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Sarah Thomas

Coastal Carolina University, slthoma2@coastal.edu

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**Ecology of estuarine birds: Differences in desensitization of year-round and transient species**

By

Sarah Thomas

Marine Science

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*Eric D. Rosch 12/08/2020*

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Louis E. Keiner  
Director of Honors  
HTC Honors College

Eric D. Rosch  
Senior Lecturer  
Department of Marine Science  
Gupta College of Science

## **Abstract**

Huntington Beach State Park in Murrells Inlet, SC, USA is considered a “hotspot” for birds, according to the eBird database (eBird, 2020). The park is also visited by approximately 300,000 people, annually (Hobdy, 2019). The causeway at the park is an area of high human and wildlife activity. Here, the differences in desensitization, or lack thereof, of year-round and transient bird species to the stimuli of vehicles and humans were determined. Multiple surveys of the birds at Huntington Beach State Park were conducted from 22<sup>nd</sup> September, 2019 to 13<sup>th</sup> June, 2020. Desensitization was quantified by use of a range finder and by observation of behavior. The vast majority of the birds surveyed were desensitized to the stimuli on the causeway. The birds that showed a response to the stimuli continued foraging behavior after the response, which suggests a level of tolerance to the stimuli.

## **Introduction**

The study site was the causeway at Huntington Beach State Park in Murrells Inlet, South Carolina, USA. On one side of the causeway, there is a freshwater impoundment marsh, known as Mullet Pond, and on the other side is a tidal salt marsh (Huntington Beach State Park, 2020). The causeway is approximately 0.30 miles (0.48 kilometers) in length and is composed of asphalt and concrete. There are two covered platforms, one on each side, that extend slightly into the marsh and pond for better viewing of the surroundings. The causeway serves as the park’s only public entrance for vehicles, so all visitors must cross it upon entering the park. Huntington Beach State Park has approximately 300,000 visitors, annually, (Hobdy, 2019) and 334 different species of birds have been seen within the park’s limits according to reports from eBird (eBird, 2020).

The causeway is an access road to the park, but is also used for recreation. There are sidewalks on either side of the causeway that are used by park visitors in various ways. Some visitors walk the sidewalks to observe the wildlife and there are many photographers that can be found on the causeway with regularity. There are also some visitors that ride bicycles on the sidewalks and others that use the causeway as part of their running route. Huntington Beach State Park also offers tours on Segway's, so the occasional tour group also uses the causeway. Navedo and Herrera (2012) conclude that recreational use near overwintering sites of migratory waterfowl can increase the vulnerability of the waterfowl. Trulio and White (2017) conducted a study to determine if waterfowl can build up a tolerance to recreational use around certain ponds. Although the waterfowl that was studied by Trulio and White (2017) showed varied tolerances, their study does show an increase in numbers of Northern Shovelers *Anas clypeata* with increased recreational use. The terms tolerance and desensitization have largely similar meanings, but in this study the term desensitization is preferred.

Roberts and Evans (1993) studied the response of Sanderlings *Calidris alba* to approaching humans. They concluded that Sanderlings were maximizing the time spent foraging by minimizing the number of flights made and the distance of the flights in response to an approaching human. Roberts and Evans (1993) distinguished between detection and response. They suggest that Sanderlings' detection of a threat and their response to said threat are not always simultaneous because of the importance of maximizing foraging time.

This study investigated the differences, or lack thereof, in desensitization between year-round bird species and transient species at Huntington Beach State Park, SC, USA. It is important to note that, unlike some of the aforementioned studies, there is no infiltration of the

marsh or pond by park visitors. All recreational and practical vehicular use near the marsh and pond is restricted to the causeway. Therefore, rather than citing an approaching stimuli, this study cites passing stimuli, referring to vehicles or people passing by a bird while remaining on the causeway.

## **Methods**

This study was conducted on the causeway at Huntington Beach State Park in Murrells Inlet, South Carolina, USA from September 2019 to June 2020. Data were collected nine times during the study period with the largest break being a result of the park closing during the Covid-19 pandemic. Surveys were done within a two hour range of low tide, since low tide is the most active time for estuarine birds. The low water levels allow for better access to trapped prey. Time, weather conditions, time of low tide, number of vehicles passed, and number of people on the causeway was recorded during each survey.

Bird species were identified using 10x42 binoculars and the number of individuals of each species were recorded. Whether the individuals were in the marsh or on the pond side of the causeway was recorded and individuals that flew overhead without landing were counted as flyover birds. Birds were counted by starting at one end of the causeway and walking toward the opposite end, stopping along the way to identify species, measure distances, and record data. Birds that flew in during the walk back to the starting end of the causeway were counted in the area in which they landed. A range finder was used to measure birds' distances from the causeway and distances flown, when applicable. The vehicles that drove along the causeway during the survey time were counted and recorded, regardless of their direction of travel. Aircraft, including commercial planes and military helicopters, that flew over during the survey

time were counted as vehicles as well. The number of people on the causeway during the survey was recorded, including walkers, runners, birders, photographers, and cyclists. If people accompanied the main surveyor, they were counted as people on the causeway, but the main surveyor was not included in the count. The presence of wildlife other than birds was also recorded, i.e. Monarch butterflies and American Alligators. Correlations between parameters within the study were analyzed using linear correlation and regression.

## Results

There was a total of 1159 individual birds comprised of 33 species identified during the study at Huntington Beach State Park. 835 of the total birds were individuals of year-round species and 324 were of transient species. Data results including number of individual year-round birds, number of individual transient birds, number of total individual birds, number of vehicles, number of people, and the time duration of each survey are reported by date in Table 1. There was a weak correlation between the dates of the surveys, representative of time of year, and the total number of birds seen ( $r^2=0.3234$ ) (Figure 1). The correlations between the number of vehicles that passed per minute and the total number of year-round and transient birds seen were weak to non-existent (year-round  $r^2=0.1133$   $p=0.3738$ , transient  $r^2=0.0909$   $p=0.4287$ ,  $N=9$ ) (Figure 2). There were also little to no correlations between the number of people on the causeway per minute and the total number of year-round and transient birds seen (year-round  $r^2=0.1754$   $p=0.2620$ , transient  $r^2=0.0513$   $p=0.5549$ ,  $N=9$ ) (Figure 3). The sample size for the statistical analysis was  $N=9$ , which represented the nine times data was collected.

There were birds observed flying in response to the noise of a passing vehicle on two occasions. During the survey on the 25<sup>th</sup> of October, a flock of Western Sandpipers *Calidris*

*mauri* were observed 20 meters from the causeway. When a car passed the flock, the birds flew a distance of 12 meters parallel to the causeway. On the 23<sup>rd</sup> of February, a solitary Black-bellied Plover *Pluvialis squatarola* was 13 meters from the causeway when it flew a distance of 19 meters, parallel to the causeway, in response to a passing vehicle. In both cases, the birds resumed foraging behavior after their short flights.

### **Discussion/Conclusions**

There were no strong correlations between the total number of individual birds and any parameter. This suggests that the presence of birds was not impacted by the number of vehicles or people on the causeway. Additionally, the presence of birds was also not a factor of the time of year. The large majority of birds observed showed no reaction to the stimuli of vehicles (98.96%). Only 12 birds flew in response to a passing vehicle (1.04% of all birds). Although all 12 birds were transient species, the foraging behavior of these birds was uninhibited, which suggests that these birds were attempting to maximize forage time and minimize flight distances in response to stimuli, as described by Roberts and Evans (1993). No birds in this study were observed reacting to the people on the causeway. This suggests that the birds that reacted to the passing vehicles were responding to the noise or size of the vehicle, which is greater than the noise of the passing people. Jonasson (2001) found that a car passing by at 70 kilometers per hour emitted frequencies between 100 and 5000Hz. Beuter and Weiss (1986) and Schwartzkopff (1973) found that two species of gulls could hear frequencies between 100 and 10,000 Hz. This suggests, that at least some of the species at Huntington Beach State Park, could hear the passing cars. However, the cars on the causeway were traveling at much slower speeds than the one in Jonasson's study.

In conclusion, the year-round birds at Huntington Beach State Park exhibit behavior that suggests total desensitization to the stimuli of vehicles and people. The transient species vary between being totally desensitized and being tolerant of the stimuli in order to maximize time spent foraging. The conclusions of this study suggest that the causeway at Huntington Beach State Park is a good example of an area that is beneficial for both the wildlife that inhabit the park and the park visitors that use the causeway recreationally.



Table 1: Bird Survey data from Huntington Beach State Park, Murrells Inlet, SC, USA.

Date	Year-Round Birds	Transient Birds	Total Birds	# of Vehicles	Time, min	# of People
22-Sep	94	3	97	107	87	28
11-Oct	248	10	258	261	22	10
25-Oct	89	33	122	175	56	18
10-Nov	126	119	245	220	29	15
9-Jan	40	29	69	117	82	37
19-Jan	71	23	94	63	120	25
23-Feb	74	62	136	216	72	26
24-May	36	44	80	192	45	7
13-Jun	57	1	58	79	102	47

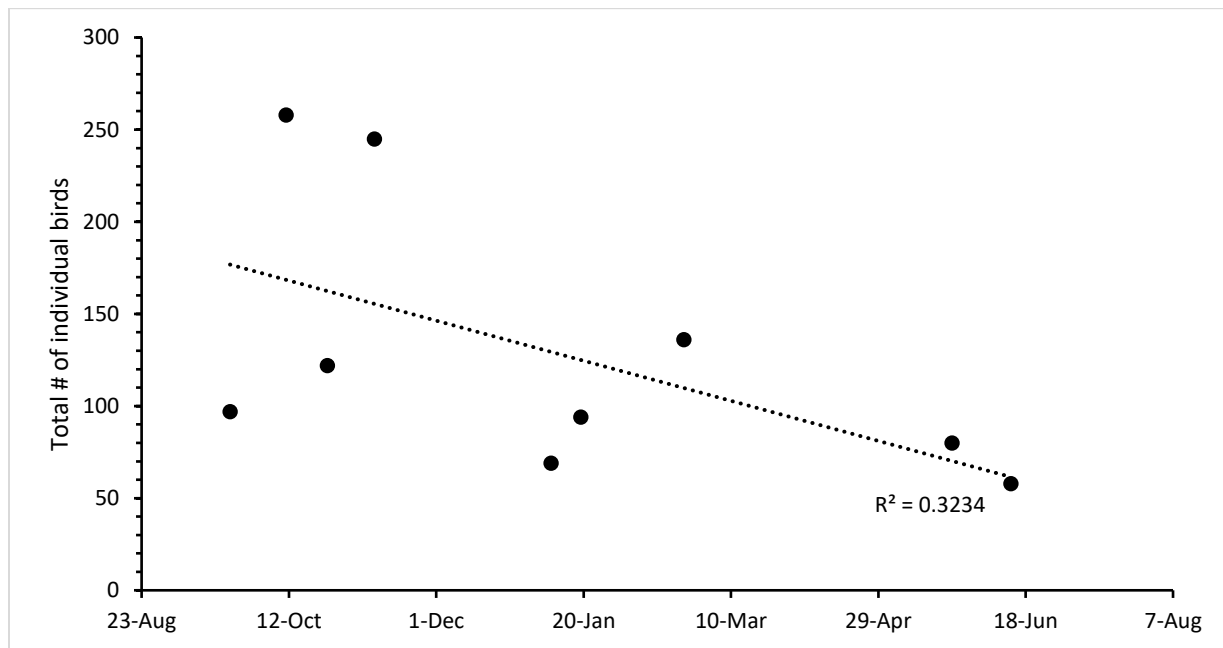


Figure 1: The total number of birds seen plotted against the survey dates. The  $r^2$  of the linear trendline is shown to be 0.3234.



Short-billed Dowitcher <i>Limnodromus griseus</i>			4						
Snowy Egret <i>Egretta thula</i>	6	15	4	7	4	5	16	8	18
Tricolored Heron <i>Egretta tricolor</i>			2	1			2	1	1
Western Sandpiper <i>Calidris mauri</i>			11	21					
White Ibis <i>Eudocimus albus</i>	10	30	4	1	1	1	5		
Wilson's Plover <i>Charadrius wilsonia</i>								1	
Wood Stork <i>Mycteria americana</i>	9	60	43	15			1	1	9

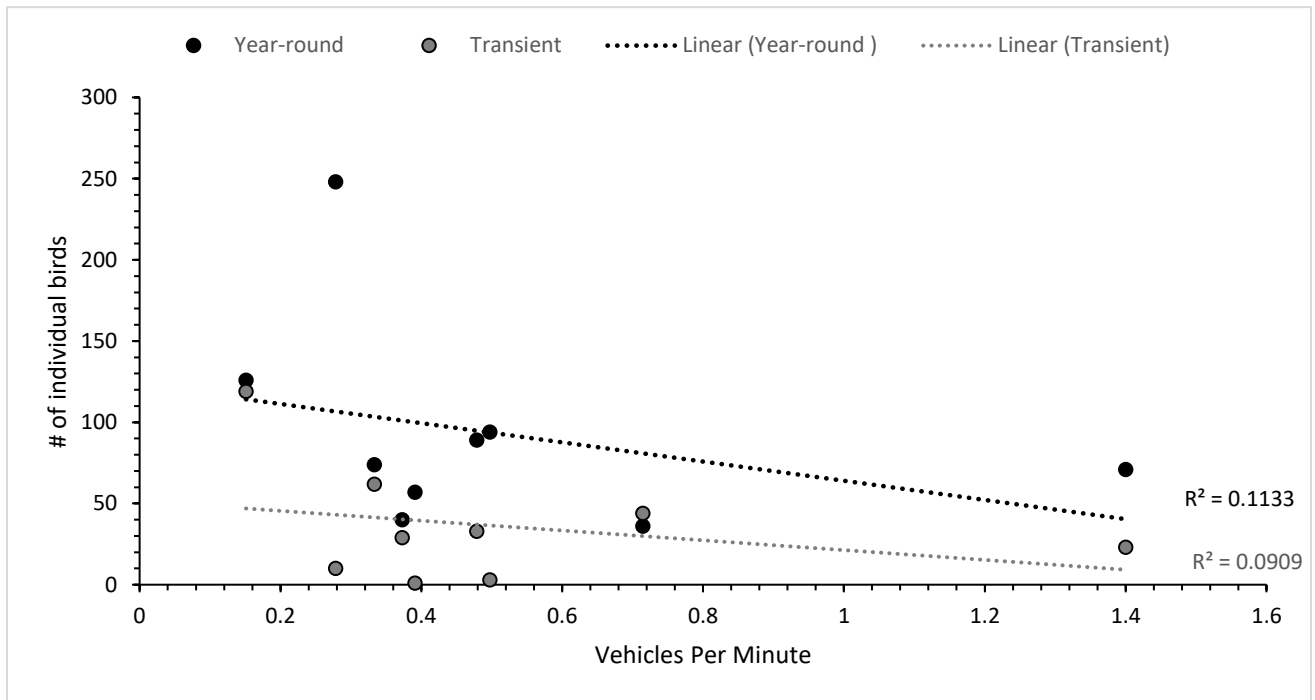


Figure 2: The total number of year-round and transient individual birds plotted against the number of vehicles per minute. The  $r^2$  value of the linear trendline is shown to be 0.1133 for the year-round birds and 0.0909 for transient birds.

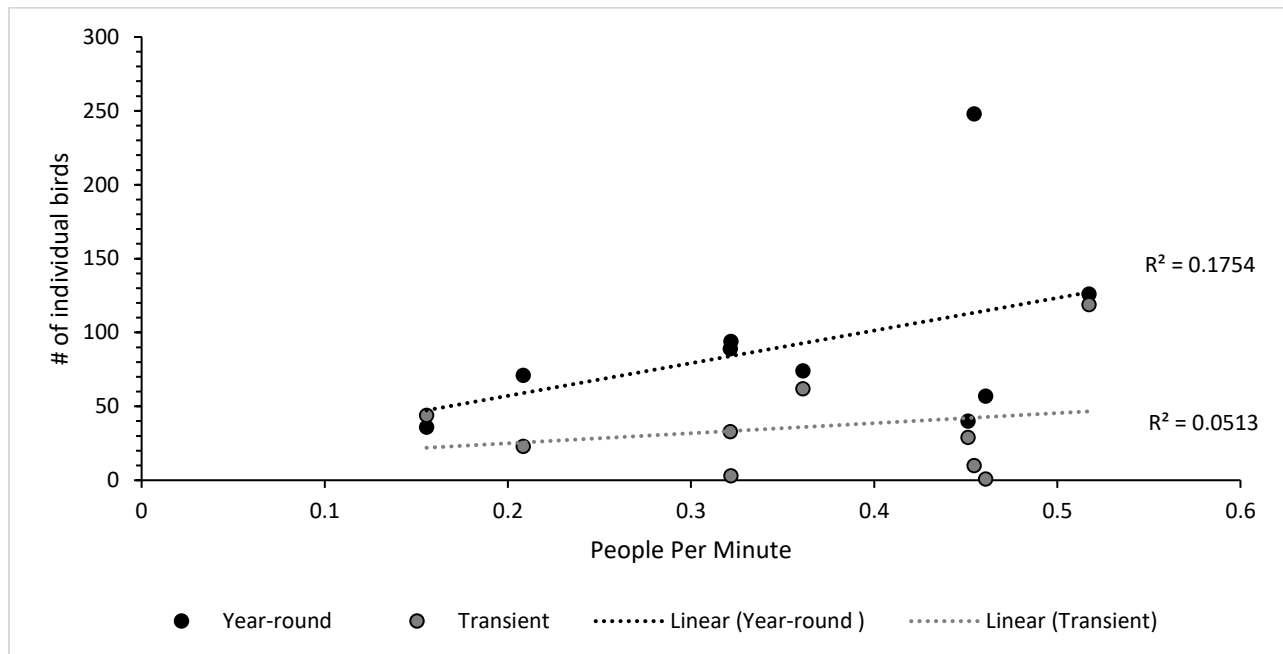


Figure 3: The total number of year-round and transient individual birds plotted against the number of people per minute. The  $r^2$  value of the linear trendline is shown to be 0.1754 for the year-round birds and 0.0513 for transient birds.

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