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Communication

Interannual Winter Site Fidelity for Yellow and Black Rails

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Abstract: Yellow Rail (*Coturnicops noveboracensis*) is a species of conservation concern, while the Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) has recently been listed as Threatened. Both species winter primarily in coastal areas from Texas through North Carolina. Between-year winter site fidelities of these species have not previously been reported, so we analyzed the recapture histories of Yellow Rails banded in southeastern Oklahoma (from 2008 to 2018) and coastal Texas (from 2006 to 2018), as well as Black Rails banded in Texas from 2006 to 2018. We banded 111 Yellow Rails in Oklahoma and 421 Yellow Rails in Texas during this time, as well as 94 Black Rails in Texas. Although Yellow Rails were routinely recaptured within season, only five individuals were recaptured between years. All recaptured birds were in Texas. Black Rails likewise exhibited low interannual site fidelity, with no interannual recaptures. The apparent low interannual site fidelity of Yellow Rails (1.1% in Texas, 0% in Oklahoma) and Black Rails (0%) is similar to that reported for other grassland species wintering in grasslands in this area (e.g., LeConte's Sparrow (*Ammodramus leconteii*), Henslow's Sparrow (*A. henslowii*)), and Sedge Wren (*Cistothorus stellaris*), and we speculate that low site fidelity could potentially be advantageous for species that use early successional habitats.

Keywords: winter site fidelity; mark-recapture; yellow rail; black rail

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1. Introduction

Many avian species, both migratory and non-migratory, exhibit interannual site faithfulness with individuals returning to the same territory in successive years [1,2]. Site fidelity, the tendency to repeatedly utilize the same areas between consecutive wintering or breeding seasons is likely dictated by a combination of perceived resource availability [3,4], territoriality [5], and the opportunity to disperse from or establish territory on natal sites [3,4,6]. Many individuals acquire fitness benefits from returning to breeding sites that are of high quality [7,8] and where previous brood success was high [2,7,9]. However, the physiological condition of individuals may also influence site fidelity [10], and site fidelity may also differ between sexes [11]. The advantages of returning to known sites to meet ecological needs typically outweigh the consequences of exploratory movement as resource availability, social structure, and predatory risk are already evaluated from previous seasons [4,12]. Additionally, wintering and stopover fidelity may benefit individuals if the food quality is site-consistent or suitable feeding grounds are infrequent on the landscape [4,13].

Site fidelity on the wintering grounds for waterbirds depends on food availability and habitat stability between and within years [4]. Interannual winter site fidelity is frequent among long-distance migratory shorebirds and waterfowl, with species such as Dunlin (*Calidris alpina*) and Bar-tailed Godwits (*Limosa lapponica*) showing strong fidelity to known feeding sites, likely due to the consistency of preferred prey or other beneficial

site characteristics [14–16]. Many sea-ducks (tribe Mergini) show consistent winter site fidelity [16,17] and contrast with dabbling species (Anatini) that display low return rates to previous wintering grounds [14]. These differences can be partially attributed to changes in habitat permanence as water levels and ice cover alter suitability over time [4]. Sanderling (*Calidris alba*) show consistent winter site fidelity even when nearby areas were measured to have higher food availability and biodiversity [18], demonstrating complexity within the drivers of fidelity.

In contrast to the aforementioned waterbirds, little is known about interannual site fidelity in Rallidae. While intra-annual site fidelity has been examined for a handful of species, e.g., [19,20], the interannual site fidelity of rails has not been investigated. The winter site fidelity of two species of conservation concern, the Yellow Rail (*Coturnicops noveboracensis*) and the threatened Black Rail (*Laterallus jamaicensis*), is a critically understudied component of their life histories. Both species are small, secretive, and largely nocturnal [21,22]. Yellow Rails primarily breed in the wet sedge meadows and marshes of central Alberta and across Saskatchewan, Manitoba, and Ontario and spend their winters along the coast of North Carolina and Texas [22], with small numbers overwintering in southeast Oklahoma [23]. In Canada, Yellow Rails are considered a species of Special Concern under the Species at Risk Act due to wetland degradation and inaccurate population survey methods [24]. Black Rails favor tidal saltmarshes and flooded vegetation with low water levels [21]. The eastern subspecies (*L. j. jamaicensis*) is partially migratory, and northern populations winter in Florida and along the Gulf Coast [21]. Populations monitored in the eastern US have declined at a rate of 4.7–9.2% annually since the late 1980s, and it is estimated that the total breeding population along the Atlantic and Gulf Coast states consists of only 455–1315 breeding pairs [25]. In 2020, Black Rails were listed as Threatened under the Endangered Species Act [26] and are considered endangered by the IUCN [27]. Currently, there are no published data on winter site fidelity for either species. Data on wintering behavior are required for implementing successful, broad-scale habitat management efforts [28,29]. This study is the first that examines interannual winter site fidelity for Black Rails and Yellow Rails and aims to reveal new insight into their wintering behavior.

2. Materials and Methods

2.1. Study Sites

Our study took place in both Oklahoma and Texas, two states in the southcentral USA. The University of Central Oklahoma Institutional Animal Care and Use Committee approved all survey procedures (IACUC #09004, #11003, #14006). All applicable ethical guidelines for the use of birds in research have been followed, including those presented in the Ornithological Council's "Guidelines to the Use of Wild Birds in Research" [30]. All samples were taken during the non-breeding season, from October through April, from 2008–2018 (Oklahoma) and 2006–2018 (Texas). We banded Yellow Rails at Red Slough Wildlife Management Area (WMA; 33°38′20.04″ N, 94°33′14.04″ W) in McCurtain County, Oklahoma. Red Slough WMA is an area cooperatively managed by the Oklahoma Department of Wildlife Conservation, the U.S. Forest Service, and the Natural Resources Conservation Service. Red Slough WMA consists of 2352 ha, of which 971 ha are wetlands and moist soil units. Grasses, predominantly *Sporobolus* spp., dominated the moist soil units [21].

We banded Yellow Rails and Black Rails at San Bernard NWR (28°52′25.61″ N, 95°32′54.64″ W). This refuge is located on the coastal plain of Texas south of Houston, in Brazoria and Matagorda Counties. All samples were taken during the non-breeding season, from October through April, from 2006–2018. San Bernard NWR contains approximately 9286 ha of salty prairie and salt marsh. Salty prairie was dominated by *Spartina spartinae* (gulf cordgrass), while the plant composition of high salt marsh varied depending upon the salinity gradient. *Distichlis spicata* (saltgrass) and *Salicornia depressa* (Virginia glasswort) dominated the most saline areas, with some *Spartina alterniflora* (smooth cordgrass) also present. *Spartina patens* (saltmeadow cordgrass), *D. spicata*, and *Bolboschoenus robustus* (sturdy bulrush) dominated areas with intermediate salinity. The areas with the least

salinity contained *Schoenoplectus americanus* (chairmaker's bulrush) and *Paspalum vaginatum* (seashore paspalum) [28].

2.2. Bird Catching and Marking

Butler et al. [28] presented details about banding rails in Oklahoma and Texas. We banded Yellow Rails once per month at Red Slough WMA from October through April, while we banded rails approximately every six weeks at San Bernard NWR. The procedure outlined by Butler et al. [21] was used to catch both species (i.e., a 12-m rope weighted with bottles (filled with rocks) was dragged through each field at night, and birds were captured using handheld nets). Additionally, some of the captures at San Bernard NWR were done using the UTV method described in Butler et al. [18]. Sampling began ~30 min after the sunset and lasted for 3 hr. The number of people participating ranged from four to 17. Two people held the ends of the rope while the remainder spaced themselves evenly behind it, maintaining a distance of 2–4 m from the rope. We used adjacent transects to sample for rails, covering the fields from edge to edge. Approximately 2/3 of all flushed birds were captured. All birds captured were measured, banded, and released.

Because we began sampling during October of each year, we considered each year to run from 1 October through 30 April. We report fidelity rate as the percentage of all banded Yellow Rails recaptured in a season subsequent to the original capture. This was calculated by dividing the total number of individuals recaptured in a year following their original capture by the total number of individuals newly captured and banded during that year. Individual birds recaptured during subsequent years were each considered a single recapture regardless of the number of within-season encounters (i.e., individuals encountered twice within the same season vs. those encountered once were treated as single recaptures of known individuals). We summarized and reported captures using median and range.

3. Results

We banded 111 Yellow Rails in Oklahoma and 421 Yellow Rails in Texas during 2008–2019. We banded a median of 4.5 rails in Oklahoma each year (range 1–54) and 26 in Texas (range 7–173). Table 1 shows the number of rails captured annually at each location. We recaptured five Yellow Rails in Texas during successive years, but no interannual recaptures occurred in Oklahoma. The calculated fidelity rate for Texas is 1.1%, while the fidelity rate for Oklahoma was 0%.

Table 1. This table summarizes the numbers of Yellow Rails banded in Oklahoma and Texas during each winter field season. N/A indicates that no efforts to find rails in Oklahoma occurred during that year.

Year	Oklahoma	Texas
2006–2007	N/A	16
2007–2008	N/A	13
2008–2009	25	N/A
2009–2010	54	173
2010–2011	18	109
2011–2012	1	N/A
2012–2013	2	N/A
2013–2014	6	34
2014–2015	3	N/A
2015–2016	N/A	7
2016–2017	N/A	51
2017–2018	2	18

The recapture rate of Black Rails was likewise low. We banded 94 Black Rails in Texas during 2006–2018. Our median number of Black Rails banded each year was 11 (range 3–28). Table 2 shows the number of Black Rails banded in Texas annually. We recaptured

five within-season Black Rails during this period, but there were no interannual recaptures. The calculated site fidelity rate for Texas was, therefore, 0%.

Table 2. This table summarizes the numbers of Black Rails banded in Texas during each winter field season. No efforts were made to band Black Rails in Texas during 2008–2009, 2011–2013, and 2014–2015.

Year	Texas
2006–2007	21
2007–2008	14
2008–2009	N/A
2009–2010	16
2010–2011	4
2011–2012	N/A
2012–2013	N/A
2013–2014	0
2014–2015	N/A
2015–2016	3
2016–2017	28
2017–2018	8

4. Discussion

During the study period, the winter fidelity rates in Texas were 1.1% and 0% for Yellow Rails and Black Rails, respectively. In Oklahoma, fidelity rates for Yellow Rails were 0%. Although Yellow Rails exhibit a degree of migratory connectivity [31,32], this apparently does not equate to individuals returning to the same sites during the non-breeding season. These return rates are comparable to other early successional wet grassland species such as LeConte's Sparrows (*Ammodramus leconteii*) in Texas [33] and Henslow's Sparrows (*Ammodramus henslowii*) [34], which both displayed low to no winter site fidelity. Sedge Wrens (*Cistothorus stellaris*), which were frequently encountered while searching for rails, are particularly sensitive to habitat structure and moisture and exhibit low site fidelity to wet sedgeland wintering sites [35].

Prescribed burning is one technique employed to maintain the early successional habitats preferred by these species. However, pre-settlement fire ecology is not well understood across the range of both species. The Stambaugh et al. [36] review of historic fire intervals in Texas indicates coastal Texas marshes may have burned at a high frequency of from one to fifteen years. The lack of inter-annual site fidelity of these two rails may be due to behavioral adaptations to early successional, transitory habitat types consistent with high fire frequency. The absence of structural permanence in wet grassland ecosystems may not confer benefits to individuals over the years, as the likelihood of that habitat naturally retaining preferred qualities is variable [4]. Inland marshes and wet grasslands may harbor more wintering Yellow Rails than currently recorded [31], especially if land management perpetuates early successional structure. Morris et al. [37] noted that sites maintained by frequent prescribed fires led to a reduction in dense woody vegetation, promoting Yellow Rail occupancy in <2 years. Haverland [38] found that Black Rails tracked in late winter prefer salty prairie habitat dominated by *Spartina* spp., but low winter detection rates in post-burned plots suggested that vegetation growth would not create sufficient cover for Black Rails for potentially $\geq$2 years following the fire. Thus, the movement of these two rail species between winters may lead to the utilization of habitats with better structural characteristics that provide greater fitness benefits, regardless of the actual magnitude of change within sites previously visited.

5. Conclusions

Our study is the first to describe winter site fidelity rates for these two rail species. Additional research is required to refine the factors that influence the lack of interannual winter site fidelity for Black Rails and Yellow Rails. The scale at which these species

are dispersing is currently unknown, as are the habitat variables impacting return rates. A deeper exploration of these factors in conjunction with within-year return rates may reveal additional wintering behaviors previously undescribed. The conservation concerns surrounding rails continue to drive the urgency in accurately assessing winter habitat usage through time.

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