Secretive Marsh Bird Sampling in a Southeastern U.S. Tidal Marsh: Developing a Protocol

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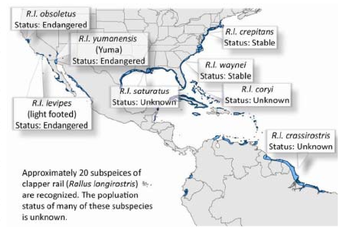
Why We're Listening

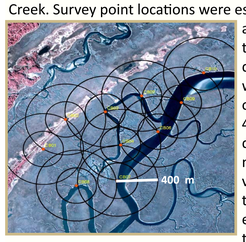
The populations of many species of birds that depend on emergent marsh habitat appear to be declining, but basic information on the population status and habitat requirements of many of these species is lacking. This information is necessary to evaluate the impacts of management actions, climate change and sea level rise on marsh bird populations. The distribution of the clapper rail, *Rallus longirostris*, in the marshes of the North Inlet-Winyah Bay National Estuarine Research Reserve, South Carolina, is being examined using a standardized call broadcast method developed by the U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit[1]. The long-term goals of this study are to determine the population size of clapper rail in the marshes of North Inlet and to examine the relationships of rail distribution to landscape patterns including distance from upland edge and upland development. However, variables such as tide height, daylight, and wind speed may affect call detection, and call-response sampling methodology has not been widely employed in the salt marsh environment of the southeast. Two years of preliminary data for the North Inlet study were examined to evaluate and refine sampling protocols.



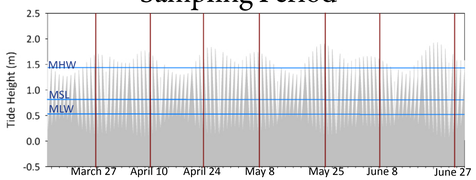
How We Listen

Site Selection

Survey points were grouped into four routs along tidal channels in the North Inlet Estuary: Debidue Marsh, Oyster Landing, Clambank Landing, and Jones Creek. Survey point locations were established by placing a first point over an aerial IR photo, then using a buffer tool in ArcGIS to establish a 400 m radius around the point. The next point was then placed on a navigable site on the buffer to ensure the sites were 400 m apart; a 400 m radius was then drawn for the second point to determine the placement of the third survey point. This process was repeated to establish all of the survey points for each of the four routs. The points were then marked in the field with PVC at the marsh edge. Two of the survey points were conducted from land, the rest were conducted from boat anchored at the marsh edge. Each survey route was always conducted in the same direction with each survey point surveyed in the same chronology.

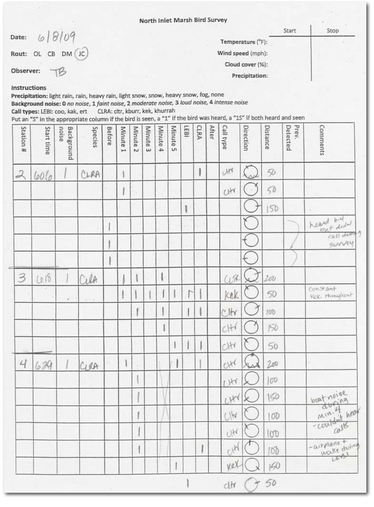


Sampling Period



All 4 routs were sampled in 2008 during 3 sample periods: May 21-23, June 4-6, and June 19-21. Routs were sampled over 3 consecutive days: Clambank on day 1, Oyster Landing and Debidue Marsh on day 2, and Jones Creek on day 3. The number of sample days was increased in 2009 to better determine the peak call period, but only the Clambank and Jones Creek routs were sampled in 2009 due to logistical constraints. The two routs were sampled at the same time on 7 days over a period from the end of March through June. Sample dates were selected on the spring tides when high tide occurred between 9:00 and 11:00 AM. Sampling began at approximately 6:00 AM and was finished by 9:00 AM.

Call-Response Observation



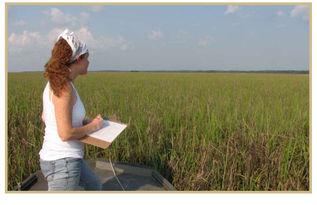
Calls were recorded during a 5-minute passive period followed by two 1-minute call response periods at each survey point. Individual birds were recorded on each line; the distance and direction of calls were noted to aid in keeping track of individual birds. The type of call was also recorded. The first call response period consisted of 30 seconds of pre-recorded least bittern vocalizations, followed by 30 seconds of silence. The second call response period was 30 seconds of pre-recorded clapper rail vocalizations followed by 30 seconds of silence. Calls were broadcast using CD player and portable speakers for which the volume was pre-adjusted to 80 db at 1 m from the speakers determined by a sound level meter. Speakers were placed on a container to raise them to the level of the emergent vegetation and were oriented perpendicular to the marsh edge.

Field Notes

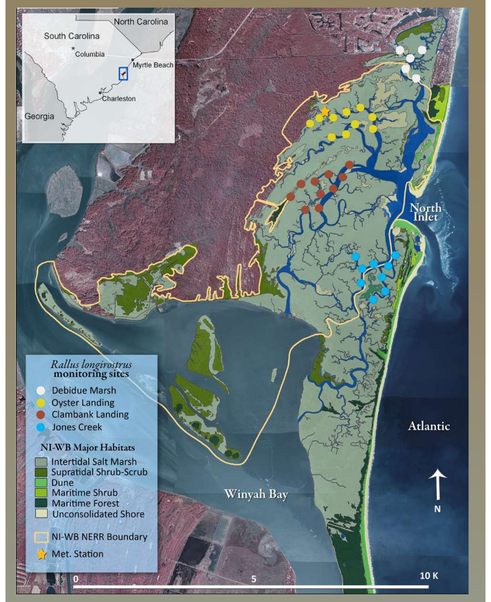
√ Sites located near developed areas should be done early in the morning to avoid lawn mower/ construction/ assorted neighborhood background noise.

√ Rails will respond to the approach of the boat, especially the sound of the anchor chain. A settling period of 1 minute may need to be incorporated prior to the start of the survey.

√ Keep in mind that clouds of biting gnats, noisy oystercatchers, marsh wrens and blackbirds, and heavy surf in the distance affect the observers ability to concentrate and may reduce the detectability of calls.



Study Area: North Inlet-Winyah Bay National Estuarine Research Reserve



The North Inlet-Winyah Bay National Estuarine Research Reserve (NI-WB NERR) is one of 27 reserves around the coastal United States that form the National Estuarine Research Reserve System. The NI-WB NERR was established in 1992 and encompasses about 12,000 acres of tidal marshes and wetlands. The 12,000 acres of the Reserve are a part of the greater 17,500-acre Hobcaw Barony, a tract of protected land which consists of wetlands, former rice fields, upland hardwood and pine forests, and barrier islands[2].

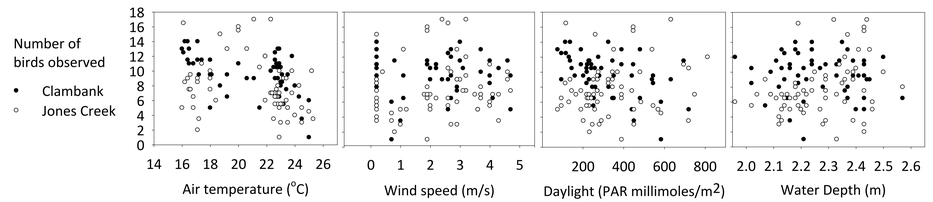
The North Inlet estuary is dominated by cordgrass (*Spartina alterniflora*) salt marsh. Needlerush (*Juncus roemerianus*) is found in the higher intertidal marsh areas, with marsh edges and relic dune ridges a mix of shrubs including wax myrtle (*Myrica cerifera*), marsh elder (*Iva frutescens*), and sea oxeye (*Borrichia frutescens*). The only development of the upland edge of the marsh is the Debordieu residential area along the northern portion of the estuary.

The South Carolina population of clapper rails is considered to be stable (hunting of king/clapper rails is permitted, with a daily bag limit of 15 birds per hunter). Previous research has indicated that clapper rails show strong site fidelity[3] which may make them good indicators of marsh health and to examine differences in the function of intertidal marsh areas with undeveloped and developed upland edge.

Near real-time weather data collected at 15 minute intervals are available from the NERR meteorological station located at Oyster Landing.

What We Heard

Environmental Variables



The number of birds observed at each survey point in 2009 was tested against air temperature, wind speed, daylight and tide depth measured at the Oyster Landing meteorological station. No correlations were found between the number of birds and these environmental variables, indicating that within the 3 hour morning sampling period chosen, time of day, tide height, and wind and air temperature did not affect the behavior of the birds or the ability to detect bird calls. The monitoring protocols produced by the Arizona Cooperative Fish and Wildlife Research Unit Surveys recommend that surveys should only be conducted when wind speed is <20 km/hr, and not during periods of sustained rain or heavy fog. No sample days occurred during rain or fog, and the mean maximum wind speed recorded was 11.6 km/hr with the maximum wind recorded at 23.4 km/hr.

Interobserver Reliability

NO significant difference (n=16)

NO significant difference (n=31)

NO significant difference (n=36)

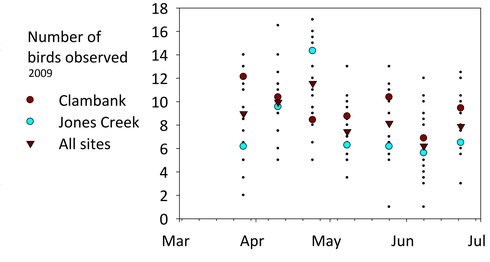
NO significant difference (n=32)

significant difference
$p = 0.002$ (n=31)

The number of birds estimated by each observer at each survey point was compared between observers using t-tests as a simple measure of interobserver reliability. A significant difference in observations was only found between two of the observers. However, the number of individual calls recorded was not significantly different between these two observers. The two observers were detecting the same calls, but one observer tended to attribute the calls to a smaller number of individual birds who were calling repeatedly.

Peak Call Period

Peak call response is likely to occur during courtship and egg-laying periods. The 2008 sampling period did not begin until the end of May, when it was noted that clapper rail chicks were seen in the marsh, raising concerns that the peak call response period may occur earlier in the spring. The 2009 sampling period extended from the end of March through the end of June to capture the peak response period. The number of birds observed increased from March 27 to April 24, then there was an overall decrease in the number observed over the remaining May and June sample dates. Based on the 2009 data, the overall peak response period appears to be in late April, however the greatest number of birds were recorded for on the Clambank rout 4 weeks prior to the greatest number of birds recorded on the Jones Creek rout. Peak nesting periods may occur at different times within subpopulations of an estuarine area.



Stay Tuned

The marsh bird monitoring project at the NI-WB NERR will be expanded in the Spring of 2010 to cover all 4 routs, and in the future routs will be added to cover additional marsh areas of interest. Questions this study seeks to answer include:

- What is the population size and denisty of clapper rails in North Inlet?
- Are there relationships between clapper rail distribution and landscape patterns including distance from upland edge and upland development?
- How will climate change and sea level rise affect popuations of birds that are dependent upon estuarine habitats?
- How can volunteers be incorporated into the monitoring program as a citizen science project?
- What are the most effective training methods and measures of interobserver reliability?

Questions? Comments?
Please contact
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1. Conway, C. J. 2005. Standardized North American Marsh Bird Monitoring Protocols. Wildlife Research Report #2005-04. U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.
2. For more information on the NI-WB NERR, visit www.northinlet.sc.edu.
3.Cumbee, J. C. Jr., K. F. Gaines, G. L. Mills, N. Garvin, W. L. Stephens Jr., J. M. Novak, I. L. Brisbin Jr. 2008. Clapper rails as indicators of mercury and PCB bioavailability in a Georgia saltmarsh system. Ecotoxicology 17:485–494