ACCESS NUMBER: 00014

STUDY TITLE: Eastern Brown Pelicans: Dispersal, Seasonal Movements, and Monitoring of PAHs and Other Oil Contaminants Among Breeding Colonies in the Northern Gulf of Mexico

REPORT TITLE: Ecological drivers of brown pelican movement patterns, health, and reproductive success in the Gulf of Mexico

CONTRACT NUMBER: M12PG00014

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA(S): Western Gulf, Central Gulf, Eastern Gulf

FISCAL YEAR(S) OF PROJECT FUNDING: 2012–2019

COMPLETION DATE OF REPORT: May 2019

COSTS: $1.2M

PROJECT MANAGER(S): Dr. Patrick Jodice

AFFILIATION of Project manager: US Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit

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KEY WORDS: brown pelican, diet, migration, nutritional stress, polycyclic aromatic hydrocarbons, risk exposure, spatial ecology, tracking

BRIEF ABSTRACT: We investigated spatial, reproductive, and physiological ecology of brown pelicans (*Pelecanus occidentalis*) throughout the northern Gulf of Mexico (GOM). Home range size and the probability and distance of migration were positively correlated with colony size. Pelicans from all colonies overlapped in space use in the Mississippi River Delta region of Louisiana during the nonbreeding season. Diet was primarily menhaden in the eastern and central regions but was more varied in the western region. Risk of exposure to contaminants was often higher in the west and central GOM compared to the eastern GOM, although factors other than region also contributed to exposure risk.

BACKGROUND: The GOM contains a high density of oil infrastructure and also supports a rich assemblage of seabirds. Understanding the effects of oil and gas activity on seabirds in the region requires a thorough understanding of reproductive ecology, foraging ecology, physiology, and habitat use. Because of its distribution patterns, behavior, and known sensitivity to contaminants, the brown pelican is a good indicator of species-level effects of interaction with coastal and marine development.

OBJECTIVES: Our objectives were to assess reproductive ecology, movement patterns, habitat use, diet, physiology, and exposure to polycyclic aromatic hydrocarbons.

DESCRIPTION: Research was conducted at seven pelican colonies throughout the Northern GOM between 83° and 98° W and 27° and 31° N. We deployed 85 GPS satellite tags on breeding adults to measure and describe home ranges, migration strategies, and risk exposure to oil and gas development and other surface pollutants. We also collected data on colonies (e.g., reproductive success, diet, contaminants).

SIGNIFICANT CONCLUSIONS: Most of the response variables we measured or modeled varied substantially among colonies and regions, although individual characteristics also were significant. The effects of environmental or anthropogenic stressors on pelicans may differ based on a combination of environmental, individual, and colony-based attributes and may not be strictly “region-based”. The use of the Mississippi River Delta region of Louisiana during migration by individuals from all regions suggests this is a hot spot for pelicans and risk exposure.

[1]P.I.’s affiliation may be different than that listed for Project Manager(s).

STUDY RESULTS: Colony size was positively related to home range size, and to distance and probability of migration. Individuals from different colonies and regions overlapped spatially and temporally during breeding, staging, and migration. These overlap areas (e.g., the Mississippi River Delta region of Louisiana) represent hot spots for pelicans at specific times of year, such as staging and migration. Menhaden made up 60–85% of the diet of pelican chicks at colonies within the summer range of menhaden, but < 40% at colonies outside of the core summer range of menhaden (i.e., Texas). Reproductive success was positively related to meal provisioning rates, which, in turn, were lowest at colonies in Texas. Fledging success was positively related to stress levels and body condition of chicks. Exposure to oil and gas activity, surface pollutants, and shipping lanes was least in the east region; it was higher but similar between the central and west regions. The similarity in exposure between the central and west regions is due to inclusion of multiple sources of risk. Hot spots of risk were located in the Mississippi River Delta (Louisiana) and Galveston Bay (Texas). The PAH profile of brown pelicans in the northern Gulf of Mexico was diverse and made up predominantly of alkylated PAHs. The level of oil and gas development in a region was not consistently the best predictor of PAH levels or individual health, and other factors (e.g., body condition, sex) also were influential.

STUDY PRODUCT(S): Primary products are noted; a complete list is available in the report.

Lamb JS, Satgé YG, Streker RA, Jodice PGR. 2020. Ecological drivers of brown pelican movement patterns, health, and reproductive success in the Gulf of Mexico. New Orleans (LA): US Department of the Interior, Bureau of Ocean Energy Management. 234 p. Report No.: BOEM 2020-036. Contract No.: M12PG00014.

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