Biodiversity Assessments of Pigeon Island, Saint Vincent and the Grenadines, West Indies

Report prepared for the St. Vincent and the Grenadines Environment Fund (SVGEF)

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Introduction

Pigeon Island, known locally as Ramier Island, is a government-owned wildlife reserve located at (12°56'49.01"N / 61°16'28.41"W), approximately 5km south of Bequia (Figure 1 and Figure 2). In recent years, there has been much interest in Saint Vincent and the Grenadines for island restoration through Introduced (invasive) species removal. Pigeon Island is one of the sites that has been highlighted as a site of intended restoration, due to its status as a wildlife reserve and past notoriety for seabird populations. Available information, both actual and anecdotal, indicate that several introduced and invasive mammal species are, or have been, present on Pigeon Island, including goats, sheep and rodents (e.g. Coffey and Collier 2021). As with other uninhabited islands throughout the Grenadines, livestock are often put out on islands to graze and periodically removed (Coffey and Collier, 2021). Therefore, the presence of livestock on offshore islands is dynamic, and includes such factors as seasonality (i.e. "let-go" season), access to offshore islands and lack of appropriate grazing areas / land ownership on inhabited islands.

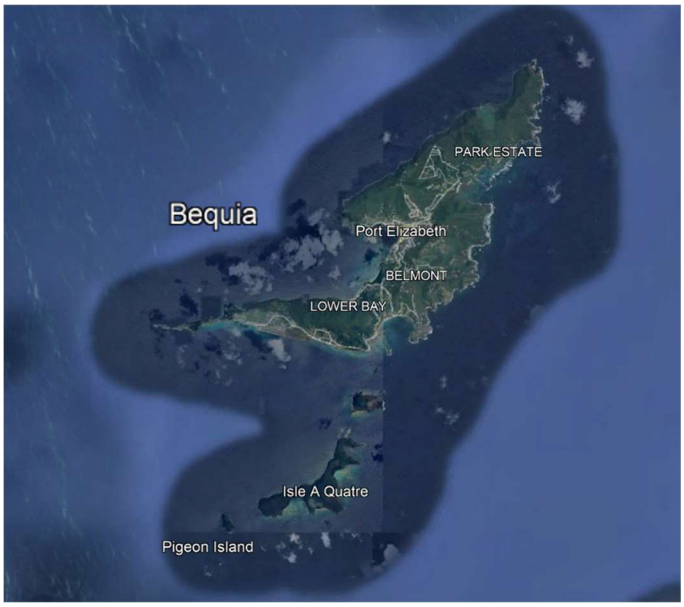


Figure 2. Location of Pigeon Island in relation to Bequia, SVG (Google Earth)

Figure 1. Aerial view of Pigeon Island (J. Coffey)

The transboundary Grenadines archipelago was highlighted as the most important region for existing nesting seabird populations in the Lesser Antilles, as well as the most threatened (Lowrie, Lowrie and Collier 2012). While there are numerous threats to seabird populations in the Grenadines, the presence of invasive species at nesting sites is a critical factor linked to seabird declines in the archipelago (Coffey and Collier 2021). Seabird surveys in 2009-10 revealed the presence of nesting seabirds on Pigeon Island, including Brown Noddy (*Anous stolidus*), Red-billed Tropicbird (*Phaethon aethereus*) and Audubon's / Sargasso Shearwater (*Puffinus iherminieri*) (Lowrie, Lowrie and Collier 2012), while recent (EPIC unpublished data) and earlier (Frost, Hayes and Sutton 2009) reports suggest additional species may be

present. However, recent surveys and anecdotal information indicate that the seabird nesting populations at Pigeon Island have declined significantly over the years, especially of the Brown Noddy "Eggbird" which previously nested in abundance in the grasses on the eastern (windward) side (J. Ollivierre, pers. comm.).

Brown Noddies typically arrive in the Grenadines in late April to initiate their breeding season, with chicks fledging in late June and early July, and are present in high numbers until approximately September when they begin to disperse. Brown Noddy breeding strategies and habitat use vary throughout the Grenadines, with some colonies composed primarily of large nests in trees (e.g. Baradal, Tobago Cays, Saint Vincent and the Grenadines) and others with nests of minimal material primarily on cliffs and amongst rocks (e.g. Sisters Rocks, Carriacou, Grenada). Brown Noddies often nest in association with other terns, such as Bridled Tern (*Onychoprion anaethetus*) and Sooty Tern (*Onychoprion fuscatus*). The Brown Noddy is one of several species of breeding seabirds in the Grenadines that is referred to as "Eggbird" due to the value of the eggs in particular communities as a food resource (e.g. Coffey and Ollivierre 2019). While the practice of harvesting seabird eggs has diminished in the Grenadines, it continues primarily in fishing villages at various locations throughout the Grenadines.

Red-billed Tropicbirds (locally known on Bequia as "Truphit") are known to breed in least numerous colonies in the Grenadines, with some reaching globally important numbers (Coffey and Collier 2020). While they have been recorded in the Grenadines year-round, they typically stagger their breeding season between November-April with an apparent peak around February and minimal activity towards the end of April. While no physical nest is constructed, eggs are typically laid amongst boulders, crevices, and cliffs and in shallow depressions amongst vegetation..

There is minimal information available regarding Audubon's / Sargasso Shearwater in the Grenadines, however, they are known to nest at several locations. While documented on Pigeon Island in the past, current breeding status is unknown. Nesting habitat typically includes burrows in soft soil and amongst crevices and boulders. While offshore fisherfolk are highly familiar with shearwaters at sea, this species is infrequently encountered near inhabited islands due to their cryptic and nocturnal behaviour at breeding colonies. There are known declines of this species in the Grenadines (e.g. see summary in Wiley 2021).

Available information indicates that there is at least one reptile species, *Ameiva aquilina*, though there have been no recent or detailed surveys (Henderson and Powell, 2018). Given that there are numerous Grenada Bank regionally endemic reptile species on islands throughout the Grenadines archipelago, including the recently discovered Union Island Gecko (*Gonatodes daudini),* assessment of reptile presence and diversity at offshore islands is of significant conservation interest.

Purpose

Between 20-22 April 2025 biodiversity assessments were conducted on Pigeon Island in advance of intended invasive mammal eradication programs. The purpose of the assessment was to establish a baseline in regards to nesting birds (especially seabirds), reptilian presence and vegetation cover, while also conducting invasive species surveys to determine the current status of introduced mammals. This

baseline is intended to establish a standard to measure species recovery in the event of restoration efforts.

Methods

1. Avian Diversity
    a. Boat-based visual surveys – Seabird surveys were conducted by teams in two speedboats that circumnavigated the island at least once daily. All individual seabirds were recorded by amount and species Additional non-seabird species were recorded when noteworthy.
    b. Land-based visual surveys –Terrestrial birds were documented opportunistically during field work activities. Species diversity was noted with no recording of abundance.
    c. Autonomous Recording Unit (ARU) – A Wildlife Acoustics audio recording device (Song Meter Micro 2) was deployed on 20 April and set to record continuously for the duration while deployed. Data was analysed using Cornell developed BirdNet software and in some cases manually.
2. Reptiles
    a. Opportunistic encounter - Reptiles encountered by the field crew were opportunistically identified and verified through photographic documentation.
3. Invasive Species
    a. Opportunistic encounter – Any introduced mammal species encountered during field activities were documented.
    b. Camera traps and baited tunnels - On 20 April three camera traps and baited (peanut butter) tracking tunnels were deployed at various sites on Pigeon Island and remained active for approximately 48 hours. On 21 April the tunnels were re-baited, and an additional camera trap (without a tracking tunnel) was deployed along the cleared trail with the intention of documenting goat / sheep presence on the island.
4. Unmanned Aerial Vehicle (UAV)
    a. A DJI Mavic Air was flown on several occasions with the purpose of documenting vegetation cover. As the drone was initially being continuously approached by seabirds (especially Magnificent Frigatebirds), the drone was thereafter not flown at a height or distance where it could have had an adverse interaction with wildlife.

Results

The terrestrial areas assessed were generally along and adjacent to a cleared trail due to the ease of access (Figure 3). On 20-21 April the island was accessed at the NW landing site. On 22 April this landing site was inaccessible due to rough waters. As such, a three-member team (Hornsey, Ollivierre and Ollivierre) accessed the island on eastern side and collected the deployed camera traps, tracking tunnels and ARU.

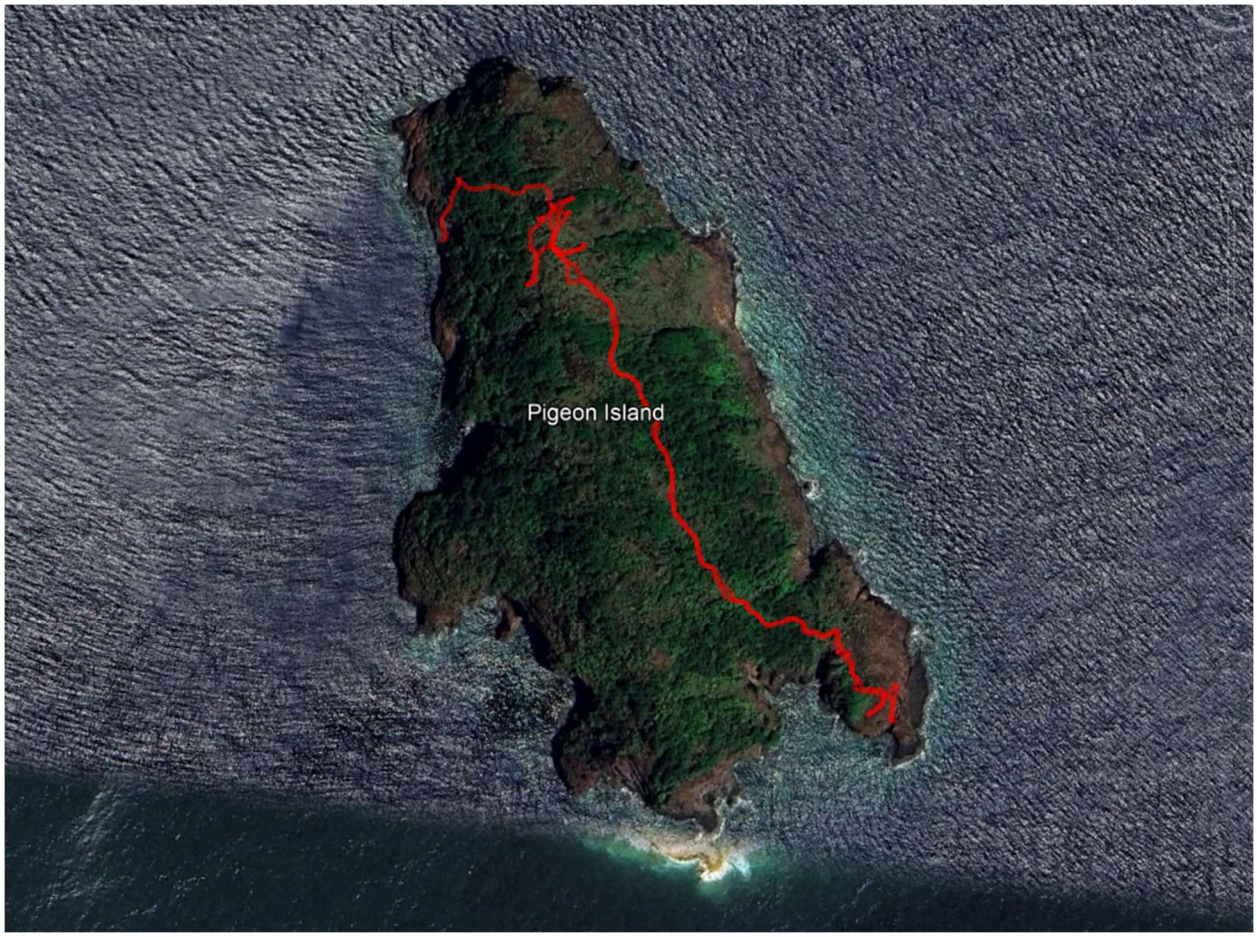


Figure 3. Route of the cleared trail and general study area (Google Earth)

1. Avian
    a. Boat-based Surveys – Four seabird species were observed on Pigeon Island during boat-based surveys (Figure 4-7). Adult and recently fledged Red-billed Tropicbirds were observed each day from 20-22 April. Surveys of known nesting areas / nests at other islands in the Grenadines in April 2025 indicated that peak nesting season had concluded (J. Coffey, pers. obs.), the timing of which coincided with the observations at Pigeon Island. Brown Boobies (*Sula leucogaster*) were observed roosting on rocky ledges surrounding the island on each circumnavigation. Laughing Gulls (*Leucophaeus atricilla*) were also observed on a daily basis, and were displaying courtship behaviour. On 21 April, Brown Noddies were observed foraging in nearby waters and roosting along the rocky shores. Both survey data and anecdotal information indicate that this was likely the arrival date of Brown Noddies in the Grenadines after their non-breeding period. Nesting behaviour was observed in Brown Noddies with individuals on the island collecting nesting material on the eastern (windward) slope. While not sighted on land, Magnificent Frigatebirds (*Fregata magnificens*) were frequently observed flying over and near Pigeon Island, while Red-footed Boobies (*Sula sula*) were observed flying over nearby waters through the channel, but too distant to be associated with Pigeon Island.

Seabird numbers were recorded as a maximum count per survey given that individuals were counted by teams in two separate boats (Table 1).

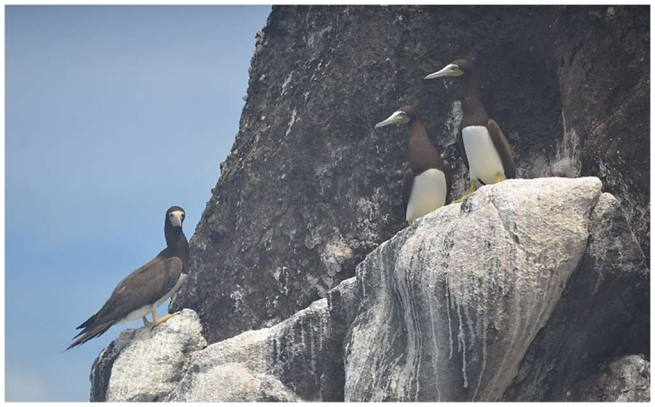


Figure 4. Adult Brown Boobies roosting (J. Coffey)

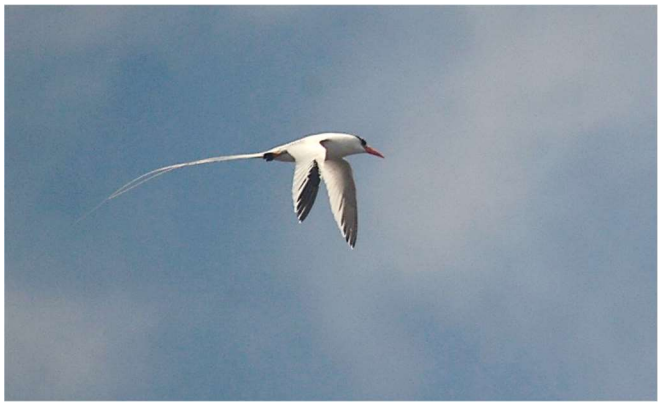


Figure 5. Adult Red-billed Tropicbird (J. Coffey)

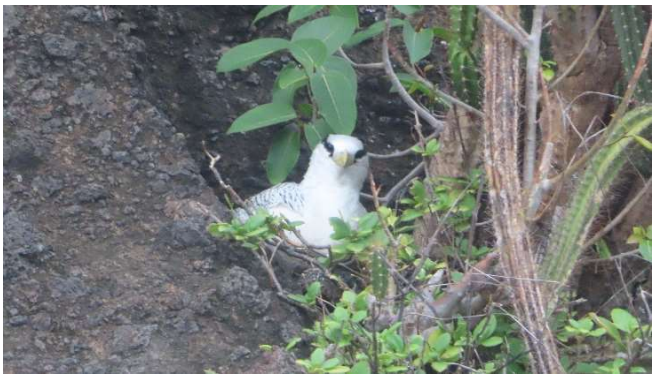


Figure 7. Red-billed Tropicbird fledgling near nest cavity (J. Coffey)

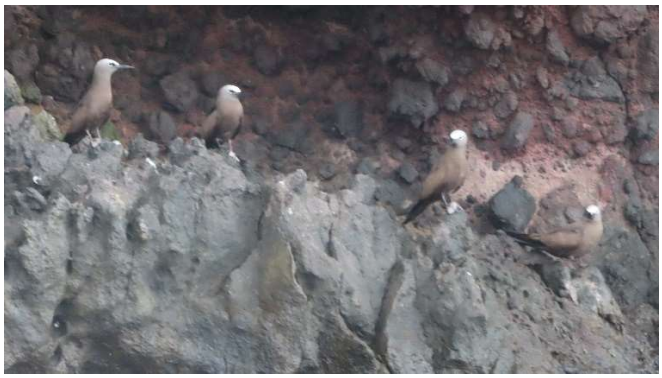


Figure 6. Adult Brown Noddies roosting (J. Coffey)

Species	20-Apr	21-Apr	22-Apr
Red-billed Tropicbird	10	4	1
Brown Booby	19	12	30
Laughing Gull	3	5	18
Brown Noddy	-	34	1
Magnificent Frigatebird	5	1	9

Table 1. Maximum count of seabirds observed at Pigeon Island during boat-based surveys.

b. Land-based Surveys (br = breeding) – Avian species opportunistically observed on the island included Scaly-naped Pigeon (*Columba squamosa*) (br), Bananaquit (*Coereba flaveola*) (br), Tropical Mockingbird (*Mimus gilvus*) (br), Grenada Flycatcher (*Myiarchus nugator*), Zenaida Dove (*Zenaida aurita*) (br), Least Sandpiper (*Calidris minutilla*) and

American Oystercatcher (*Haematopus palliatus*). A breeding code was designated if the species was observed nesting and/or observed displaying breeding/courtship behaviour.

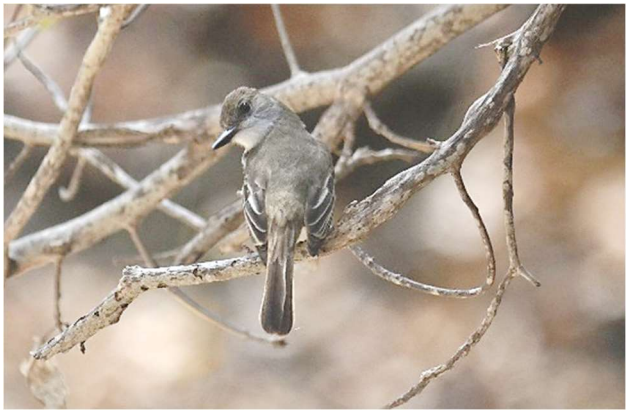


Figure 8. Grenada Flycatcher (J. Coffey)

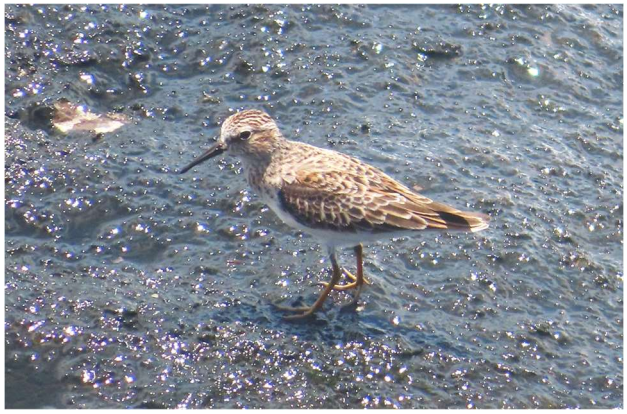


Figure 9. Least Sandpiper (J. Coffey)

c. Autonomous Recording Unit – Over forty-four hours of audio recordings were collected. Audio recordings were processed and analysed using Cornell BirdNet software. Species selection was set to location at 12°N 61°W. Where possible, audio segments were further verified manually by cross-checking with audio files in eBird. Positive matches included: Yellow-bellied Elaenia, Bananaquit, Red-billed Tropicbird, Caribbean Elaenia, Zenaida Dove, Eared Dove, Common Ground Dove, Tropical Mockingbird, Scaly-naped Pigeon, Laughing Gull, and Caribbean Barn Owl. Erroneous or questionable records (e.g. rare in region) were omitted from this report.

   While Audubon's / Sargasso Shearwater was not detected through the automated analysis in BirdNet, manual processing of several files recorded during darkness detected several highly likely vocalizations of this species, as well as additional vocalizations of Barn Owl not detected through the automated analysis. Furthermore, as this audio recorder was placed near the second camera trap and baited tracking tunnel, additional activity heard throughout each night is presumably attributed to rodent activity.

2. Reptile Surveys

Four reptile species were observed during the assessments. Ground Lizards (*Ameiva aquilina*) were observed throughout the area surveyed and are previously known to be on the island. The Grenadines Pink Rhino Iguana (*Iguana iguana insularis*) was encountered on numerous occasions, with individuals sighted throughout the entire area assessed. Iguanas were very wary of human presence, and retreated rapidly into dense vegetation on every encounter. The Grenada Bush Anole (*Anolis aeneus*) was also encountered on several occasions. A single Turnip-tail Gecko (*Thecadactylus rapicauda*) was sighted near the watering troughs. These sightings represent new island records for three of these species previously not documented in the literature for Pigeon Island.

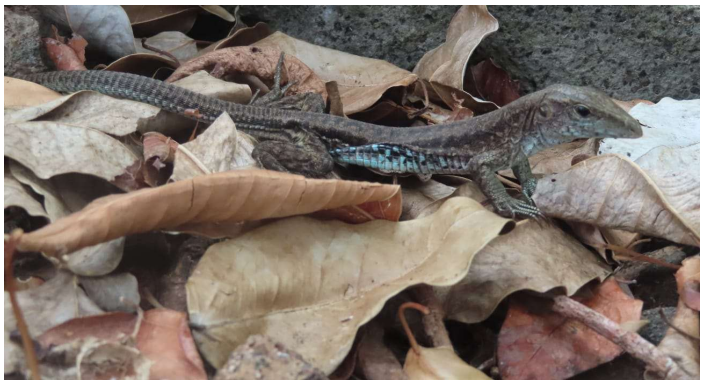


Figure 10 . Ameiva aquilina (J. Coffey).

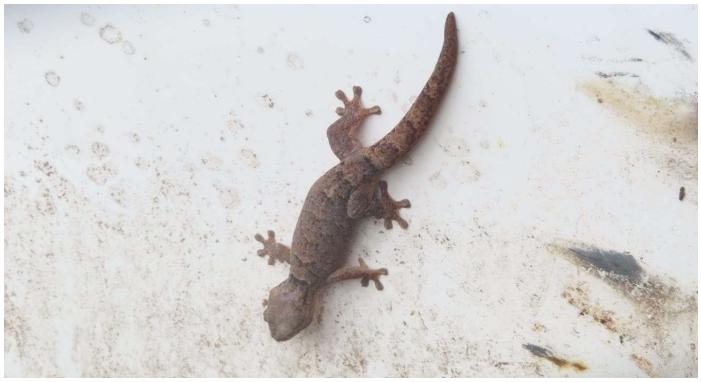


Figure 11.. Thecadactylus rapicauda (J. Coffey)

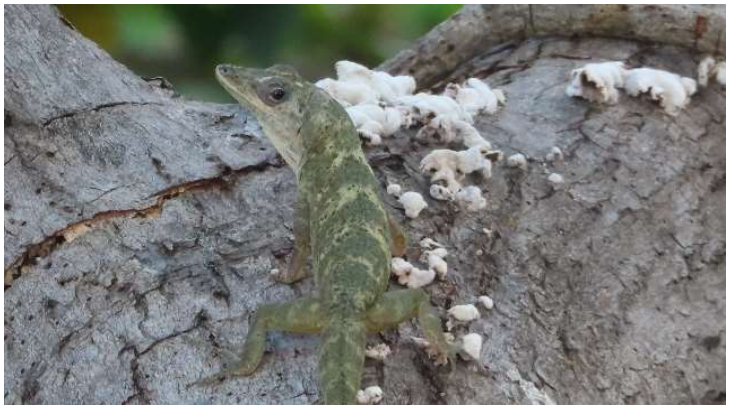


Figure 11. Anolis aeneus (J. Coffey).

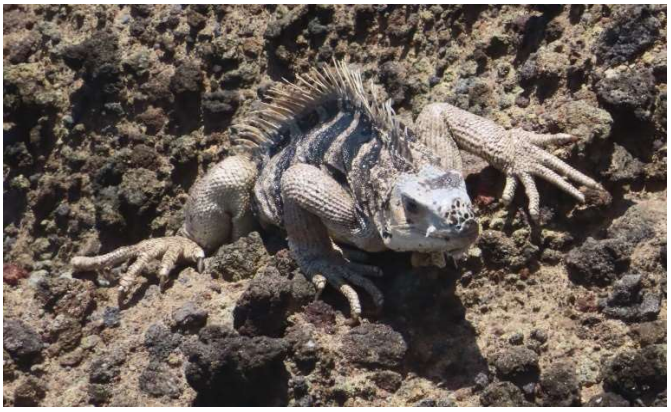


Figure 11. Iguana iguana insularis (J. Coffey)

3. Invasive Species

    a. Opportunistic Encounter – Several introduced mammals were visually observed during field work activities. On 20 April during camera trap deployments, an individual black rat (*Rattus rattus*) was observed and photographed near the area where the water troughs are located at approximately noon (Figure 12). On 21 April, several sheep were observed along the walking trail towards the south of the island.

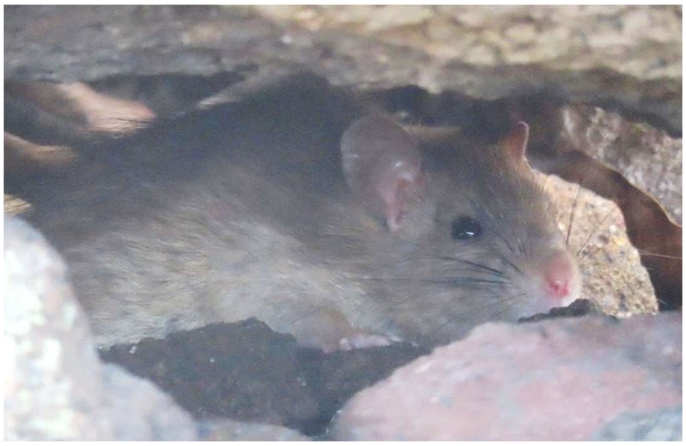


Figure 12. Black Rat (Rattus rattus) (J. Coffey)

    b. Camera Traps

Camera 1 – This camera was deployed with a baited tracking tunnel near the landing site where a team member had previously observed rodents (Ollivierre, pers. obs.), and remained on the island for

approximately 48 hours. Rodents were documented at the bait station throughout darkness on each night that the camera trap remained deployed (20-21 April). Up to four rats were photographed in a single image, indicating the likelihood of a high density of rodents on the island (Figure 13). The same individuals were observed on numerous occasions and were identifiable by distinct physical features.

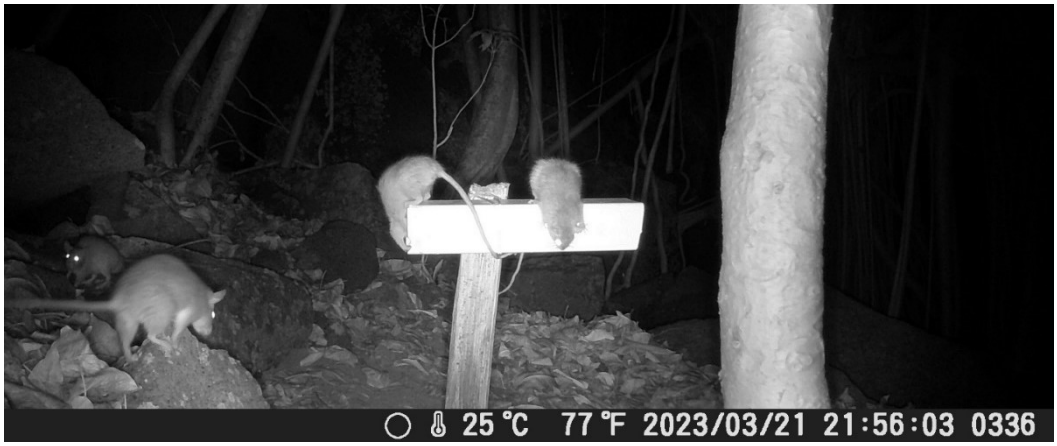


Figure 13. Black rats at bait station near the NW landing site.

Camera 2 – This camera was deployed with a baited tracking tunnel near the water troughs where goats are presumed to frequent, and remained on the island for approximately 48 hours. Shortly after deployment, two sheep (Figure 16) and a black rat (Figure 16) were documented on the camera during daylight. Black rats were especially active near the bait station during darkness on both evenings, with

Figure 16. Sheep at bait station.

Figure 16. Black Rat at bait station during daylight.

Figure 16. Three Black Rats at bait station during darkness.

up to three individuals documented in a single image concurrently (Figure 16). As with the first camera, several distinct individuals were observed due to unique physical features. While rats were primarily documented approaching on the ground, several clips also documented an individual climbing a tree in the background.

Camera 3 – This camera was deployed on 21 April along the cut trail where sheep had been observed on the same day, and remained on the island for approximately 24 hours. A baited tracking tunnel was not deployed in conjunction with this camera. Two sheep were documented walking along the trail (Figure 17).

Figure 17. Sheep walking along cleared trail.

Camera 4 – This camera was deployed with a baited tracking tunnel on the south of the island where goats are presumed to frequent, and remained on the island for approximately 48 hours. Despite being triggered by the field team during both deployment and retrieval, the camera was not triggered by any wildlife. The bait had also been removed during deployment and it is unknown what species was involved.

4. Unmanned Aerial Vehicles

As previously mentioned, it was not possible to capture the entire island with the UAV for several reasons (e.g. approached by seabirds, overheating, etc.). The below collected imagery during the field survey period is overlaid on a Google Earth image dated 19 Aug 2024 (Figure 18). Note that the drone imagery and the Google Earth image vary from dry to wet season respectively. As goat presence on uninhabited islands in the Grenadines (and elsewhere) is known to contribute to erosion through reduction of vegetation cover, monitoring assessments of vegetation change over time due to invasive species presence and/or removal would avail of periodic aerial imagery collection.

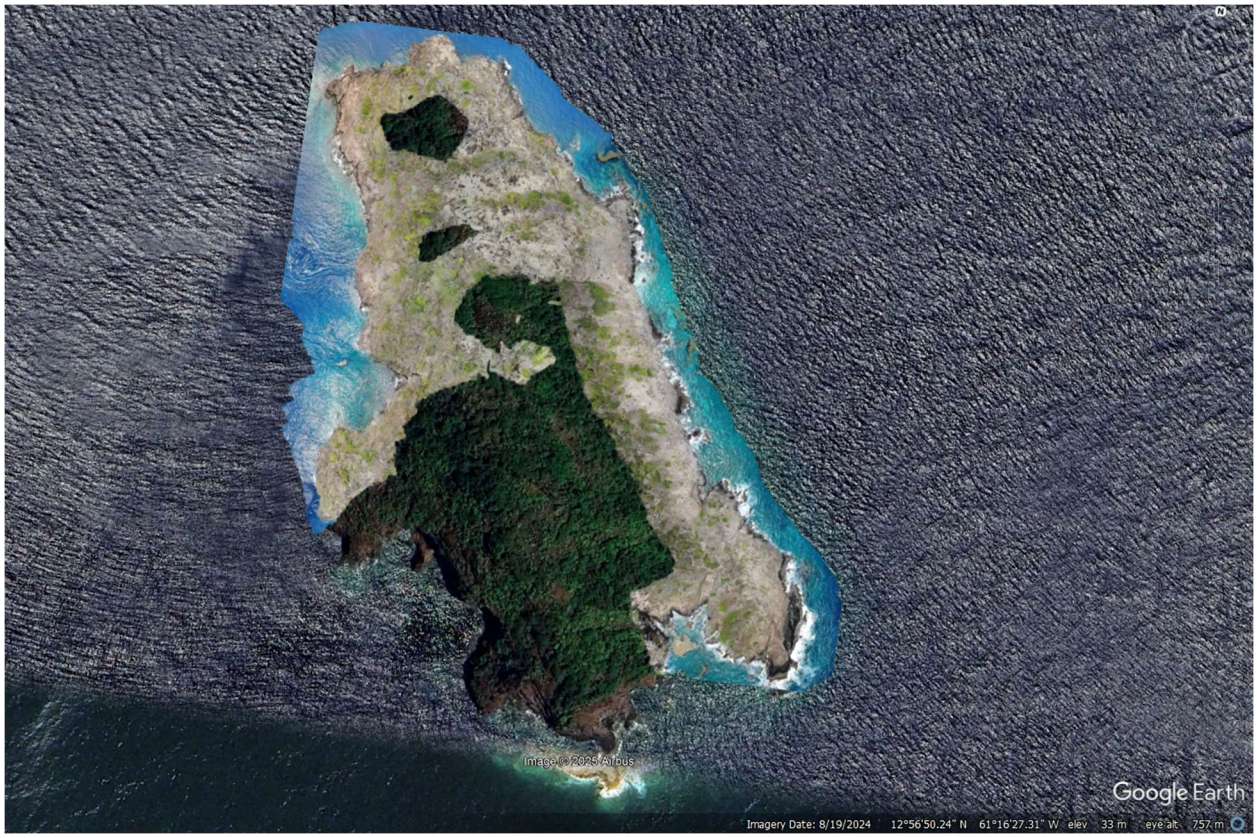


Figure 18. Drone imagery overlaid on Google Earth image.

Additional Threats

The refrigerator that is located in the area of the water troughs was observed to be full of water with several dead birds inside (Figure 19). It was not possible to identify the dead birds to species level, but individuals observed on the camera trap and audio recordings indicate they are potentially Zenaida or Eared Dove (Figure 20). On 21 April the survey team emptied the water out of the refrigerator and it remained turned over to prevent further casualties. Shotgun shells were additionally noted at several locations on the island (Figure 21). While it is known that goats and Scaly-naped Pigeon (and possibly iguana) are hunted on the island, such activity can also present a disturbance to nesting birds and

prohibit recolonization. Additionally, given that seabirds continue to be occasionally targeted for harvesting of their eggs and chicks in the Grenadines, any accessible colony close to an inhabited island could be subjected to this practice, and is a factor to consider in future conservation initiatives.

Figure 19. Dead bird inside refrigerator (J. Coffey)

Figure 20. Columba sp. near refrigerator.

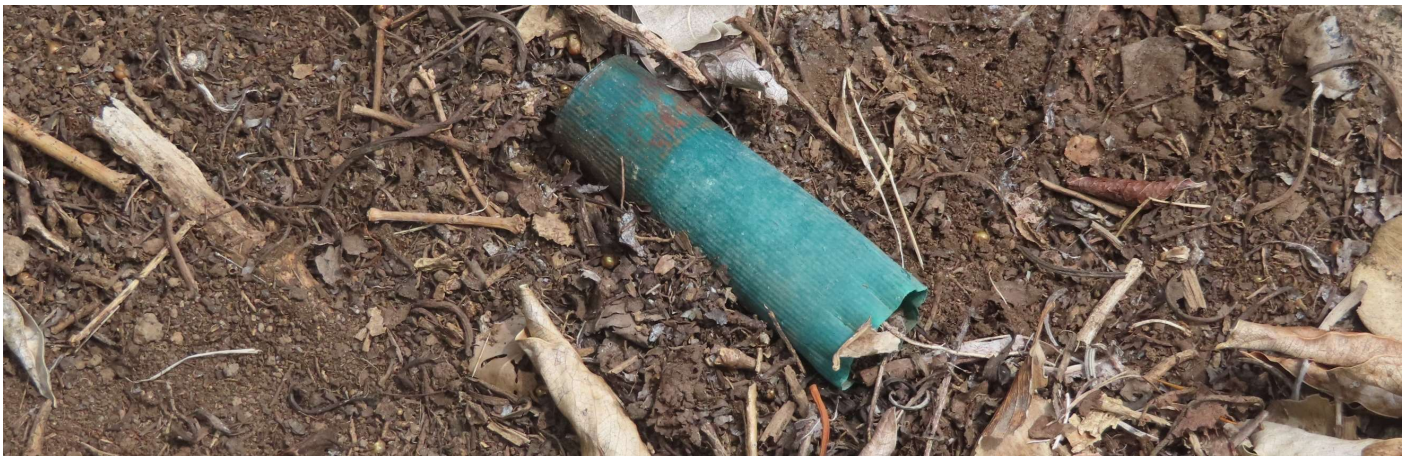


Figure 21. Shotgun shells scattered around island (J. Coffey).

Additional Activities

1. Isle a Quatre – On 21 April boat-based surveys were conducted by the field team via circumnavigation of Isle a Quatre in the afternoon. Species observed included: Osprey, American Oystercatcher, Great Blue Heron, Red-billed Tropicbird, Little Blue Heron, Laughing Gull, and Brown Booby.

2. Tourism Discussion – On 22 April the team participated in a semi-directed roundtable beach-side discussion on Isle a Quatre regarding the potential for seabirds and the nearby islands to be

featured as tourism attractions for visitors to Bequia. Topics of discussion included the status of seabird resources in the Grenadines in a regional and global context, understanding bird-based tourism and tourists, feedback on challenges to offer such services (e.g. tourism certification, access to tourism / cruise ship market, costs involved in developing the product, required equipment, specialized training, weather factors, etc.). It was noted that the participants are ideally suited to perform such activities through their extensive knowledge of Bequia and surrounding islands, experience in tourism, experience in seafaring and associated activities (e.g. fishing, whaling, boat-building, navigation, etc.), and their awareness and use of seabirds to find fish and understand weather patterns.

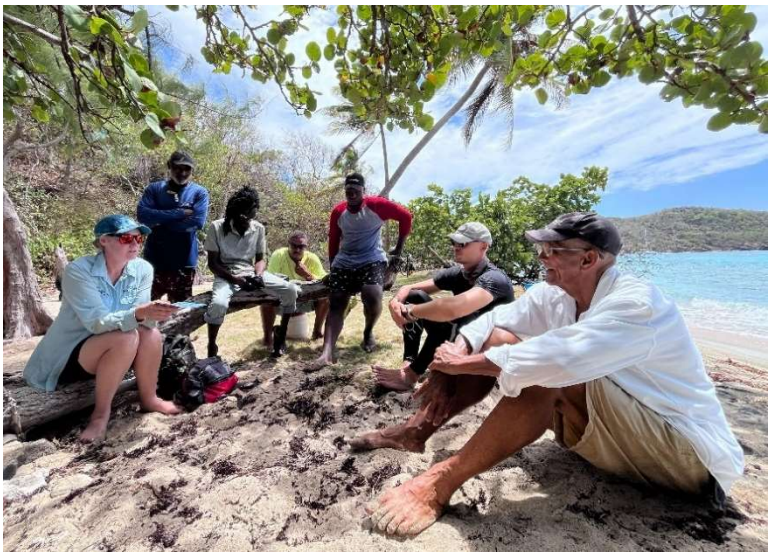


Figure 22. Field team participate in seabird tourism discussion (L. Gaymes).

3. Seabird Monitor Training – Seabird Monitor training occurred at various locations throughout the field survey period, and included Pigeon Island, Isle a Quatre, Syrup / Chirrup Cay, Middle / Whale Cay, Petit Nevis, Paget Farm jetty, Big Cay, and West Cay. Participants were trained in basic boat-based surveying methods, identification and age classes, estimation and data recording. It was noted that there are several current projects in the Grenadines focusing on seabirds and that developing the skills required in seabird monitoring could avail of additional opportunities for participants.

Figure 24. Brown Booby chick on Bequia mainland (J. Coffey).

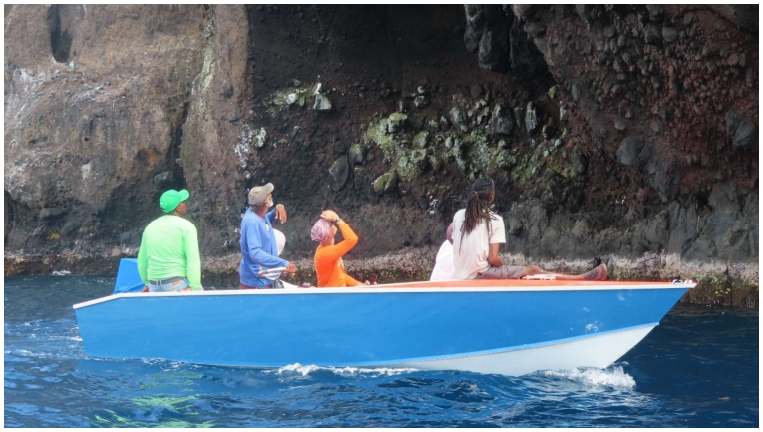


Figure 23. Field team conducting seabird surveys and seabird monitor training (J. Coffey).

Discussion and Recommendations

Avian diversity and abundance

- Several non-seabird avian species that were observed are known to regularly rely on offshore uninhabited islands in the Grenadines for foraging and nesting, such as the Scaly-naped Pigeon, Zenaida Dove, Eared Dove and American Oystercatcher. The Grenada Flycatcher is a regionally endemic species whose range is restricted to Saint Vincent and the Grenadines and Grenada. Regardless of goat removal efforts, the presence of rodents will continue to limit the species richness and abundance of birds on the island. Further studies of terrestrial birds could focus on diversity, abundance and nesting activity, especially pertaining to nesting success.
- Given the varying timings of seabird nesting in the Grenadines by species, follow-up boat-based surveys of the island are recommended periodically (e.g. monthly) to document activity that would not have been observed during this field effort. Further investigations of Audubon's / Sargasso Shearwater nest locations and associated habitat can be done through land-based surveys. The value of acoustic devices for documenting contemporary shearwater presence and longer-term recovery should be considered.

Reptile diversity and abundance

- Several regionally endemic reptiles were noted during surveys. For example, the Grenada Tree Anole is a Grenada Bank endemic whose population reaches as far north as Bequia, while the Pink Rhino Iguana subspecies is known only throughout the Grenadines. While these observations were documented opportunistically, a more detailed and thorough investigation of reptile diversity on the island is recommended. As with avian diversity and abundance, the presence of rodents will limit reptilian populations on the island and have been also known to alter behaviour (i.e. regularly on "alert mode" due to the threat of predation).

Vegetation

- Monitoring of changes in vegetation throughout the year (i.e. to cover dry and wet season) should occur in tandem with any goat removal activities. UAVs are a useful tool to capture aerial imagery for monitoring regeneration.

Invasive Species

- While goats were not documented on camera traps, the significant amount of scat on the island and anecdotal information provided evidence of their presence. Any goats present on the island appear to be extremely wary of human presence. Further surveys should be conducted to assess their abundance and feasibility of removal.
- Sheep removal should also be included in island restoration efforts.
- Removal of grazing animals will allow for regeneration of vegetation, however, the presence and abundance of Black Rats on the island will prohibit recovery of native species, such as nesting marine and terrestrial birds, and reptiles.

Seabird Monitors and Tourism

- Continuation of the Seabird Monitor program and tourism development related to seabirds and island restoration can provide supplemental and alternative incomes for adjacent communities, while also preserving traditional knowledge and cultural heritage. Providing such opportunities for local communities in tandem with outreach and education has the potential to contribute to the longer-term success of island restoration efforts.

Acknowledgements

We would like to extend sincere gratitude to the Saint Vincent and the Grenadines Environment Fund (SVGEF) for supporting this important and meaningful project, and for involving us in the process. In particular, to Stephan Hornsey, Lisa Gaymes and Johnny Ollivierre for their dedicated work in environmental conservation and community stewardship. To Vaughn Thomas of Carriacou for continuing to be a positive influence and mentor to other fisherfolk regarding seabird conservation throughout the Grenadines. Special thanks to Bentley and Red from Bequia for their depth of knowledge, seafaring skills and continued interest and involvement in seabird projects. And finally, to Johnson, Enoch and Jerome for their assistance in the field – these islands are yours for the future.

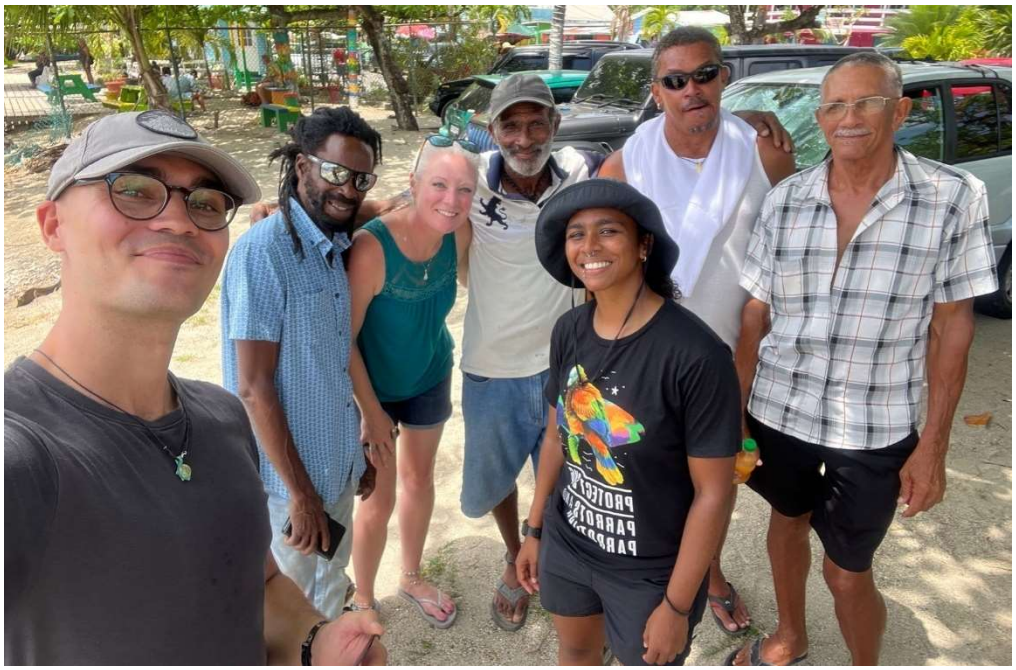


Figure 25. Field team (missing Johnson, Enoch and Jerome) (S. Hornsey)

References

Coffey, J., and A. Ollivierre. 2019. Birds of the Transboundary Grenadines. Birds of the Grenadines, St. John's, NL, Canada.

Coffey, J., and N. Collier. 2020. Community-based Conservation Management Plan for the Seabirds of the Transboundary Grenadines Archipelago. Environmental Protection in the Caribbean (EPIC), Green Cove Springs, FL.

Coffey and N. Collier. 2021. Introduced mammals threaten the Grenadines transboundary tropical seabird hotspot. Journal of Caribbean Ornithology 34:61-74.

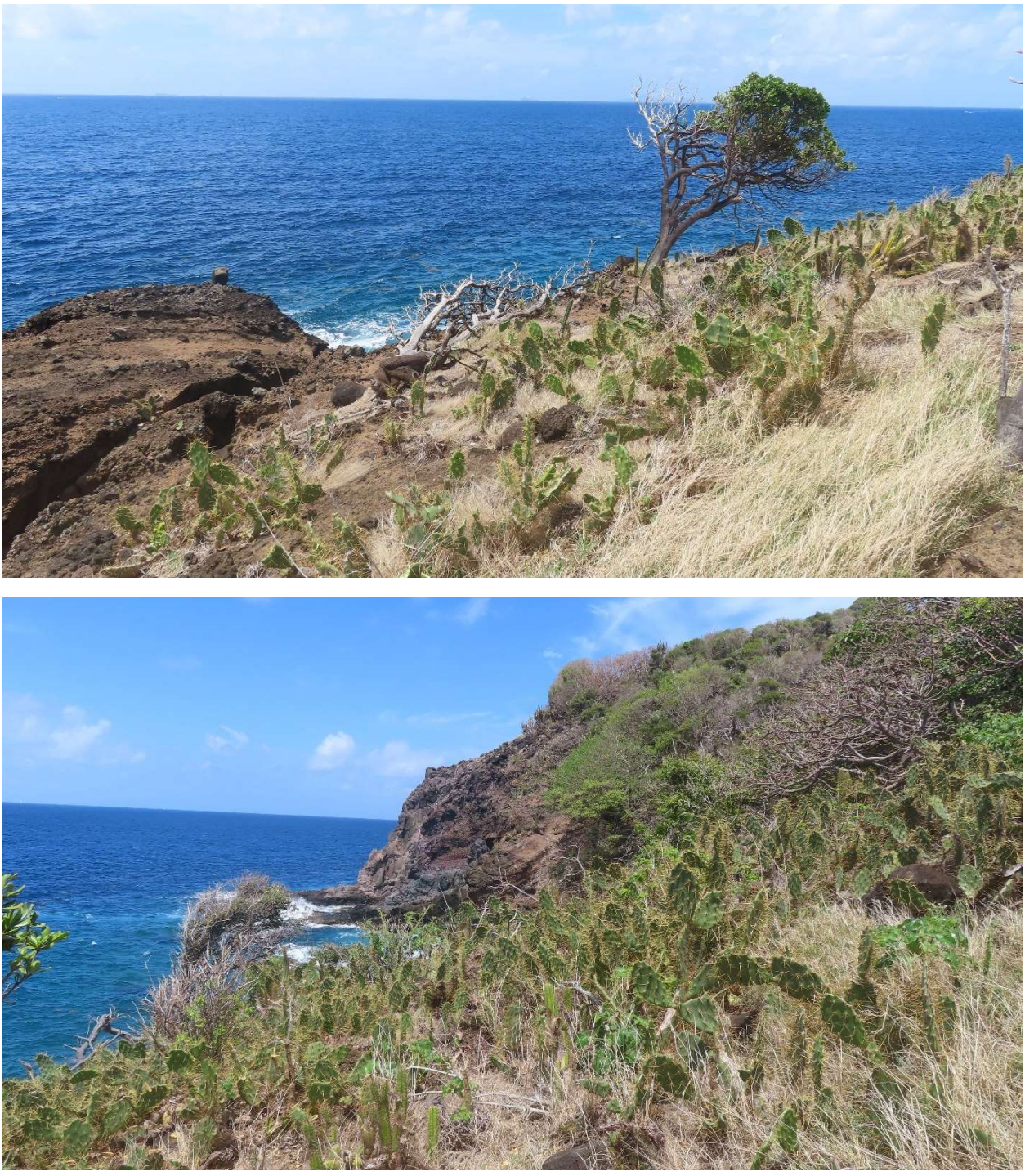
Frost, M., F. Hayes and A. Sutton. 2009. Saint Vincent, the Grenadines and Grenada. In: An Inventory of Breeding Seabirds of the Caribbean, eds. P. Bradley and R. Norton. University Press of Florida, Gainesville. 353pp.

Henderson, R. and. R. Powell. 2018. Amphibians and reptiles of the St. Vincent and Grenada Banks, West Indies. Edition Chimaira, Frankfurt am Main, Germany. 448pp.

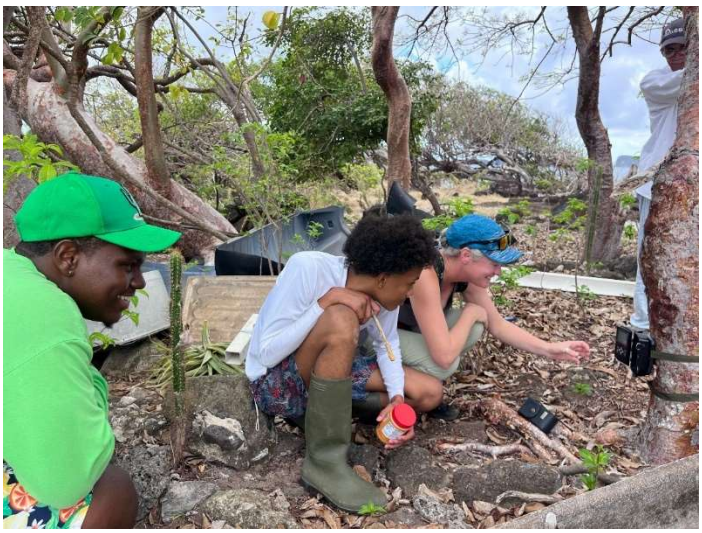
Lowrie, K., D. Lowrie, and N. Collier. 2012. Seabird Breeding At las of the Lesser Antilles. CreateSpace Independent Publishing Platform, CA.

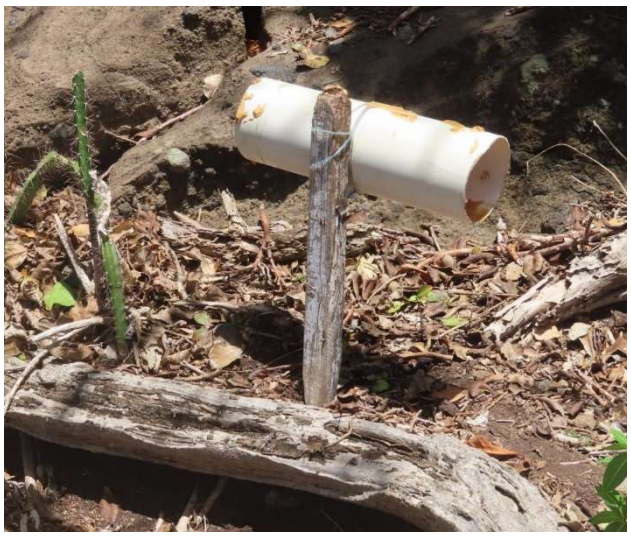
Wiley, J. 2021. The Birds of St. Vincent, the Grenadines and Grenada. BOC Checklist Series 27. Tring, United Kingdom.

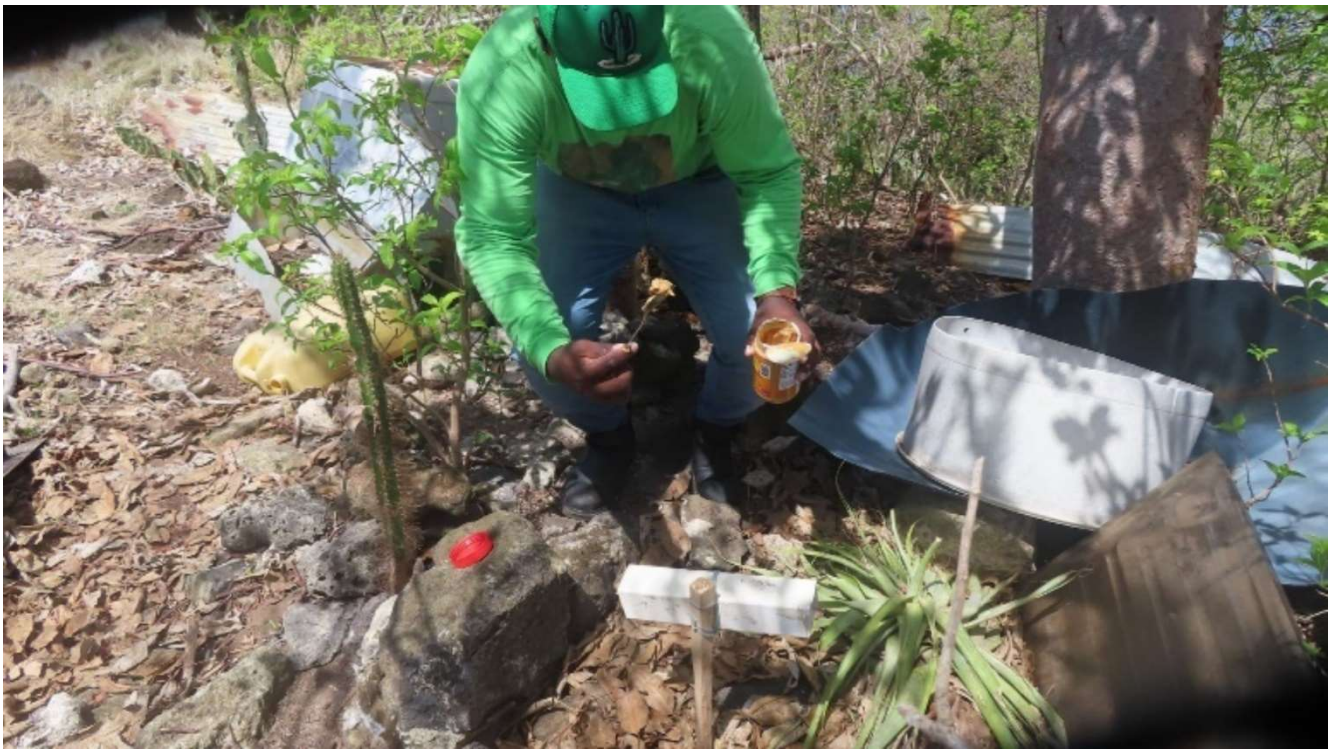
Appendix – Additional Photos



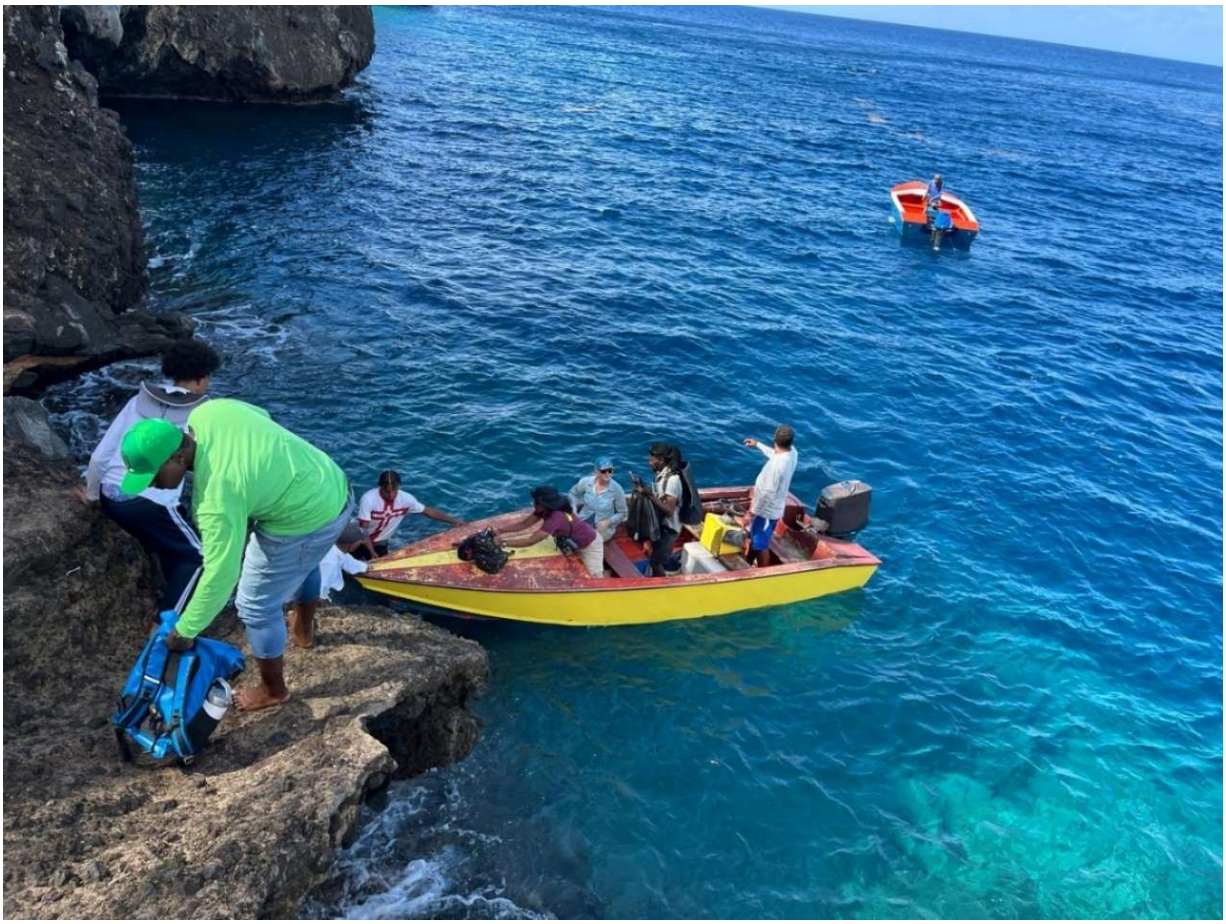
Photos taken on the eastern (windward) side of Pigeon Island in the former Brown Noddy nesting colony (J. Coffey)







Deploying baited tracking tunnels and checking camera traps (L. Gaymes)



Landing site on NW Pigeon Island on a calm day (S. Hornsey)