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EXPANSION OF ROSEATE SPOONBILL BREEDING DISTRIBUTION IN SOUTHWEST FLORIDA

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Wading birds can be used as valuable ecological indicators in coastal ecosystems (Burger and Gochfeld 2004, Amat and Green 2009). Changes in their abundance and distribution can reveal insights about underlying patterns of environmental change, such as how the Roseate Spoonbill (*Platalea ajaja*) is used to monitor changes in Florida's Everglades ecosystem (Lorenz et al. 2009). Here, we report expansion in the breeding distribution of this species to new sites in southwest Florida. We documented the first nests in recent history for this area through routine rookery surveys. We discuss our findings in the context of population trends within the region based on publicly available data. These observations also contribute to ongoing assessments of shifts in the distribution of this indicator species.

The Roseate Spoonbill (hereafter spoonbill) is one of six spoonbill species worldwide and the only representative of the genus *Platalea* in the new world. It is designated as a Species of Special Concern in Florida, with poorly understood seasonal patterns and regional philopatry (Dumas 2000). Over recent decades, wading birds in the southern United States have been rebounding from human persecution during the later nineteenth and early twentieth centuries (summarized in Hodgson and Paul 2013, Kushlan 2018). Likewise, spoonbills were decimated in Florida mainly because of the plume trade and over-hunting. Into the early 1930s their numbers were so greatly reduced that only a small colony was known to persist in Florida at Bottle Key (Allen 1942), and breeding success in Florida Bay did not appear to rebound until the 1950s (Lorenz et al. 2002).

Field observations.— Broadly, nesting wading bird populations in Florida are used as indicators of environmental health. As such, colony patterns are carefully monitored with the aim of restoring historical nest numbers (SFWBR 1997–2017). Colonies are surveyed routinely in several southern parts of the state by government, non-profit, and academic partners. Results are collated in an annual assessment, the South Florida Wading Bird Report (SFWBR). Spoonbills have been monitored in Florida Bay since 1935 (Alvear Rodriguez 2001) and more recently tracked in the SFWBR since 2005. Based on these reports, the subtropical estuary of Florida Bay has been the major breeding location for spoonbills, with 90% of nesting occurring on mangrove islands within the boundaries of Everglades National Park (Bjork and Powell 1996, Lorenz et al. 2002).

As an example of regional monitoring efforts, wading bird colonies have been surveyed monthly throughout the nesting season since 2008 by trained staff of the Florida Department of Environmental Protection (DEP) in Estero Bay Aquatic Preserve, Lee County and in Charlotte Harbor Aquatic Preserves, Charlotte County

(Fig. 1). Surveys in both areas follow a direct count method as described by Paul and Paul (2004; see Clark and Leary 2013). Two observers surveyed each island by boat from a distance of 30–45 m, with a third person recording data. Observers recorded species and stage of breeding (i.e., incubating, chicks present, or unknown) at each nest encountered to measure nest counts and peak nesting effort. The primary observer stayed consistent except for staff change-overs, and trained volunteers conducted the secondary observer counts. They recorded the average of the two observers' counts (Lang 2018).

During this standard monitoring, nesting activity by spoonbills was detected in two parts of Estero Bay Aquatic Preserve where this species had not been recorded as breeding in prior surveys. Breeding activity was observed in Estero Bay during 2017 and 2018. First, a nest was observed on Coconut Point East Island (26.38411, –81.84905) in May 2017, and the pair fledged two chicks. In 2018, 4 chicks were documented during a survey at Hurricane Island (26.46812, –81.95352). These breeding records were documented in the 2017 and 2018 SFWBR annual reports. At Charlotte Harbor Aquatic Preserves, 3 nests were observed during 2018, and 2 were observed in 2019. The 2019 nests were observed at Oyster Creek (26.8181, –82.3359) and Gasparilla Marina (26.8269, –82.2625). Incubation occurred in April, and chicks were present in May and June (M. McMurray, personal communication).

Historical records.— To ascertain whether these nesting occurrences were indeed new for the region, we performed a detailed search of recent and historical records for evidence of any other breeding by this species in Estero Bay, our main study area. We compiled population trends dating back to the early 1950s in South Florida to create a baseline for comparison with current sightings. Sources that we consulted included spoonbill sightings in the publicly available database eBird (Cornell Laboratory of Ornithology 2018), the Florida Breeding Bird Atlas (FWC 2003), prior editions of the SFWBR (SFWBR 1997–2017), and other local researchers for further discussion.

Data plotted from the public database eBird show that spoonbill sightings are most frequent around Florida Bay, Estero Bay, and Lake Okeechobee (Fig. 1). There are many potential sources of bias in datasets generated by citizen science (Kosmala et al. 2016, Callaghan et al. 2017). For example, publicly reported records are not standardized for temporal or spatial effort and they are influenced by observer experience. However, our purpose in showing these compiled records is strictly to illustrate the coarse pattern of spoonbill occurrences in Estero Bay and adjacent areas, and not to infer relative abundance.

Our thorough search of available records confirmed that no prior spoonbill nesting has been documented in Estero Bay or Charlotte Harbor in recent times. Rookery data that Estero Bay Aquatic Preserve staff compiled from the 1970s (collected by Ted Below, Audubon), 1980s (collected by Robert Reppening), and 1990s (collected by Paul Hinchcliff) indicated that spoonbills were observed in the bay roosting and foraging but not nesting. A spoonbill expert confirmed that no prior nests have been reported in the area to their knowledge, although nesting likely would have occurred in what is now Lee County prior to the plume hunting era (J. Lorenz, personal communication). Our compilation of breeding records from SFWMD reports also illustrated how nesting counts in Florida Bay have declined over time (Fig. 2), concurrent with the timing of new breeding records in Estero Bay and Charlotte Harbor.

Potential implications.— Fluctuations in spoonbill population and breeding counts during recent history can provide an index of changing conditions in the coastal ecosystems of southern Florida. Indeed our observations are consistent with other recent findings of spoonbills in areas north of Florida Bay (e.g., Hodgson and Paul 2013). In part this could represent a return to historical nesting sites as populations rebound from prior persecution, such as observation from Chastant et al.

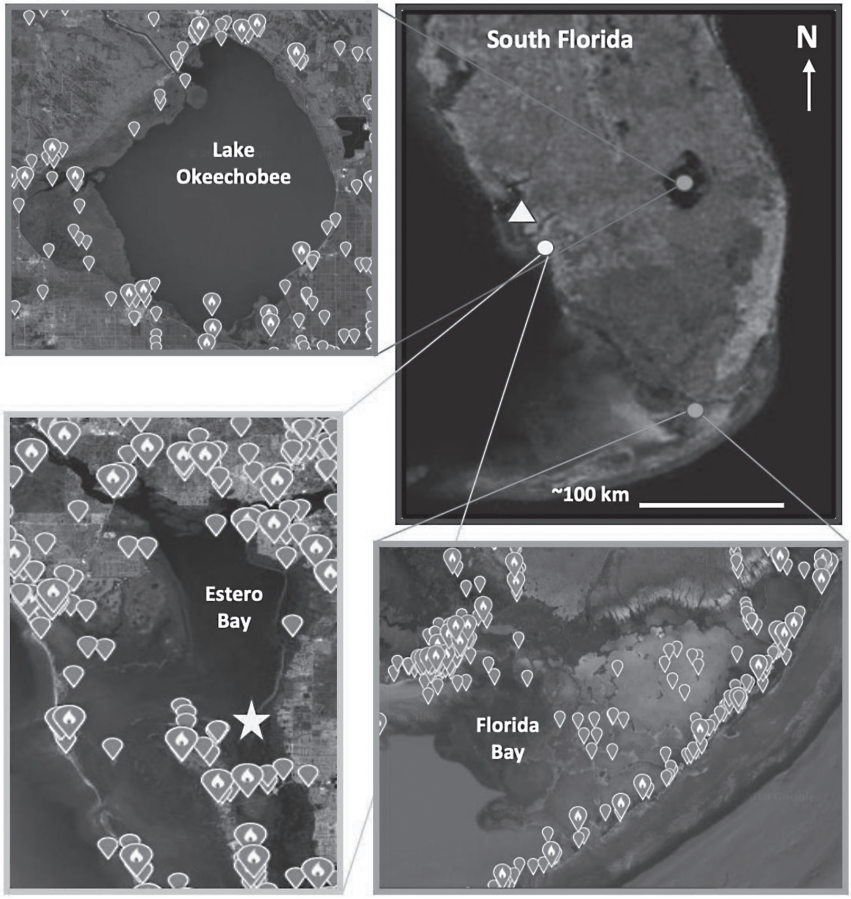

Figure 1. Areas in South Florida with the highest density of Roseate Spoonbill sightings, mapped using records obtained from the eBird database in May 2018 (Cornell Laboratory of Ornithology 2018). Maps are intended solely to illustrate distributions, and not for absolute comparisons; inset photos are not at an equivalent scale. The flame logo indicates hotspots, which are aggregate results for popular birding locations as designated in eBird. The bottom right inset shows sightings within historical nesting areas around Florida Bay. The top left inset shows sightings around Lake Okeechobee. The bottom left inset shows sightings within the main study area of Estero Bay. The star indicates the approximate location of a Roseate Spoonbill nest at Hurricane Island in the Estero Bay Aquatic Preserve, Lee County and the triangle indicates the location of Charlotte Harbor Aquatic Preserves farther north.

(2015) of the first spoonbill breeding on Lake Okeechobee since the 1870s. Another possible explanation could be range shifts to new areas as wading birds adapt to environmental change. Media reports from summer 2018 documented observations

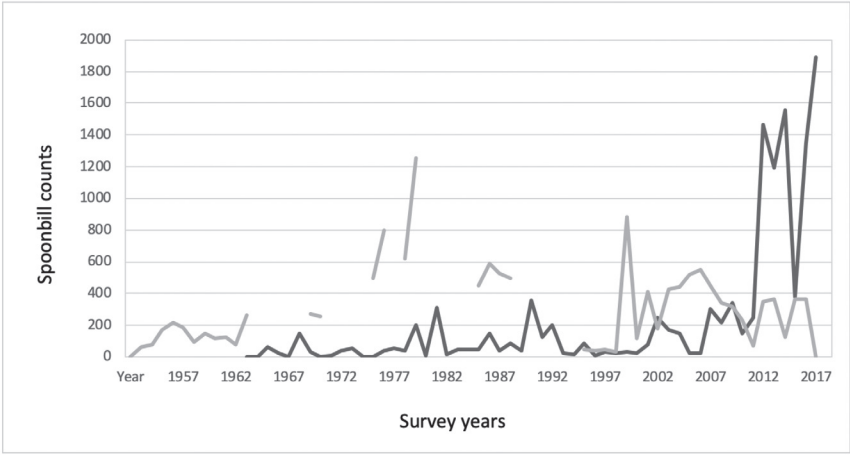

Figure 2. Observations of Roseate Spoonbill individuals (dark line) and nests (light line) in Florida Bay from 1953 to 2017. We obtained data from citizen sightings in eBird, and nesting records from South Florida Wading Bird Reports. Note that there are many potential sources of bias in datasets generated by citizen science, such as increased effort over time and other factors discussed in the main text of this paper.

of spoonbills in unexpected northern locations including Maine and Quebec (Minor 2018). All of these changes are consistent with the fact that water-level fluctuations in Florida Bay and the Keys influence the abundance of spoonbill nests (Lorenz 2014), and with data that suggest a decline in the environmental conditions of Florida Bay (Lorenz and Becker 2017). Overall, the result is that spoonbill nesting in Florida Bay appears to be negatively affected as sea level rise in the Keys is increasing water levels in primary spoonbill foraging areas (Lorenz et al. 2018).

Whether this suite of observations captures a distributional shift or merely a fluctuation will be confirmed only by a longer time series of data into the future. Possible shifts in the breeding distribution of this species do seem to parallel changes in the conditions of wetlands, although the precise drivers of the distributional changes are beyond the scope of this paper. Responses could be due to combinations of habitat loss, sea level rise, and changes in food availability. These are compelling avenues for future research in the context of global change during the Anthropocene, and will require collaborative and interdisciplinary efforts by the scientific community. Population dynamics of wetland and coastal birds thus continue to be an important research need in South Florida, including an understanding of how water management policies influence the breeding success of wading birds.

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