natural Resources and will be led by Clemson University doctoral student Abby Lawson. Clemson researchers also are working on a separate project with nearby states to develop a transboundary alligator harvesting and conservation strategy.

Contacts

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Related Links

School of Agricultural, Forest and Environmental Sciences

South Carolina Cooperative Fish and Wildlife Research Unit

Associated Images

Clemson researchers to study oil and gas operations' impact on Gulf pelicans

 Published: January 29, 2013

CLEMSON — A federal agency has turned to Clemson University's South Carolina Cooperative Fish and Wildlife Research Unit to collect data that will help it assess the environmental impact of oil and natural gas operations on the marine and coastal environments of the northern Gulf of Mexico's outer continental shelf.

Clemson researchers will fill data holes on the migratory habits of eastern brown pelicans.
image by: Clemson University

The South Carolina Cooperative Fish and Wildlife Research Unit will fill data holes on the migratory habits, demographics and reproductive success of eastern brown pelicans. The data will serve as a snapshot that will help the Bureau of Ocean Energy Management (BOEM) understand the impact of human activities, such as oil and natural gas operations, and help identify possible mitigation protocols.

The four-year study, which will commence in the spring, is a collaboration between the Bureau of Ocean Energy Management, the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service, Clemson University and the states of Texas, Louisiana and Florida. The research is supported by a $1.2 million grant from BOEM and USGS.

"This research will be paramount in understanding the migration and success of eastern brown pelican colonies in relation to each other in the northern Gulf of Mexico," said Patrick Jodice, leader of the South Carolina Cooperative Fish and Wildlife Research Unit and professor in Clemson's School of Agricultural, Forest and Environmental Sciences. "The data we collect will allow the BOEM to more fully assess the potential impact of oil and gas development in the Northern Gulf."

The research will cover an area extending from the Gulf Coast of Texas along the Louisiana Coast to the northwestern Gulf Coast of Florida.

Researchers will use satellite and GPS transmitters to gather data on the dispersal, seasonal and annual movements, season home range and site fidelity of adult brown pelicans among nesting colonies in the northern Gulf of Mexico. Data on body condition and health will be assessed through physical examinations and avian blood-chemistry profiles. Researchers will attempt to identify what portion of brown pelican contaminant loads are derived from particular prey sources and foraging areas by performing analyses of predator and prey tissue samples at colony sites.

This research will build upon previous efforts by Jodice to study the ecology of brown pelicans in South Carolina and in the Gulf of Mexico in response to the Deepwater Horizon incident.

While the eastern brown pelican is not listed on the Endangered Species Act or the Migratory Bird Treaty act, it is considered a "Species of Conservation Concern" by all coastal states along the Gulf of Mexico except Alabama.

END

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Related Links

South Carolina Cooperative Fish and Wildlife Research Unit

Bureau of Ocean Energy Management

Associated Images

Clemson researchers will fill data holes on the migratory habits of eastern brown pelicans.

Eastern brown pelicans are a Species of Conservation Concern among coastal states.