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Photo: St. Kitts Sea Turtle Monitoring Network

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Cover Page: An *Anarhynchus wilsonia* (Wilson's Plover) parent on North Friars Beach during breeding season. Undated photograph by St. Kitts Sea Turtle Monitoring Network.

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Abstract

Surveys to identify nesting shorebirds and seabirds were conducted by the St. Kitts Sea Turtle Monitoring Network (SKSTMN) during leatherback sea turtle (*Dermochelys coriacea*) nesting seasons between 2010–2013 on the two main leatherback nesting beaches: Keys Beach and North Friars Beach, in St. Kitts, West Indies. Two species of shorebirds, *Anarhynchus wilsonia* (Wilson's Plover) and *Himantopus mexicanus* (Black-necked Stilt), and two species of seabirds, *Sternula antillarum* (Least Tern) and *Thalasseus maximus* (Royal Tern), were documented nesters during the study period. Establishing usage and confirming nesting by these species is critical in the development of conservation management programs to ensure these areas are protected and that disturbance to these nesting species is minimized.

Keywords

Anarhynchus wilsonia, *Himantopus mexicanus*, Keys Beach, North Friars Beach, *Sternula antillarum*, St. Kitts, *Thalasseus maximus*

Resumen

Nidificación de aves playeras y marinas en dos playas de anidación de tortugas laúd en San Cristóbal, Caribe insular, 2010–2013 • Entre 2010 y 2013, la Red de Monitoreo de Tortugas Marinas de San Cristóbal (SKSTMN–St. Kitts Sea Turtle Monitoring Network) realizó muestreos para identificar aves playeras y marinas nidificantes durante las temporadas de anidación de *Dermochelys coriácea* (Tortuga Laúd) en las dos principales playas de anidación de la especie: Keys Beach y North Friars Beach (San Cristóbal, Caribe Insular). Se documentó la nidificación de dos especies de aves playeras: *Anarhynchus wilsonia* (Frailecillo de Wilson) e *Himantopus mexicanus* (Cigüeñuela Cuellinegra), y dos especies de aves marinas: *Sternula antillarum* (Charrán Chico) y *Thalasseus maximus* (Charrán Real) como nidificantes en el período de estudio. Determinar el uso de estas áreas y confirmar la nidificación de dichas especies es fundamental para diseñar programas de manejo para la conservación que garanticen la protección de estos hábitats y minimicen las perturbaciones sobre las aves nidificantes.

Palabras clave

Anarhynchus wilsonia, *Himantopus mexicanus*, Keys Beach, North Friars Beach, San Cristóbal, *Sternula antillarum*, *Thalasseus maximus*

Résumé

Nidification de limicoles et d'oiseaux marins sur deux plages de ponte de la tortue luth à Saint-Kitts, Antilles, 2010–2013 • De 2010 à 2013, le Réseau de suivi des tortues marines de Saint-Kitts (SKSTMN–St. Kitts Sea Turtle Monitoring Network) a effectué des relevés visant à identifier les limicoles et les oiseaux marins nicheurs pendant les saisons de ponte de *Dermochelys coriacea* (tortue luth) sur les deux principales plages de ponte de cette tortue : Keys Beach et North Friars Beach, à Saint-Kitts, Antilles. La nidification de deux espèces de limicoles, *Anarhynchus wilsonia* (Gravelot de Wilson) et *Himantopus mexicanus* (Échasse d'Amérique), et deux espèces d'oiseaux marins, *Sternula antillarum* (Petite Sterne) et *Thalasseus maximus* (Sterne royale), a été documentée au cours de la période d'étude. La détermination de l'utilisation de ces zones et la confirmation de la nidification de ces espèces sont des éléments

essentiels pour la conception de programmes de gestion en faveur de la conservation qui garantissent la protection de ces habitats et réduisent au minimum les perturbations subies par ces espèces nicheuses.

Mots clés
Anarhynchus wilsonia, *Himantopus mexicanus*, Keys Beach, North Friars Beach, Saint-Kitts, *Sternula antillarum*, *Thalasseus maximus*

St. Kitts, West Indies, has a well-established sea turtle conservation program operating on the two main leatherback nesting beaches on the island, Keys Beach (17°20'07.6"N, 62°42'14.3"W) and North Friars Beach (17°16'31.4"N, 62°40'13.4"W). This program was implemented by the St. Kitts Sea Turtle Monitoring Network (SKSTMN) in 2003 and incorporates a wide range of activities that take place on these beaches including research, ecotourism, and education. Consequently, these coastal areas have an increased density of human foot traffic during the leatherback nesting season (February to September) during which daily morning patrols are conducted (February, March, and 15 July to 30 September), as well as night patrols (six nights per week from 2000 to 0400, 1 April to 15 July) to document sea turtle nesting activity. The increased foot traffic from this sea turtle patrol activity could potentially disturb other nesting species such as shorebirds and seabirds.

Historically, three species of shorebirds including *Himantopus mexicanus* (Black-necked Stilt), *Anarhynchus wilsonia* (Wilson's Plover), and *Anarhynchus nivosus* (Snowy Plover) along with eight species of nesting seabirds including *Onychoprion fuscatus* (Sooty Tern), *Onychoprion anaethetus* (Bridled Tern), *Leucophaeus atricilla* (Laughing Gull), *Anous stolidus* (Brown Noddy), *Sterna dougallii* (Roseate Tern), *Pelecanus occidentalis* (Brown Pelican), *Fregata magnificens* (Magnificent Frigatebird), and *Sternula antillarum* (Least Tern) have been documented nesting in St. Kitts (Burdon 1920, Danforth 1936, Morris and Lemon 1982, Arendt 1985, Norton 1989, Gricks 1993, Steadman *et al.* 1997, Horwith and Lindsay 1999, Wilson 1999a, Vittery 2006). The majority of research on shorebird and seabird nesting habitat in St. Kitts has been conducted in salt pond and mangrove ecosystems with limited documentation relating to the beach ecosystem (North Friars Beach, South Friars Beach, and just south of Barker's Point; Fig. 1) (Burdon 1920, Danforth 1936, Morris and Lemon 1982, Arendt 1985, Norton 1989, Gricks 1993, Steadman *et al.* 1997, Horwith and Lindsay 1999, Wilson 1999a, Vittery 2006, J. Wilson pers. comm.).

Sternula antillarum is listed as a species of special conservation concern on St. Kitts and Nevis, and nests in St. Kitts and Nevis (Horwith and Lindsay 1999, Wilson 1999a, Lowrie *et al.* 2012). *Sternula antillarum* is protected under the National Conservation and Environmental Protection Act (NCEPA) of 1987. Based on the last population assessment conducted by BirdLife International, it is listed as a species of Least Concern by the International Union for Conservation of Nature (IUCN) with a decreasing population trend (BirdLife International 2018, Thompson *et al.* 2020, IUCN 2024). Nests and nesting pairs have been documented in several locations on St. Kitts including Great Salt Pond (Brown and Brindock 2011), Greatheeds Salt Pond (Danforth 1936, Wilson 1999a), the Southeastern Peninsula (Arendt 1985, Lowrie *et al.* 2012), Little Salt Pond, Half Moon Bay Salt Pond (Wilson 1999a), North Friars Beach, Keys Beach, the beach immediately south of Barker's Point, and Turtle Beach (Mosquito Bay) (Arendt 1985, Wilson 1999a, Brown and Brindock 2011, Stimmelmeyr *et al.* 2013). Wilson (1999a) documented 20 nests at North Friars Beach in 1997 and eight nests on the beach just south of Barker's Point (Fig. 1). Stimmelmeyr *et al.* (2013) noted four nests on Keys Beach in 2006 and two in 2007, with other beach-associated nesting locations noted as Half Moon Bay (two nests in 2007) and North Frigate Beach (nine nests in 2007).

Little information is available on *Anarhynchus wilsonia* nesting in the Caribbean although breeding and nesting has been documented in Bonaire (Wells and Wells 2006), St. Martin (Brown and Brindock 2011), and St. Kitts (Brown and Snyder 2013). *Anarhynchus wilsonia* nesting in St. Kitts has been documented at Half Moon Bay Salt Pond, Little Salt Pond, North Friars Beach, South Friars Beach, Cockleshell Beach, Mosquito Bay, and Great Salt Pond (Fig. 1; Wilson 1999b, Vittery 2006, Brown and Snyder 2013). As systematic surveys were not conducted, no nests counts were available (Vittery 2006, J. Wilson pers. comm.). *Anarhynchus wilsonia* is listed as a species of Least Concern by the IUCN and in the United States population decline and range constriction have been noted (Zdravkovic *et al.* 2023, IUCN 2024).

Nesting by *Himantopus mexicanus* in St. Kitts has been documented since the 1920s (Burdon 1920, Danforth 1936, J. Wilson pers. comm.) at Frigate Bay Salt Pond, Greatheeds Salt Pond, Half Moon Bay Salt Pond, and Muddy Pond (Fig. 1), although no quantifiable studies of adults or nests have been conducted. *Himantopus mexicanus* is listed in St. Kitts as a nesting resident found in a restricted number of habitats (J. Wilson pers. comm.). The IUCN lists it as a species of Least Concern (IUCN 2024). Previous reports had not examined beaches as potential nesting sites, so the documented distribution may not reflect an actual restricted number of habitats utilized but rather a restricted number of studies to document habitat utilization.

Thalasseus maximus has been recorded as a year-round resident in St. Kitts (Wilson 1999a, Vittery 2006). This species is protected under NCEPA in St. Kitts and Nevis and the only record of assigned population status in St. Kitts listed them as stable (Wilson 1999a). *Thalasseus maximus* is listed as a species of Least Concern by the IUCN (IUCN 2024) and their populations in North America are stable as well (Buckley and Buckley 2002). Updated population assessments would be useful to determine if these populations are indeed stable in both St. Kitts and North America as the last evaluations were reported in 1999 and 2002, respectively (Wilson 1999a, Buckley and Buckley 2002).

The primary goals of this study were to determine the species of shorebirds and seabirds currently utilizing these beaches as nesting areas, the number of nests per species, and if increased sea turtle conservation-related foot traffic on these beaches

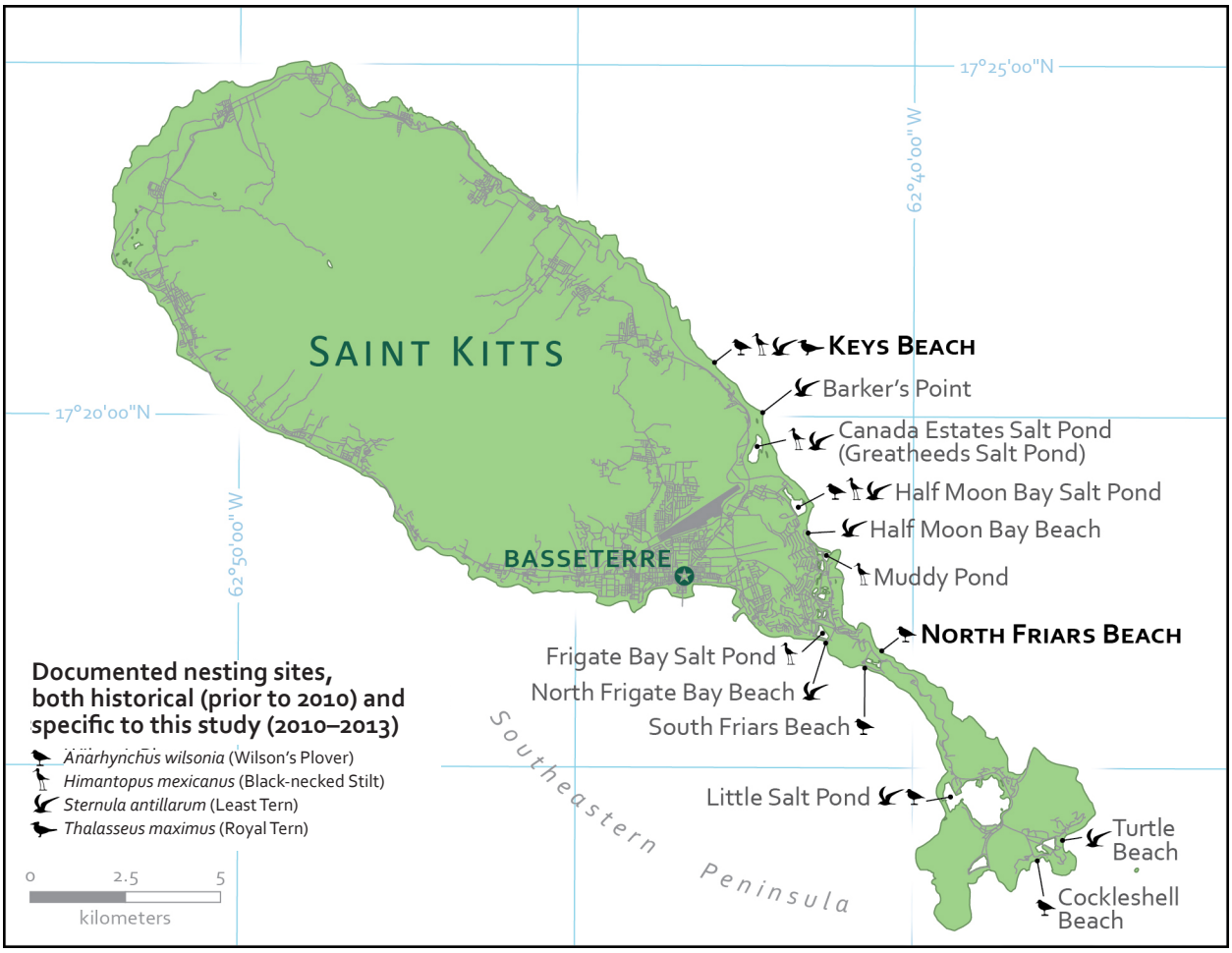

Fig. 1. Documented nesting sites for *Anarhynchus wilsonia* (Wilson's Plover), *Himantopus mexicanus* (Black-necked Stilt), *Sternula antillarum* (Least Tern), and *Thalasseus maximus* (Royal Tern) at Keys Beach and North Friars Beach in St. Kitts, West Indies, 2010–2013. Historical nesting sites are also shown.

resulted in nest abandonment. This information is critical to the development of a conservation management plan for these species to increase public awareness while limiting the impact to the various nesting birds utilizing the same sites.

Methods

Beach surveys were conducted on Keys Beach and North Friars Beach between 2010–2013 on the island of St. Kitts, West Indies (Fig. 1), based on volunteer availability during daylight hours, at minimum every two to three days from 9 June to 23 July 2010, 25 May to 29 July 2011, 3 May to 30 August 2012, and 3 February to 30 August 2013. Both beaches feature wide zones of unvegetated sand bordering the Atlantic Ocean to the east and to the west, with denser vegetation on the inland side. All shorebird nests within the study areas were documented. A nest was defined as a scrape with eggs or flightless chicks. Time spent in the area during surveys was minimized, lasting less than one hour for the entirety of each beach, to reduce the potential for disturbance to the nesting pairs and chicks. Additionally, patrols were limited to early morning (0500–0800) or late afternoon (1700–1900) to avoid peak heat periods.

Fig. 2. *Anarhynchus wilsonia* (Wilson's Plover) nest on North Friars Beach, St. Kitts. Wooden craft stick used to mark the nest is on the far right. Photo by Jeremy M. McKeever 2011.

A unique alphanumeric identification code was assigned to each nest during a nesting season, which was recorded on a wooden craft stick that was subsequently embedded in the sand adjacent to its respective nest at about 10 to 20 cm and was positioned between the nest and the vegetation line (Fig. 2). To minimize the likelihood that nest marking would interfere with incubation or result in nest abandonment or attract any other species' attention to the nest, small, non-dyed craft sticks measuring 0.95 cm × 11.43 cm that roughly matched the color of the beach sand were used. Additional information recorded for each

nest included GPS coordinates, number of eggs present, adult behavior at time of data acquisition, presence of chicks, predation evidence, evidence of hatch, and if a nest was washed over by the tide. Peak nesting months were defined as the months with the highest counts of nests.

A nest was noted as predated if an egg was broken open or any predators were observed destroying the nest or chicks. A nest was considered hatched if the eggs were gone within the timeframe of the anticipated hatch date and there were no signs of depredation, if shell fragments were seen in the vicinity of the nest, or if a chick was present. A nest was considered abandoned if eggs were present but no adults were found incubating the nest or within the vicinity for more than one day.

Results

Sternula antillarum

During the study period, adults, nests, and chicks were observed only on Keys Beach with two distinct colonies annually. As previously documented by Wilson (1999a), our surveys demonstrated that the nesting season for this species in St. Kitts begins in May and concludes in August. Peak nesting months for this species were June and July.

A total of 248 *Sternula antillarum* nests were documented on Keys Beach during the study period and 155 of these nests showed definitive signs of hatching. 26 nests showed signs of depredation, 9 nests were washed out by the tide, and 1 was inundated by the tide and subsequently did not hatch. Over the course of this study, 1 nest was noted as abandoned two days following deposition, with cause unknown. No other *Sternula antillarum* nests during the course of this study were abandoned (Table 1). The fate of 56 nests during the study period was unknown.

Anarhynchus wilsonia

Surveys of Keys Beach and North Friars Beach during the study period demonstrated that the nesting season for this species in St. Kitts starts in April and concludes at the end of August. Peak nesting months for this species at these sites over the

Table 1. Nest numbers and fates by species and beach, 2010–2013. Totals for each category are shown in bold type.

	Keys Beach				North Friars Beach			
	2010	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Sternula antillarum								
Total laid	**52**	**17**	**69**	**110**	**0**	**0**	**0**	**0**
Hatched	47	0	35	73	0	0	0	0
Tidal disturbance	1	0	2	7	0	0	0	0
Depredated	3	0	2	21	0	0	0	0
Abandoned	1	0	0	0	0	0	0	0
Unknown outcome	0	17	30	9	0	0	0	0
Anarhynchus wilsonia								
Total laid	**7**	**3**	**17**	**12**	**3**	**0**	**3**	**0**
Hatched	4	0	14	9	2	0	2	0
Tidal disturbance	1	0	0	0	0	0	0	0
Depredated	0	0	1	3	0	0	1	0
Abandoned	0	0	0	0	0	0	0	0
Unknown outcome	2	3	2	0	1	0	0	0
Himantopus mexicanus								
Total laid	**0**	**0**	**3**	**2**	**0**	**0**	**0**	**0**
Hatched	0	0	1	1	0	0	0	0
Tidal disturbance	0	0	2	1	0	0	0	0
Thalasseus maximus								
Total laid	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Unknown outcome	1	0	0	0	0	0	0	0

course of this study were May and June. No *Anarhynchus wilsonia* nests were abandoned during the course of our study. Of the 39 nests documented over the study period, 27 hatched, 4 were depredated, 1 was inundated by the tide with no hatch noted, and the fate of 7 was unknown (Table 1).

Himantopus mexicanus

Five nests were documented on Keys Beach over the course of this study. Three of these nests were washed away by the tide and two hatched (Table 1).

Thalasseus maximus

One nest was documented on Keys Beach over the course of this study. As the nest was laid on 11 July 2010 and our surveys concluded on the 23 July 2010, the fate of the nest was unknown. The adults were noted to be foraging in the area during and until the conclusion of the surveys (Table 1).

Discussion

Sternula antillarum nest in the summer months in St. Kitts and migrate in winter. Our findings agreed with those of Wilson (1999a) that demonstrated that their nesting season runs from May through August. Despite habitat on both beaches being similar and suitable for *Sternula antillarum* nesting, our study documented no nesting on North Friars Beach in 2010–2013. Wilson (1999a) noted a high level of human and pet disturbance to the nesting colonies on North Friars Beach and determined this to be the main impact affecting their reproductive success. With increased unregulated foot traffic on these beaches from tourists, residents, and animals since that time, it is not surprising that this species appears to have abandoned North Friars Beach as a nesting site at the time of this study.

Estimates of *Sternula antillarum* populations in the Caribbean have been projected at 1,500 to 3,000 nesting pairs (Jackson 2000). More focused studies on Bonaire have documented 180 nesting pairs and estimates for Aruba are 100 to 200 nesting pairs (Jackson 2000, Wells and Wells 2006). Given that one nest typically represents one breeding pair, the nesting population on Keys Beach ranged from 52 to 110 nesting pairs during our study period. Further studies at other sites on St. Kitts should be conducted to develop a more thorough quantification of the numbers of nesting pairs utilizing St. Kitts per annum to determine the regional significance of St. Kitts to the overall Caribbean population.

The larger number of *Anarhynchus wilsonia* nests laid at Keys Beach compared to North Friars Beach was not unexpected as North Friars Beach receives a high level of unregulated foot traffic from humans and animals, as opposed to Keys Beach where the primary foot traffic comes from sea turtle conservationists, a few residents of the area, and a small horse stable. There is concern that, without regulation of beach use, *Anarhynchus wilsonia* may abandon this nesting site as *Sternula antillarum* has done during this study period.

This study is the first to document *Himantopus mexicanus* nesting at Keys Beach. The distribution and final deposition of the nests identified at Keys Beach indicate that the majority of nests are laid within close proximity to the high tide line and are consequently lost.

Although only one *Thalasseus maximus* nest was discovered during this study, it is significant as this is the first confirmed documentation of a nesting event for *Thalasseus maximus* in St. Kitts. While one previous report listed this species as a breeding resident (Norton 1989), no information was provided on how this status was determined. Additionally, prior to and following Norton's report, several other reports have contradicted this initial listing as Steadman *et al.* (1997) failed to list *Thalasseus maximus* as a breeding bird in St. Kitts. Surveys conducted in July 1997 only recorded observations of a few *Thalasseus maximus* loafing on various mud flats, but not on beaches surveyed (Wilson 1999a).

Data gathered during this study indicates that neither the activities of the sea turtle conservation project nor the activities of the seabird and shorebird project resulted in nest abandonment. Additionally, no sea turtle nesting events damaged any incubating bird nests during this study. Our findings regarding the marking of nests were consistent with data collected by Epstein (1999) on a sea turtle nesting beach in Brevard County, Florida, where they also noted that marking of the bird nests in their study did not result in nest abandonment. As all sea turtle patrols on the two study beaches (Keys Beach and North Friars Beach) are conducted on foot rather than using all-terrain vehicles (ATV), and staff are sensitized to keep as close to the high tide line as possible to avoid disturbing incubating nests; it is likely for these reasons that the sea turtle monitoring activities do not result in nest abandonment. Additionally, marking bird nests increases their visibility on the beach during the day and night, and decreases the potential for the accidental crushing of eggs or chicks and disturbance due to human recreational activities.

The total numbers of nests on Keys Beach for both *Sternula antillarum* and *Anarhynchus wilsonia* increased over the course of our study. Because other areas of St. Kitts are also experiencing increasing levels of traffic due to construction and development, one may speculate that the increase in the number of nests at Keys Beach may be the result of birds leaving the beaches being disturbed by development and moving to a beach that is somewhat protected.

Continuation of the shorebird and seabird nest monitoring program is important so that trends can be documented, and banding of nesting pairs would be an important addition to this research project. Banding of nesting pairs would enable researchers to determine migration patterns of *Sternula antillarum* and to identify breeding pairs and chicks of all species using these nesting sites. More information, including hatch success of nests, repeat nesting events, health of specific animals through incorporation of health assessments, and chick survivorship could then be documented.

Potential predators recorded at the two sites studied included *Sus scrofa* (hogs), Ocypodinae (ghost crabs), *Herpestes auropunctatus* (mongoose), *Canis familiaris* (dogs), *Chlorocebus aethiops* (monkeys), and humans. Foot traffic by livestock, pets, and humans and vehicular traffic (both automotive and ATV) can be regulated through the development and subsequent enforcement of protective regulations for shorebirds and seabirds. A strong public education component, including media campaigns and sign placement to provide a buffer between human

activities and nests, must also be implemented as a supplement to the protective regulations. Because the beaches in this study are exposed to both conservation-oriented and recreational human traffic, a set of guidelines to minimize the disturbance of these types of activities to nesting birds must be developed and a public awareness campaign launched to sensitize and educate the public. As Keys Beach is a portion of the United Nations Educational, Scientific and Cultural Organization (UNESCO) St. Mary's Biosphere Reserve, this type of activity fits within the sustainable use mandates of a Biosphere Reserve. Human interaction should be limited to low impact research activities and organized ecotours by trained guides. Ecotours will allow individuals to accompany research scientists on field excursions to assist in data collection. Funds raised through such tours can be used to fund the ongoing research activities, thus promoting sustainable use in the context of conservation and research.

The research, conservation, and ecotour activities as they relate to nesting seabird and shorebird populations must fall under regulation by the Department of Marine Resources as the beach environment in St. Kitts is labeled as "fishery's waters" under current law (Fisheries Regulations 2002) and the St. Kitts Department of Environment as they are tasked with monitoring avian populations in St. Kitts and Nevis. Therefore, a set of regulations, such as those in place for marine turtles (Fisheries Regulations 2002), must be developed and implemented along with the associated penalties and fines for violations of the law.

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Author Contributions

KS and JM planned the study. All authors participated in field data collection, collation of data, worked on manuscript drafts, and approved the final version.

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