Searches for the Diablotin Black-capped Petrel on Dominica: Results from an expedition during February 2023



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COVER IMAGE: View of Morne Trois Pitons and Morne Micotrin (from Baiac ridge). Stephen Durand, 2023.

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Contents

Contents 2
1 Summary 4
2 Introduction 5
3 Methods 6
3.1 Survey area 6
3.2 Survey period 7
3.3 Audio-visual surveys 7
3.4 Dog searches 8
3.5 Marine surveys 9
4 Results 9
4.1 Audio-visual surveys 9
4.2 Dog searches 10
4.3 Marine surveys 10
5 Discussion 11
6 Recommendations for future conservation work 12
7 Note on power line blueprint 13
8 Data sharing 14
9 Acknowledgements 15
10 Literature Cited 15
Appendix: Phenology diagram of Diablotin Black-capped Petrel 31

List of Figures and Photographs

Figure 1. Areas surveyed during the February 2023 search effort. 20
Figure 2. Areas surveyed and searched during the February 2023 effort. 21
Figure 3. Conservation activity in the Morne Micotrin area of Dominica. 26
Photograph 1. Search dog África in front of the team's vehicle, during the February 2023 effort. 27
Photograph 2. Yvan Satgé interviewing boat captains about seabirds, during the 15 February boat trip. . 27
Photograph 3. Cavity marked by search dog África as potential Black-capped Petrel burrow, Micotrin antenna trail, February 2023. 28
Photograph 4. Cavity marked by search dog África as potential Black-capped Petrel burrow, Morne Diablotin trail, February 2023. 28

Photograph 5. Stephen Durand, Yvan Satgé, and Jacob González-Solís upon reaching the survey site on Morne Diablotin, and starting the audio-visual survey, 16 February 2023. 29

Plate 1. Plate used during interviews with people living near suspected Black-capped Petrel nesting areas, and boat captains. 30

Figure A1. Phenology diagram of Diablotin Black-capped Petrel. 31

List of Tables

Table 1. Details of audio-visual survey locations used during the February 2023 effort. 17

Table 2. Details of audio-visual observation effort during February 2023. 18

Table 3. Details of search effort during February 2023. 19

1 Summary

The Diablotin Black-capped Petrel (*Pterodroma hasitata*) is an endangered seabird endemic to the Caribbean. A small population remains on Dominica but breeding areas have yet to be located.

During February 2023, we used multiple methods to attempt to locate Black-capped Petrels: 1) we conducted audio-visual surveys on mountain tops near suspected breeding and/or courtship areas, from sunset to moonrise; 2) we searched for nesting sites with a 5 year-old conservation scent dog, África; and 3) we organized a boat trip along the Atlantic coast to search for petrels returning to the island. Simultaneous to this search effort, one Black-capped Petrel was observed from the Martinique ferry on 8 February.

During 67.7 hours of audio-visual surveys at nine survey locations, we did not hear or observe petrels. During 39.7 dog-hours covering 59km and 219ha, we located four potential nesting sites (three on Morne Micotrin, one on Morne Diablotin): to date, no petrels were observed in camera traps deployed at those sites.

These results are concerning and, if a population of Black-capped Petrels remains on Dominica, its size must be small and/or spatially limited to areas not surveyed during recent efforts. In this report, we make recommendations for future Black-capped Petrel conservation actions commensurate with the capacity present on the island.

Additionally, during this effort, we became aware of construction work for geothermal electrical production near suspected breeding areas, and for power lines along most of the western coast. These power lines will present a great risk of collision for any remaining petrels and could greatly affect the species' viability on the island. Therefore, we also take the liberty to propose recommendations for monitoring, reducing, and mitigating these risks.

Although the 2022 and 2023 surveys did not bring the results that were expected by the conservation community, now, more than never, is the time to intensify efforts to locate Black-capped Petrel breeding areas. The small remaining population may irremediably be affected by development projects and Dominica may lose one of its ecological treasures.

Fieldwork involved Yvan Satgé (EPIC, Clemson University; expedition leader), Stephen Durand (independent; local expedition lead), Jacob Gonzalez-Solis (University of Barcelona; dog handler and petrel expert), Jeanelle Brisbane (Dominica Forestry, Wildlife & Parks Division; local biologist), Jennifer Wheeler (BirdsCaribbean; field assistance). In parallel with the search effort, but funded independently, outreach effort was coordinated by Jeanelle Brisbane, Jennifer Wheeler, and Sea McKeon (American Bird Conservancy).

2 Introduction

The Black-capped Petrel (*Pterodroma hasitata*), also known as the Diablotin bird on Dominica, is one of the most threatened seabirds in the western north Atlantic. The species is currently only known to nest on the island of Hispaniola but breeding is probable in Dominica and suspected in Cuba, Jamaica, and Guadeloupe (Wheeler et al. 2021). Black-capped Petrels were widespread in the Greater Antilles in the nineteenth century (Collar et al. 1992) but they are now categorized as Endangered throughout their range (BirdLife International 2018). The current population size is unknown but estimates based on at-sea observations range from 2000 to 4000 individuals globally, with a fragmented nesting population estimated at 500 to 1000 pairs (BirdLife International 2023). To date, only ~100 nests have been found, all on Hispaniola (Wheeler et al. 2021). Two phenotypes of the species exist (a dark form and a light form, with intermediate phenotypes; Howell & Patteson 2008, Manly et al. 2013) but it has been suggested that the light form is breeding on Dominica (Satgé et al. 2023; Bretagnolle, personal communication).

All known nesting sites are in mountainous areas, more than 1500m above sea level. There, petrels nest in the thick understory of steep montane forests, and excavate underground burrows in limestone crevasses, loose rocks, or soil (Satgé et al. 2023). Nesting Black-capped Petrels are threatened by a variety of human impacts including agricultural land clearing, introduced predators, collision with telecommunication towers, and light pollution. Recent surveys of known nesting areas showed an overall negative trend in population estimates since 2013 (Wheeler et al. 2021). If no major action is taken to halt this decline, the U.S. Fish and Wildlife Service predicts that the two major nesting populations are likely to face extirpation by 2070, a potential loss of up to 85-95% of the currently known breeding population (U.S. Fish and Wildlife Service 2018).

The island of Dominica is the designate type locality for the Black-capped petrel (Satgé et al. 2023). Widespread on the island in the early 1800's, the last known nesting petrel was found in 1862 and the species is thought to have persisted through the 1930's (Simons et al. 2013). In recent years, Black-capped Petrels were heard calling near Morne Diablotin in 1977, and small numbers were heard or observed in other parts of the island in the 1980's (Evans & James 1997). Petrels were found grounded in 1990 in Roseau (Evans & James 1997). Recently, petrels were found in January 2007 in the village of Trafalgar [Edit 2026-10-21: after discussing with Arlington James, it appears that the following information is incorrect] ~~, in May 2007 and in 2013 near the hydro-electricity power plant at Trafalgar, and in 2015 in the village of Morne Prosper and left there~~ (*fide* Arlington James 2015, cited in Brown et al. 2020). Between 2001 and 2018, twelve Black-capped Petrels were spotted flying by the island of Guadeloupe towards Dominica (Levesque & Yésou 2018).

Over the last 20 years, Environmental Protection in the Caribbean (EPIC) led six expeditions on Dominica to look for Black-capped Petrels. In 2001, areas in the southern mountains near Morne Fous were surveyed but no petrels were detected (Brown & Collier 2001). In 2010, another expedition looked for petrels on the water, and listened for calling birds at night: no petrels were detected (Lowrie et al. 2012). In January 2015, an expedition using a marine radar unit, night-vision optics reported 968 petrel-like targets, using radar over 20 stations (Brown 2015). 8 flying petrels were reported using night-vision. A follow-up effort was completed in 2016 by a joint Grupo Jaragua/American Bird Conservancy team in collaboration with the Forestry, Wildlife & Parks Division of Dominica with the intent of finding nesting petrels. During eight days of nest searching on Morne Trois Piton, Morne Micotrin, and the ridge connecting the two peaks, no petrel nests were located, although several areas were deemed appropriate for nesting petrels (Rupp et al. 2016). In 2020, marine radar unit and night-vision optics were used once again to detect 240 petrel-like targets were detected at 8 stations, and 6 flying petrels were reported using night-vision (Brown 2020). In January 2022, night-time thermal imagery was used to survey areas previously located by radar as having Black-capped Petrel activity (Satgé & Millischer 2022). A single petrel was observed, flying away from Morne Micotrin towards the Caribbean Sea.

Building on these results, we organized an expedition in February 2023 to attempt to locate nesting areas on Dominica. The objectives were to 1) confirm (or refute) the low level of Black-capped Petrel activity observed in 2022; and 2) search potential breeding areas with a trained conservation dog. This report details the methods and results of this expedition and recommends next steps for the conservation of the Black-capped Petrel on Dominica.

3 Methods

3.1 Survey area

Fieldwork took place on Dominica, at locations where Black-capped Petrel activity was recorded during radar surveys (Brown 2015, Brown 2020) and during thermal surveys (Satgé & Millischer 2022). We prioritized areas around Morne Micotrin and the Roseau flyway (Figure 1), where petrel-like targets were detected with radar and a petrel was observed with thermal binoculars (Brown 2015, Brown 2020, Satgé & Millischer 2022). Additionally, we also surveyed from other mountains that appeared to have characteristics of *Pterodroma* petrel courtship areas: protruding vertical profile (i.e. peaks that tower above the surrounding mountains), steep slopes, narrow peak ridges, and/or remote location. From north to south, these were: Morne aux Diables, Morne Diablotin, Morne Micotrin, Morne Nicholls, and Morne Anglais (Table 1 and Figure 1). We searched for nesting sites with a dog along access trails to these survey areas. We

could not survey from Morne Trois Pitons because the access trail had been damaged by recent hurricanes.

3.2 Survey period

Fieldwork took place from 6 – 16 February 2023, a period most consistent with previous survey effort (Brown 2015, 2020, Satgé & Millischer 2022). This period also allowed to potentially observing both petrel phenotypes (Figure A1). Indeed, Black-capped Petrels found grounded in 2007 and 2010 were of the light form (International Black-capped Petrel Conservation Group, cited in Satgé et al. 2023) but the phenotype of the other three grounded petrels is unknown. Therefore, although it is suggested that petrels nesting on Dominica are of the light form, both phenotypes may be nesting on the island.

Additionally, the period following the full moon has been described as showing maximum courtship activity in other *Pterodroma* (Pujol Casado 2020). With the full moon on 5 February (Figure A1), the period we chose optimized the chances of observing Black-capped Petrel activity at courtship areas.

3.3 Audio-visual surveys

We surveyed potential Black-capped Petrel courtship areas. Black-capped Petrels, like other *Pterodroma*, are most active between sunset and three hours after sunset (Brown et al. 2015, Brown et al. 2020, Satgé et al. 2019), or until moonrise (Pujol Casado 2020).

We made observations through long-range uncooled thermal binoculars (Accolade 2 LRF Pro, Pulsar, USA). Unlike night-vision technology, which uses available light and is limited in distance and quality, thermographic technology provides night-time imagery using differences in infrared radiations emitted by objects. The level of infrared radiation produced by an object is a direct function of its temperature, which is independent from the amount of light available. Animals, and particularly homeothermic (i.e. “warm-blooded”) animals such as Black-capped Petrels, differ from background temperatures and can therefore be observed with thermal binoculars even when no light is present. However, fog/clouds and rain can limit the range of thermal binoculars, due to the scattering of light off droplets of water.

We attempted to attract petrels using a strong portable spotlight (P18R Signature, LedLenser, Germany: 4,500 lumens) and a flashlight (MT14, LedLenser, Germany: 1,000 lumens). At times, we also played recordings of Black-capped Petrel calls on a rugged Bluetooth speaker (JBL, USA).

Two to three observers were present during all surveys and one person was observing at all times, except in poor weather (rain and/or thick fog) (Table 2). The observer scanned the sky,

mountain tops and slopes, ridgelines, and/or valleys in the available field of view. Binoculars were battery-powered and lasted up to 9 hours. Simultaneously, all observers listened for possible petrel calls. Black-capped Petrels have distinctive calls during courtship, a low-octave *oooohhhh, oooohhh, ooohhhh-eek* (Satgé et al. 2023). In good weather conditions, calls of *Pterodroma* petrels can be heard at distances up to 2km (JGS, personal observation) therefore we chose survey locations between 500m and 2km of potential courtship areas (Table 1).

In February 2020, autonomous Acoustic Recording Units (ARUs, Songmeter SM4, Wildlife Acoustic, USA) were deployed at Morne Rachette, Morne Trois Pitons, Morne Micotrin and Bellevue-Chopin (Morne Anglais) (Brown 2020). ARUs were set to record every night from sunset to midnight.

Following this search effort, Stephen Durand deployed additional ARUs at Morne aux Diables and Morne Trois Pitons in March 2023.

3.4 Dog searches

Pterodroma petrels leave a strong odor inside and around their burrow. Therefore, trained conservation scent dogs (also known as "search dogs" or "sniffer dogs") are a powerful tool to detect these inconspicuous species (Bennett et al. 2020). During fieldwork, we used a search dog, a 5 year-old female Springer Spaniel named África, to attempt to locate Black-capped Petrel nest sites (Photograph 1). África was professionally trained to detect the scents of *Pterodroma* and *Hydrobates* species on Cape Verde. Upon detection of a scent, she was trained to search upwind in a zig-zag fashion and, upon locating the source of the scent, to "mark" the location by sitting next to it. Before and during searches, we reinforced África's training and motivation by hiding objects with *Pterodroma* or *Hydrobates* scent along search trails and surrounding habitat, and rewarding her when she located them. África was capable of detecting a scent up to a distance of ~50m under fair weather conditions (the distance increased in windy conditions and decreased in rainy conditions). To prevent África from tiring too fast, we avoided working with her during the heat of the day. Therefore, we started dog searches in the early afternoon and carried on until we had reached the top of the search trail (typically the location of the audio-visual survey for that night). We also made África search on the way back to the trailhead.

At sites marked by África, we attempted to confirm Black-capped Petrel nesting activity by looking into the possible burrow with flashlights and an endoscope (5.5mm 1080px camera with 6 white LEDs, DEPSTECH, China), and playing Black-capped Petrel calls from a smartphone. We also searched the surrounding area for feathers and feces. We deployed camera traps facing the main opening marked by África: we used two Strike Force 5FHD (low glow; trigger speed: 0.04s; recovery time: 1.1s) and one Strike Force Pro 5DCL (low glow; trigger speed: 0.16;

recovery time: 0.4s)(Browning, USA) in trail mode, with 8 Rapid-Fire shots, and fast motion infrared detection.

3.5 Marine surveys

We surveyed for Black-capped Petrels from the following ferries: Guadeloupe-Dominica (5 February), Martinique-Dominica (8 February), and Dominica-Guadeloupe (17 February).

On 15 February, we organized a boat trip on the Atlantic side of Dominica to attempt to observe Black-capped Petrels returning to the island, between 13h00 and 18h30. We chartered a ~5-m, bi-engine, open-deck fishing boat from Marigot to, approximatively, the latitude of Grand Bay to the south, and 6.5nm to the east (Figure 1). We used ~2.5kg of food-grade sardines in brine as chum, and popcorn coated with ~1.5L of food-grade cod liver oil as floating attractants.

During the trip, we interviewed the two boat captains about seabirds they typically encounter during fishing trips (Photograph 2). Using open-ended questions, we asked if they knew or had seen birds pictured on a laminated plate we provided (Plate 1), which showed six species present in Dominica: Brown Booby, Sisserou Parrot (Imperial Amazon), Lesser Antillean Swift, White-tailed Tropicbird, Brown Pelican, and Black-capped Petrel.

4 Results

4.1 Audio-visual surveys

During nine nights between 6 and 16 February, we surveyed seven sites, from nine survey locations (Table 2 and Figure 2). We surveyed Morne Micotrin during three nights in a row (6, 7, and 8 February). All sites were adjacent to potential courtship areas. On two nights (9 and 13 February), skies were clear with light winds, allowing for good to excellent visibility and audibility; on one night (11 February), conditions were reasonable, with light wind and passing fog; and on six nights (6, 7, 8, 10, 12, and 16 February), conditions were bad, with strong winds, thick fog, and rain showers. Audio-visual survey effort across all sites totaled 67.7 hours (Table 2). Morne Micotrin was surveyed for a total of 25.5 hours.

We did not observe or hear Black-capped Petrels, though we observed bats on multiple occasions (identified as per Satgé & Millischer 2022).

ARUs were recovered at Bellevue Chopin (Morne Anglais) and Morne Trois Pitons in 2022, and at Morne Micotrin and Morne Rachette in 2023. ARU data were analyzed by Abram Fleishman and Matthew McKown (Conservation Metrics Inc., USA) in May 2023 (i.e. after this search effort). No petrels were detected.

4.2 Dog searches

We surveyed 10 sites during 10 days between 6 and 16 February (Table 3). Mean start time was 15h12 (range: 10h00-17h30) and mean end time was 20h33 (range: 13h00-23h55). We surveyed Morne Micotrin (antenna side) three times, Freshwater trail two times, and all other sites one time. Habitats searched included (from lowest to highest elevation) secondary rainforest, montane rainforest, mountain thicket, and elfin woodland (per Rupp et al. 2016). In rainforests and thickets, the understory was open enough for África to search areas up to 50m from the search trail but, in elfin woodland, dense vegetation restricted her movements to <20m from the search trail. Steep slopes and drop-offs (60°-90°) were present at highest elevations on Morne Micotrin, Morne Anglais, Morne Nicholls, Morne aux Diables, and Morne Diablotin: for her safety, we prevented África from searching these slopes. Search effort across all sites totaled 59km, 219ha, and 39.7 dog-hours.

África marked three locations on Morne Micotrin (antenna trail, one location in mountain thicket, and two locations in elfin woodland; Photograph 3), and one location on Morne Diablotin (in montane rainforest; Photograph 4) (Figure 2). We thoroughly inspected the possible burrows with flashlights, an endoscope, and by playing Black-capped Petrel calls but could not confirm petrel activity. We did not find feathers or feces. We deployed cameras at all three locations on Morne Micotrin. Cameras were inspected on 17 March 2023: no petrels were observed.

4.3 Marine surveys

A petrel was observed from the ferry between Martinique and Guadeloupe on 8 February 2023 (Sea McKeon). This is the only Black-capped Petrel observed during this expedition.

On 15 February, we left the dock at 13h30 and returned by 19h00. The weather was challenging, with Beaufort 3-5 seas and SE to NE winds. At 14:30 we observed two Magnificent Frigatebirds (one female, one male) and one Red-footed Booby, which were foraging. We approached the birds and attempted to attract them using chum and popcorn coated with cod liver oil. The birds showed little interest in the chum and we continued southwards while dispersing oil-coated popcorn. By 16h45, we turned back due to deteriorating weather and lack of seabird activity. During the whole trip, in addition to the two Magnificent Frigatebirds and single Red-footed Booby mentioned above, we only observed one *Hydrobates sp.* and one unidentified shearwater. No petrels were observed. Effort totaled 17 hours (three observers during 5.6 hours) and 85km.

The boat captains knew of the booby, tropicbird, and pelican shown on the laminated sheet but seemed to mistake the Black-capped Petrel for a tern. Although they mentioned seeing the petrel at sea between Dominica and Marie-Galante (Guadeloupe), we suspected that they were

mistaking when they mentioned that the bird landed on their fish-aggregating device, and that it was of a much smaller size than a petrel: we suspect that they confused the petrel with Bridled/Sooty terns.

5 Discussion

Despite ample audio-visual effort near potential courtship or breeding areas, and dog searches near these areas, we did not observe, hear or confirm nest sites of Black-capped Petrels at any of the surveyed locations (Figure 1). Therefore, if a population of Black-capped Petrels remains on Dominica, its size must be small and/or spatially limited to areas not surveyed during recent efforts.

The methodology we used for audio-visual surveys this year compares to the thermal effort conducted in 2022 (Satgé & Millischer 2022). A single Black-capped Petrel was observed during that effort, above the western slopes of Morne Micotrin, and, this year, most of our effort was concentrated on Morne Micotrin. The 2022 survey locations were located at lower altitudes than this year, typically well below the cloud line. This year, we chose locations at higher altitudes because they were nearer dog search areas and they would allow direct audio-visual observations at courtship areas, or near breeding locations. Expect for two nights at (Morne Anglais and Morne aux Diables), low clouds limited the efficacy of thermal binoculars. Nevertheless, audio conditions were reasonable: although the low-medium audibility caused by winds (Table 2) prevented us from hearing potential calls at long distances (~2km), petrels could still have been heard calling from short distances (<500m: JGS, personal observation). Therefore, although we may have visually missed petrels flying nearby in the fog, we are confident that we did not miss calling petrels during audio-visual surveys.

Our search dog África marked three locations along the trail to the Micotrin antenna, and one location near the trail to Morne Diablotin, as possible Black-capped Petrel nest sites. Further visual investigation and monitoring with camera traps did not confirm use by petrels. These were the only locations marked by África. There and at other searched areas, her searching efficacy was greatly limited by dense vegetation. By hiding objects scented with *Pterodroma* odor, we could confirm that África could pick up those scents in dense habitat but her movements were highly hindered. For safety, we did not let África search steep slopes, such as those near the summits of Morne Anglais, Morne Nicholls or Morne aux Diables, though she did not show particular interest in those slopes either. However, it is likely that wind updrafts would have brought petrel smells to search trails on ridges above those slopes: we are confident that, were petrels nesting in those steep slopes, África would have showed interest, and we would have heard or seen petrels.

In Satgé & Millischer (2022), we recommended that future audio-visual surveys take place during a calendar period when petrel flight activity is more intense: nuptial visit in October or egg-laying period in early December (Table 3 in Satgé & Millischer 2022). During this 2023 effort, we instead decided to survey at the onset of suspected egg hatching (Figure A1) because this is the optimal period for dog searches. Indeed, although dogs may pick up scents left by petrels travelling on the ground to and from their nest site, the scent is more prevalent and remains for longer when petrels are present inside the burrow. Moreover, we chose a period just past the full moon, when *Pterodroma* courtship activity is higher. Therefore, by choosing a study period in early February, we optimized both the dog search and the audio-visual survey.

6 Recommendations for future conservation work

Given the limited results of the 2022 and 2023 surveys, it is urgent to locate Black-capped Petrel nesting areas on Dominica, to assess any threat that may affect a remaining population. At the moment, we do not recommend intensifying foot or dog searches: Dominica offers large expanses of suitable nesting habitat that has not been searched but searches through this available habitat may inefficiently use the limited monetary and human resources available. Thus, to maximize opportunities to locate nests, it appears necessary to prioritize conservation efforts.

In Dominica, we recommend that the following activities be considered for Black-capped Petrel conservation work:

- **Improve or create trails** to areas that could not be surveyed during recent radar and audio-visual efforts: priority areas include Morne Trois Pitons (from trailhead to the mountain peak), Morne Watt, and the top part of Morne aux Diables.
- **Deploy acoustic recorders** at the top of Morne Trois Pitons and near the top of Morne Watt, during the nuptial visit of October/November and during the breeding period from December to May. We suggest that acoustic recorders can also be deployed during other conservation and research fieldwork in suitable mountainous habitat (amphibian and reptile conservation, geothermic assessments, etc.)
- **Outreach to guards and workers** at any large construction site near suitable Black-capped Petrel habitat (for example in Laudat, Middleham Falls hotel complex, Sugar Loaf power station). Construction sites that are lighted at night can attract adults and fledglings. It is important that guards know what petrels look like, what they should do, and who they should contact in the event of a petrel grounding. Such information is very important to help locate nearby breeding areas
- **Sea-watch surveys** from vantage points near suspected flyways (e.g. offshore Roseau; Grand Bay; mouths of Layou, Pichelin, Rosalie, Castle-Bruce, Hampstead, Manicou,

Porthsmouth, or Coulibistrie rivers), from 16h00 to dusk. Black-capped Petrels are readily observed at that time from coastal areas near breeding areas on other islands.

- **New surveys of human communities** near potential nesting areas, to gather information on where petrel hunting occurred in the past, if petrel calls have been heard, and to understand any human/petrel interactions that may occur.
- **Outreach marine researchers**. Dominica nationals are involved in marine mammal research and their at-sea work is likely to take place in areas also used by Black-capped Petrels. It would be very valuable to know if petrels are observed in pelagic areas offshore Dominica.

Finally, we also recommend providing Black-capped Petrel outreach lesson plans to primary school, high school, and/or college aged youth (optimally, 1 lessons per month, from January to May). Educational material may be obtained from the International Black-capped Petrel Conservation Group. During the nuptial visit of October/November and during the breeding period from December to May, college students could easily and safely do audio surveys at Boeri Lake. At this location, courtshipping petrels on Micotrin or Trois Pitons could be heard in good weather conditions.

Additionally, we recommend to conduct marine surveys of potential Black-capped Petrel hotspots at fishing or whale-watching areas near Dominica and Guadeloupe (where a petrel population is suspected to nest, Wheeler et al. 2021). For example, marine mammal ecologists who work on the Dominica Sperm Whale population (*Physeter macrocephalus*) may encounter Black-capped Petrels during their fieldwork at sea. Locating foraging and/or congregating areas is a first step towards deploying remote tracking devices on petrels, a method that proved successful in capturing Black-capped Petrels at sea (Satgé et al. 2022) and can provide robust information on nesting areas in Dominica and Guadeloupe (Raine et al. 2022).

7 Note on power line blueprint

During this effort, it has come to our attention that power lines will be built between geothermal plants in Laudat and an electrical plant near Portsmouth (SugarLoaf electrical plant). These power lines will follow a large portion of the western coast of the island and cross most major rivers. Rivers typically act as flyways for Black-capped Petrels flying back to breeding sites at dusk (Brown 2015, Brown 2020) and this development could potentially become a major threat to remaining petrels on Dominica. On Kauai (Hawaii), power lines surrounding the island have been in big part responsible for the extreme decrease of the local

Pterodroma and *Puffinus* populations (Raine et al. 2017). These nocturnal seabirds fly at high speed back to breeding sites (>40 km/h) and can fail to see power lines cutting across their flyways. When multiple power lines are placed vertically, they effectively form a fence across the flyway. Collision with power lines can cause direct mortality or cripple birds, which then have very low chances of survival. Given that petrels come back almost annually during dozens of years to breed on the island and use river flyways multiple times a year during the breeding season, even a very low chance of colliding with a powerline during a single flight may result in an almost certain collision during a lifetime. Therefore, given the suspected low numbers of petrels on Dominica and their high risk of collision with power lines, any direct or indirect mortality could greatly affect the species' viability.

Here, we make recommendations to monitor, reduce, and mitigate the impact of power lines on the Dominica Black-capped Petrel population.

Monitoring: To estimate exposure and vulnerability, it is necessary to confirm the number of petrels using each flyway, and flight height at powerline crossing sites. Therefore, before the power lines are built, we recommend that stakeholders implement monitoring of affected petrel flyways using radar and thermal vision at future powerline crossing sites. Once power lines are built, we recommend additional monitoring to assess the level of collision.

Reducing: Measures can be taken during the construction phase, which will be more efficient and cost-effective than trying to retrofit power lines once they have been installed. A number of reduction measures exist but using diverters and top line removal reduce about 90% of collisions. Diverters attached to powerlines (reflective, or with LED) allow petrels to see the power lines and to avoid them. Removing the top line, which is usually used to deflect lightning strikes but causes most collisions, can greatly decrease the number of collisions. If multiple lines are going to be used, horizontal line placement (where lines are placed side by side horizontally) can also reduce collisions. Indeed, vertical line placement (when the lines are placed one above the other) creates an invisible fence that increases the risk of collision.

Mitigating: Stakeholders should be prepared to fund conservation measures to mitigate the effects of this threat on the petrel population. These mitigations should include (but not be limited to) protection of flyways and suspected breeding areas, searches for breeding sites, predator control, colony restoration, as well as outreach and environmental education.

8 Data sharing

GIS data on survey locations and search trails and areas is provided as a .zip file (*2023_Diablotin_search_GIS.zip*).

9 Acknowledgements

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Table 1. Details of audio-visual survey locations used during the February 2023 effort.

Survey station	Latitude (°)	Longitude (°)	Altitude (m)	Nearest potential courtship area	Max. distance to courtship area (m)
Boery Lake	15.35162	-61.32035	865	Micotrin; Trois Pitons (southeast slopes)	750; 1500
Micotrin Antenna	15.34269	-61.31844	1200	Micotrin	200
Micotrin Northwest	15.34789	-61.32705	935	Micotrin	900
Morne Anglais	15.28511	-61.33180	1095	Morne Anglais	450
Morne Nicholls	15.31570	-61.30411	950	Morne Watts	1000
Freshwater Lake	15.34098	-61.30380	970	Morne Micotrin	1600
Mosquito Mountain	15.48225	-61.37791	995	Morne Diablotin (east slopes)	500-2000
Morne aux Diables	15.61245	-61.42946	615	Morne aux Diables	400
Morne Diablotin	15.50499	-61.40330	1365	Morne Diablotin (west slopes)	1000

Table 2. Details of audio-visual observation effort during February 2023.

Survey station	Date	Start time	End time	Survey duration (h)	Weather	Visibility	Audibility	Moonrise	Number of observers	Effort	Results
Boery Lake	6-Feb-2023	19:00	20:00	1:00	Light wind; fog; rain showers	Low	Medium	18:59	2	2.00	0
Micotrin Antenna	7-Feb-2023	18:30	20:15	1:45	Strong wind; fog; rain showers	Low	Medium	19:47	2	3.50	0
Micotrin Northwest	8-Feb-2023	18:00	20:45	2:45	Strong wind; fog; rain showers	Low	Medium	20:35	4	11.00	0
Morne Anglais	9-Feb-2023	18:15	21:00	2:45	Light wind; light fog; no rain	Good	V. good	21:22	6	16.50	0
Morne Nicholls	10-Feb-2023	18:10	20:00	1:50	Strong wind; fog; rain showers	Low	Low-Medium	20:11	3	5.50	0
Freshwater Lake	11-Feb-2023	17:30	20:30	3:00	Light wind; fog; light rain	Medium	Medium	23:00	3	9.00	0
Mosquito Mountain	12-Feb-2023	19:50	21:30	1:40	Light wind; fog; rain showers	Low	Low-Medium	23:55	4	6.67	0
Morne aux Diables	13-Feb-2023	18:30	20:30	2:00	Light wind; no fog; no rain	Excellent	Excellent	-	3	6.00	0
Morne Diablotin	16-Feb-2023	17:30	20:00	2:30	Strong wind; fog; rain showers	Low	Low-Medium	-	3	7.50	0
									Total (h):	67.67	
									Total Micotrin (h):	25.50	

Table 3. Details of search effort during February 2023.

Search area	Habitat *	Date	Start time	End time	Distance searched (km)	Area searched* (ha)	Effective search duration (h)	Results
Freshwater Lake	Elfin woodland	6-Feb-2023	17:30	18:30	4.78	19.46	1.00	0
Boeri Lake	Elfin woodland	6-Feb-2023	18:30	20:30	2.39	9.9	1.00	0
Micotrin Antenna	Elfin woodland	7-Feb-2023	16:00	21:30	3.32	8.72	3.75	1 marked location; no petrels
Micotrin Antenna	Elfin woodland	8-Feb-2023	10:00	13:00	2.21	8.85	3.00	1 marked location; no petrels
Micotrin Northwest	Montane rainforest (low elevations); Mountain thicket (intermediate elevations); Elfin woodland (high elevations)	8-Feb-2023	16:00	22:15	6.01	20.1	3.50	0
Morne Anglais	Mountain thicket (low elevations); Elfin woodland (high elevations)	9-Feb-2023	16:30	23:00	4.42	17.42	3.75	0
Morne Nicholls	Montane rainforest (low elevations); Mountain thicket (intermediate elevations); Elfin woodland (high elevations)	10-Feb-2023	16:00	21:45	8.08	34.4	3.92	0
Micotrin Antenna	Elfin woodland	11-Feb-2023	12:30	14:30	5.39	21.55	2.00	1 marked location; no petrels
Freshwater Lake	Elfin woodland	11-Feb-2023	17:15	20:45	2.39	9.9	0.50	0
Mosquito Mountain	Montane rainforest (low elevations); Mountain thicket (intermediate elevations); Elfin woodland (high elevations)	12-Feb-2023	15:45	23:55	7.3	28.44	6.50	0
Morne aux Diables	Secondary rainforest (low elevations); Mountain thicket (high elevations)	13-Feb-2023	15:45	22:00	3.66	14.64	4.25	0
Morne Diablotin	Montane rainforest (low elevations); Mountain thicket (intermediate elevations); Elfin woodland (high elevations)	16-Feb-2023	14:00	23:00	8.81	25.18	6.50	1 marked location
				Total:	58.76	218.56	39.67	

* Following Rupp et al. (2016)

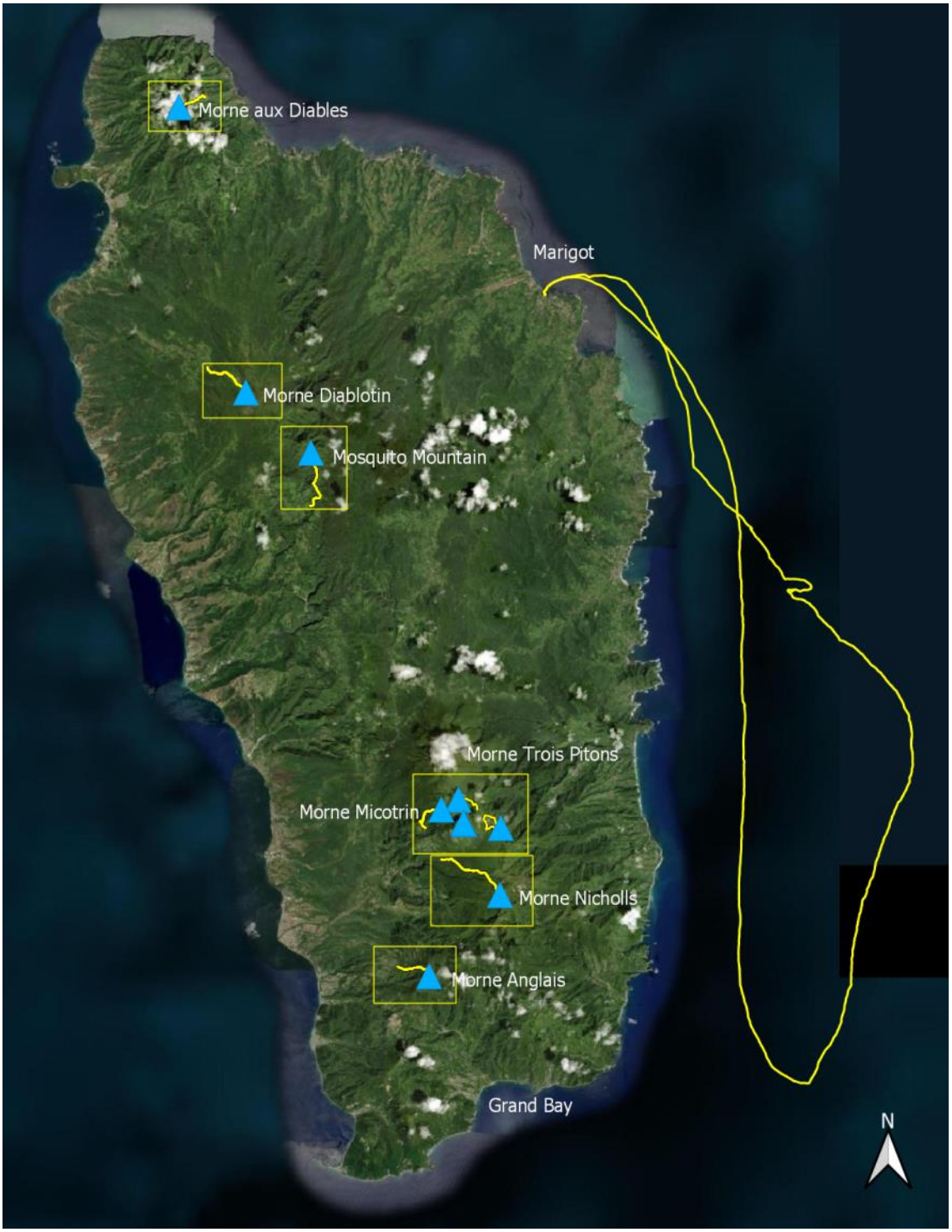
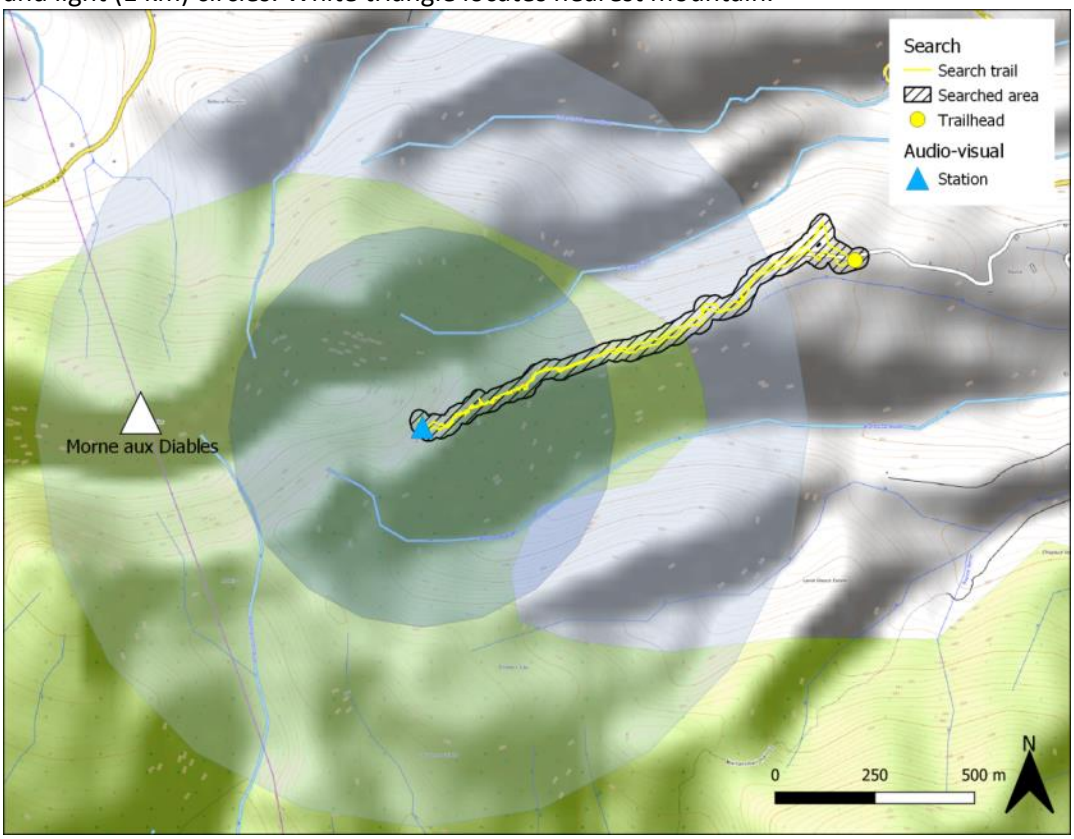


Figure 1. Areas surveyed during the February 2023 search effort.

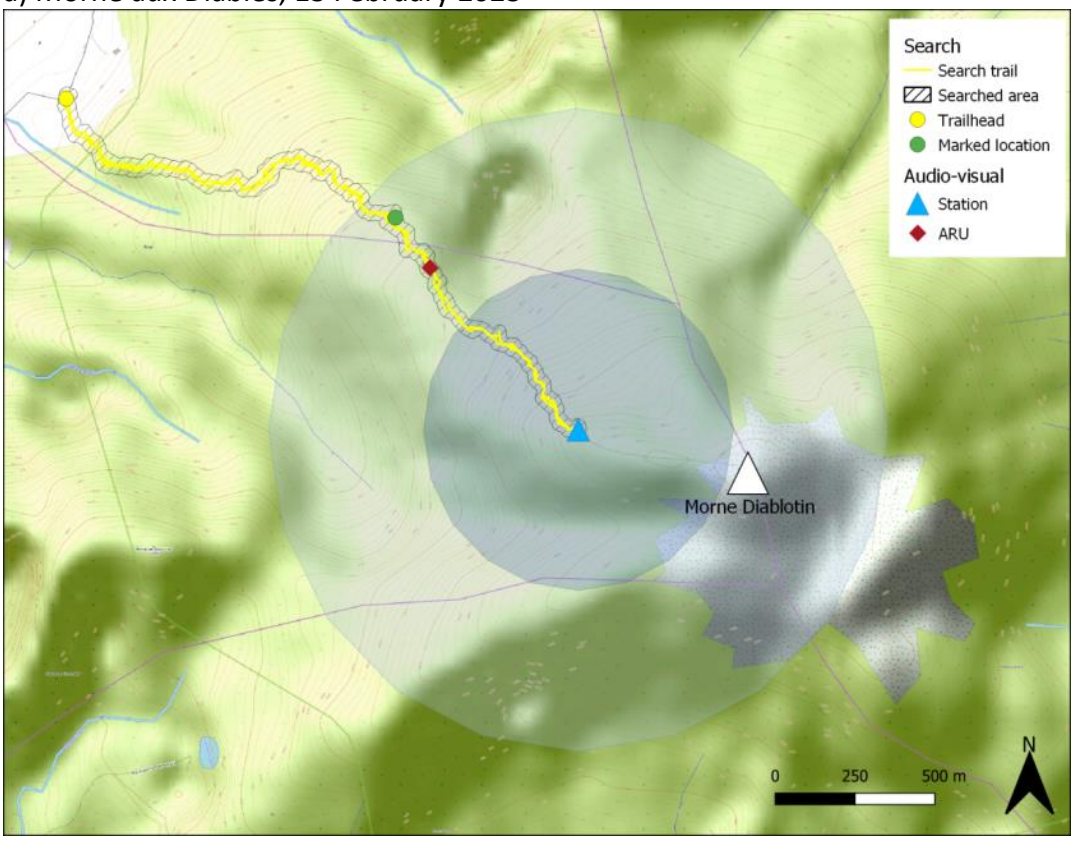
Triangles indicate survey locations. Yellow lines indicate search areas.

Figure 2. Areas surveyed and searched during the February 2023 effort.

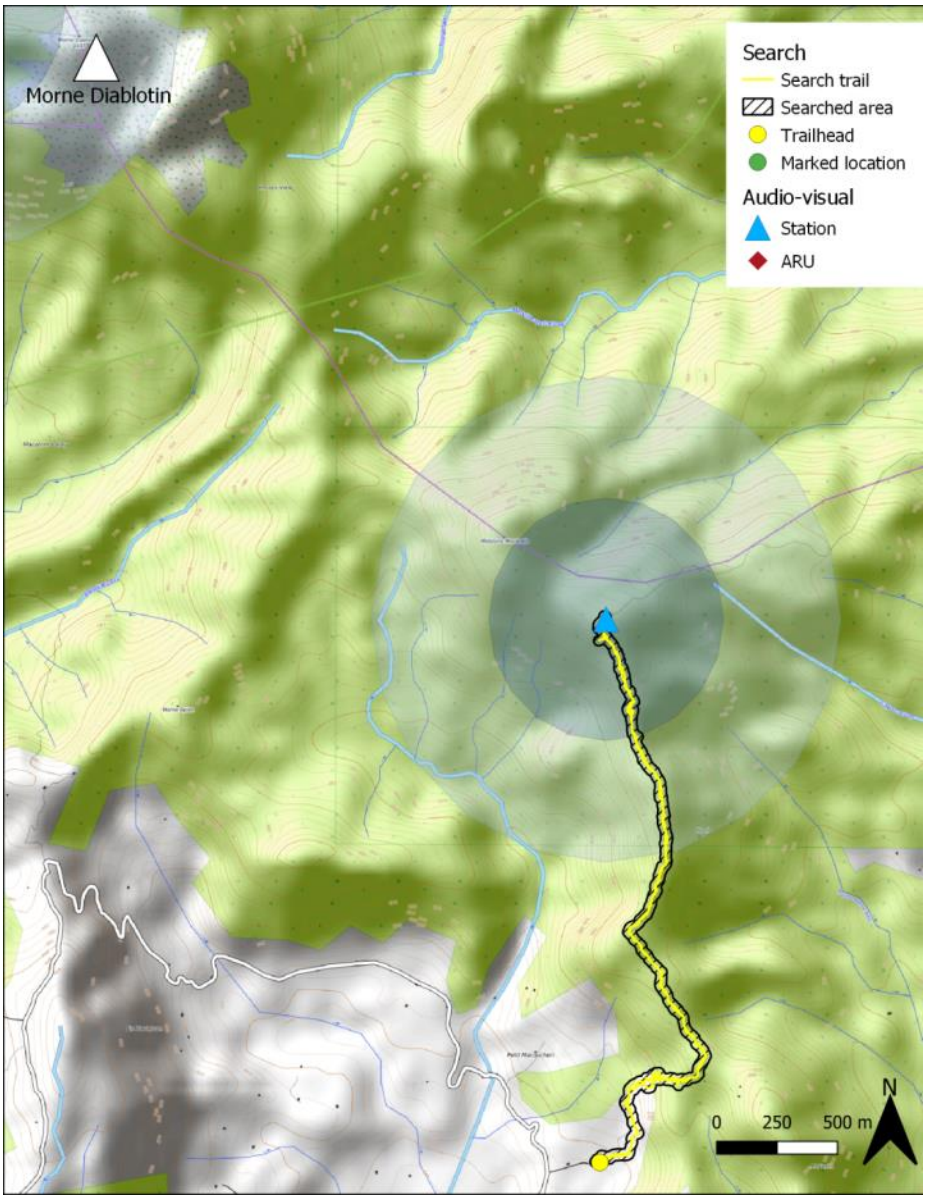
Areas are listed from north to south. Hearing distance for petrel calls are represented as dark (500 m) and light (1 km) circles. White triangle locates nearest mountain.



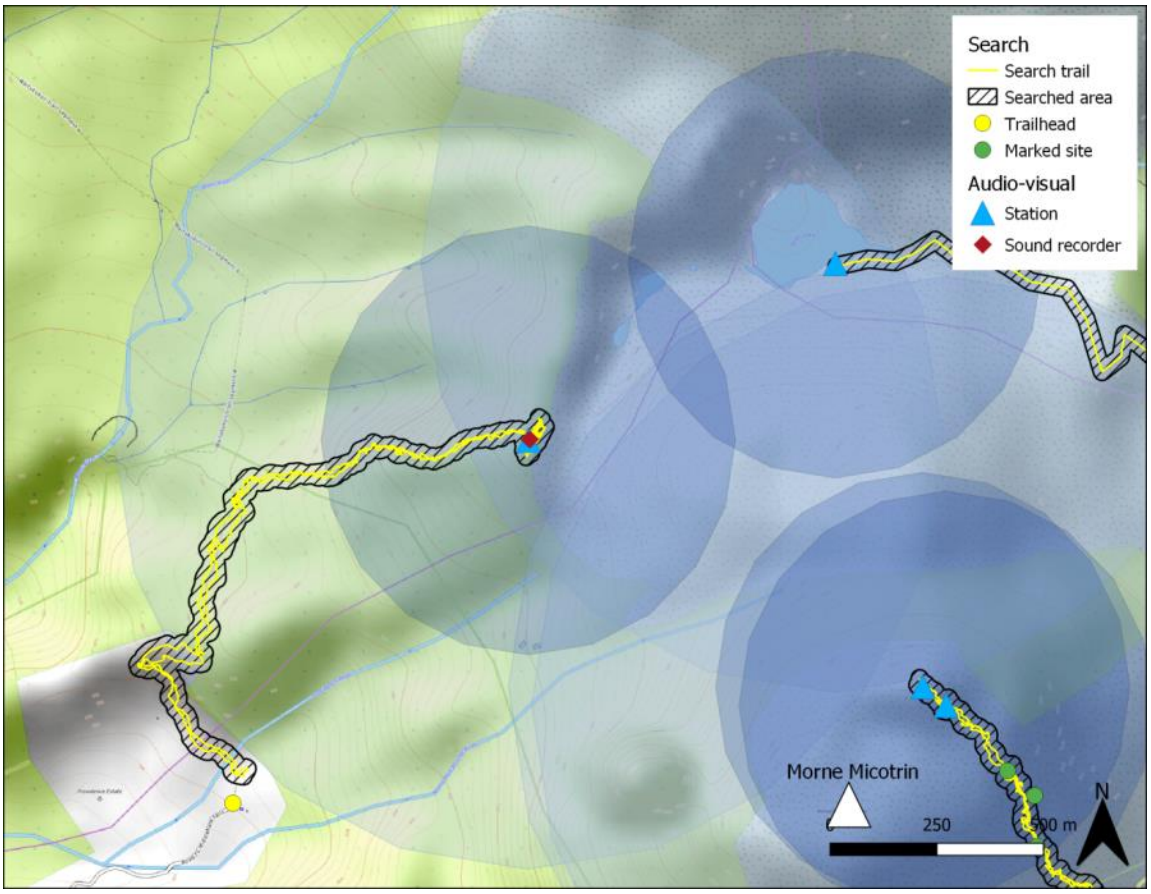
a) Morne aux Diables, 13 February 2023



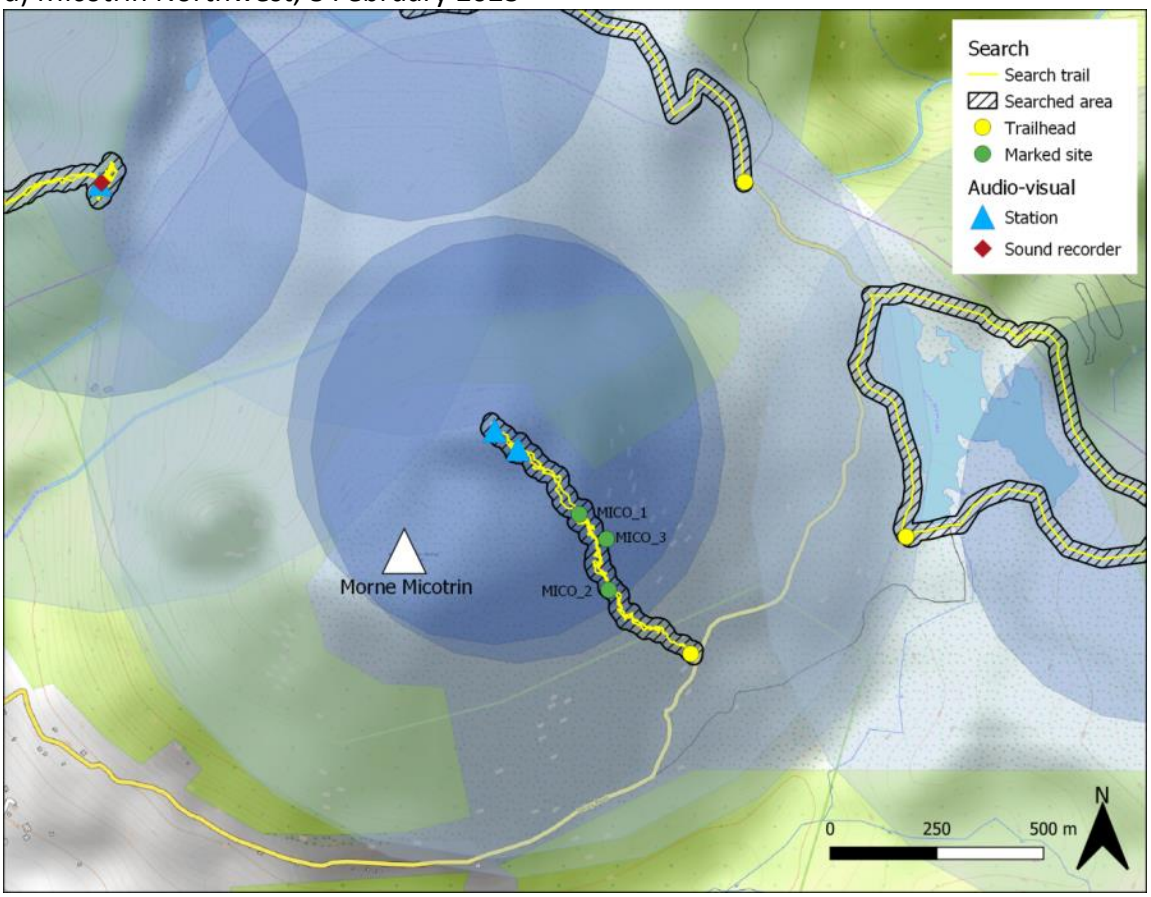
b) Morne Diablotin, 16 February 2023



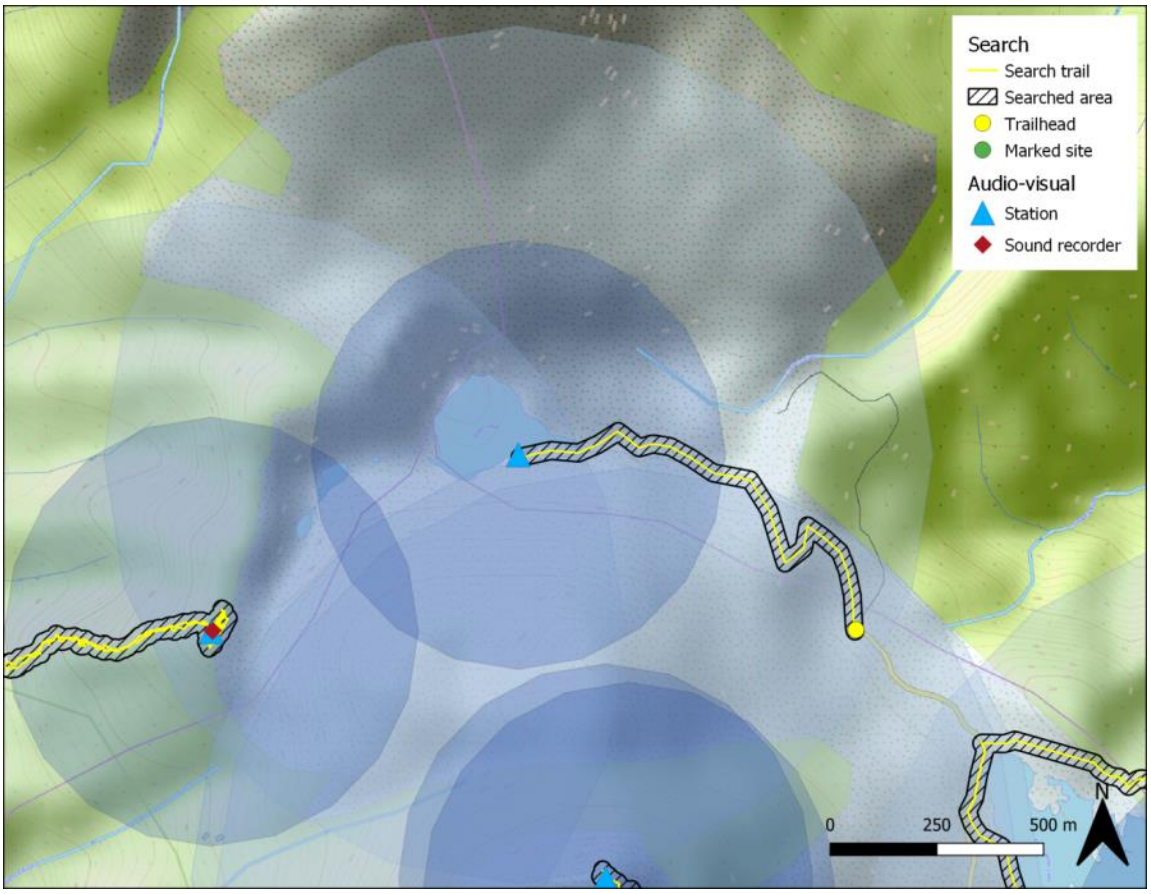
c) Mosquito Mountain



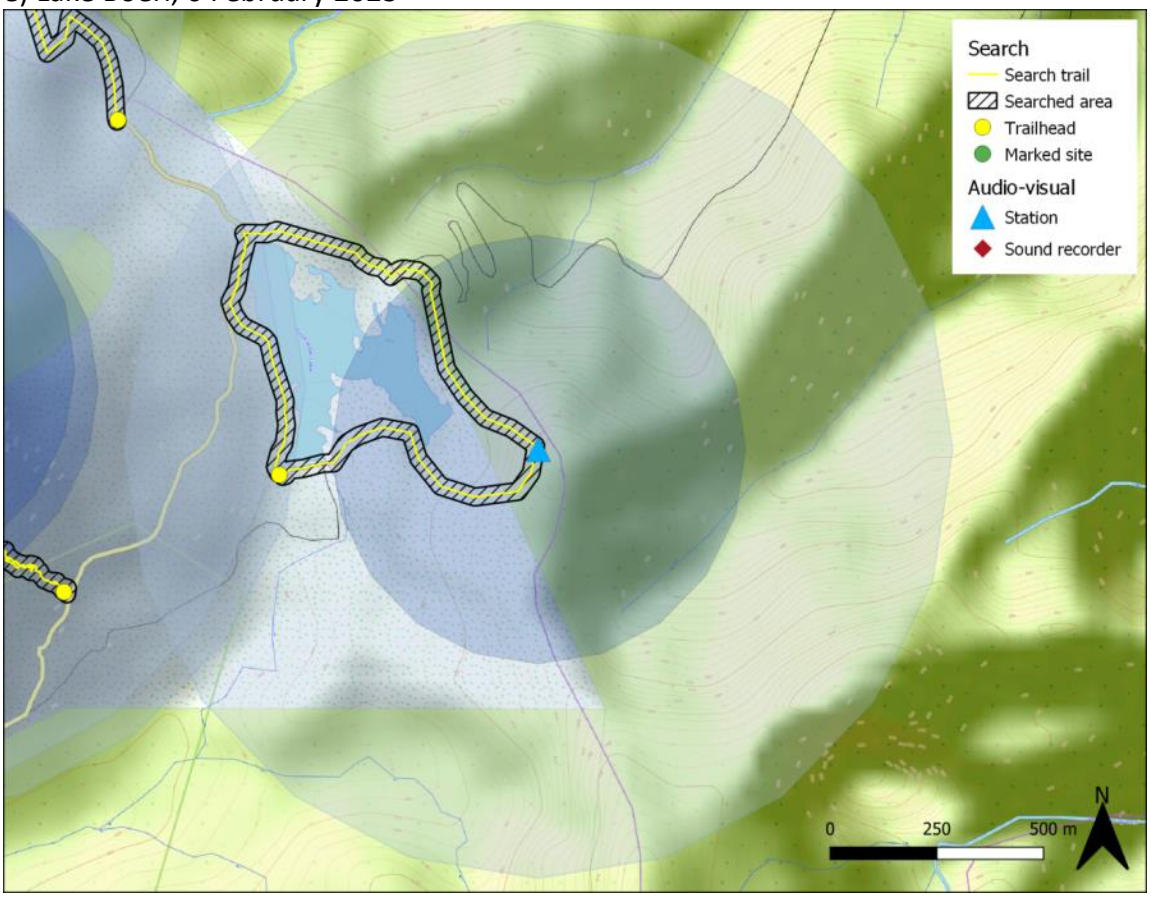
d) Micotrin Northwest, 8 February 2023



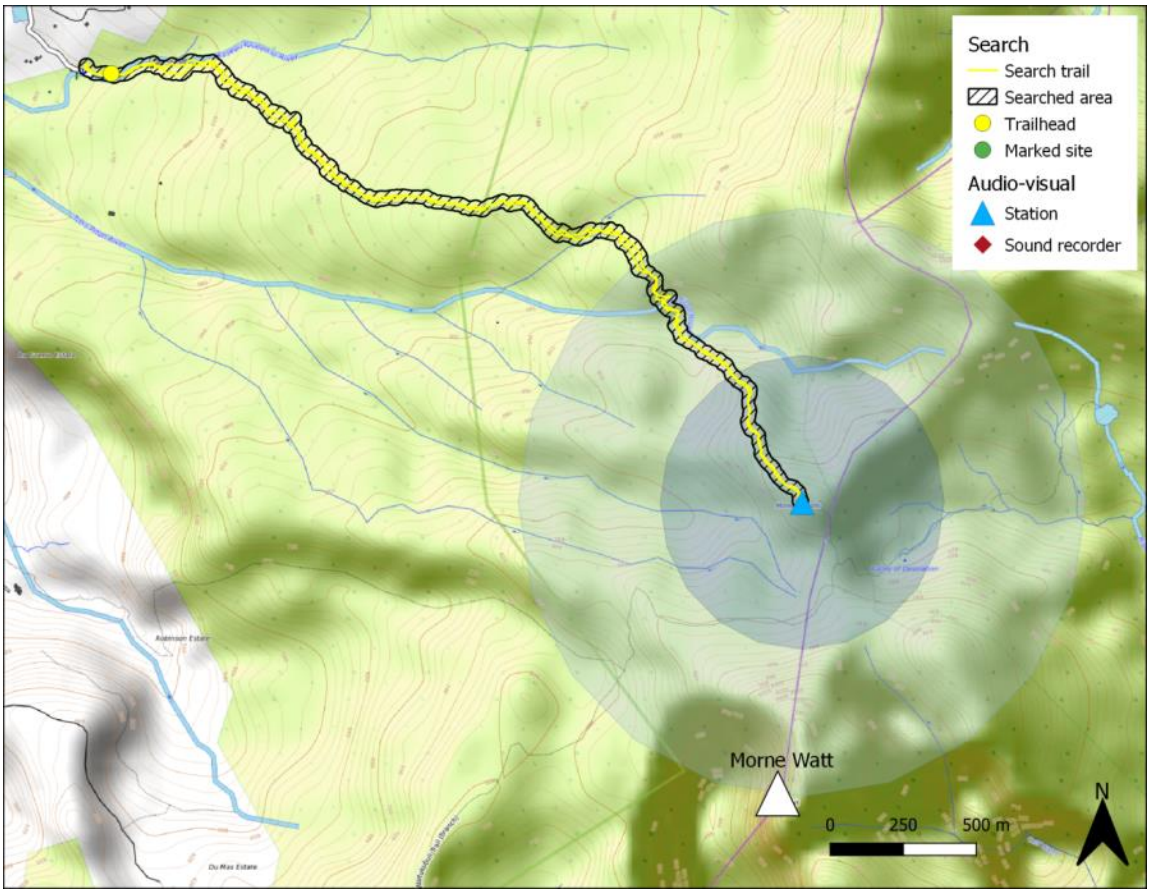
d) Micotrin antenna, 7, 8, 11 February 2023



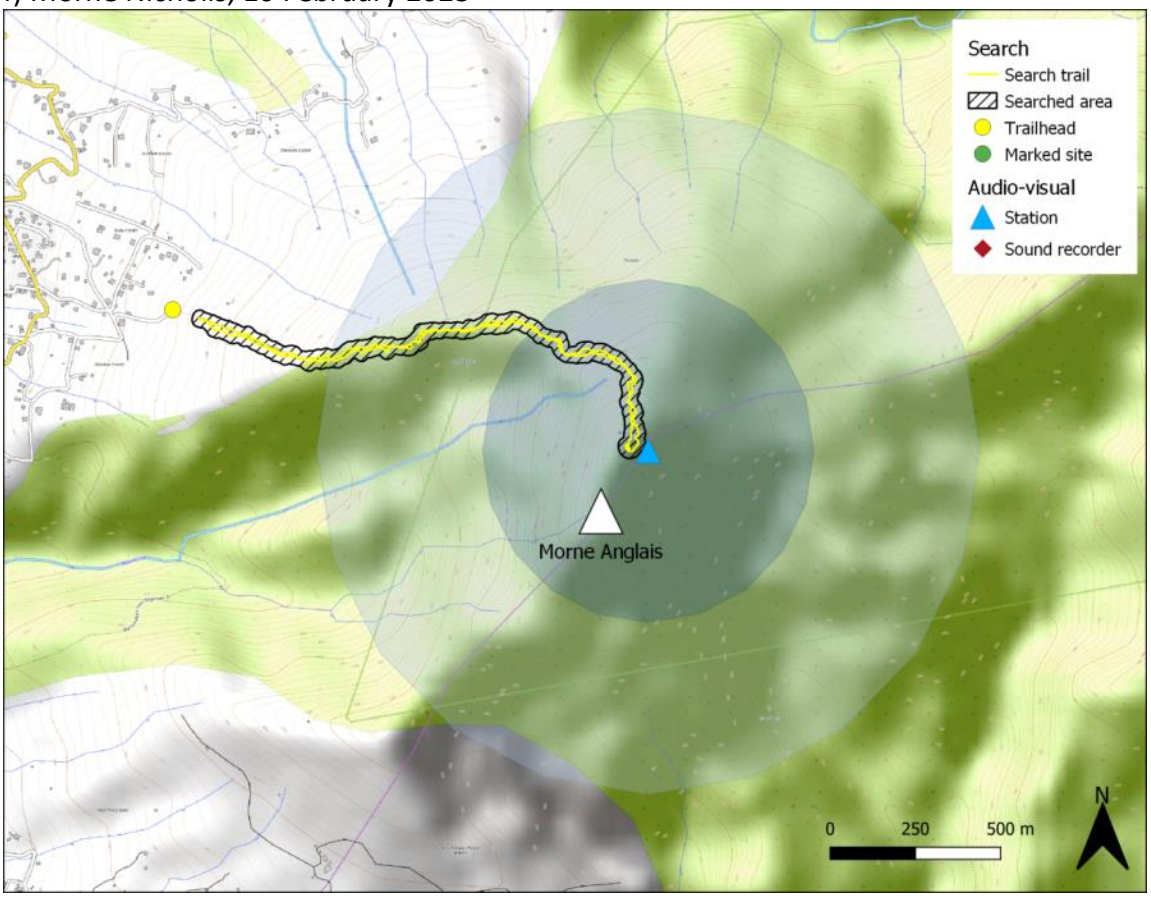
e) Lake Boeri, 6 February 2023



e) Freshwater Lake, 11 February 2023



f) Morne Nicholls, 10 February 2023



g) Morne Anglais, 9 February 2023

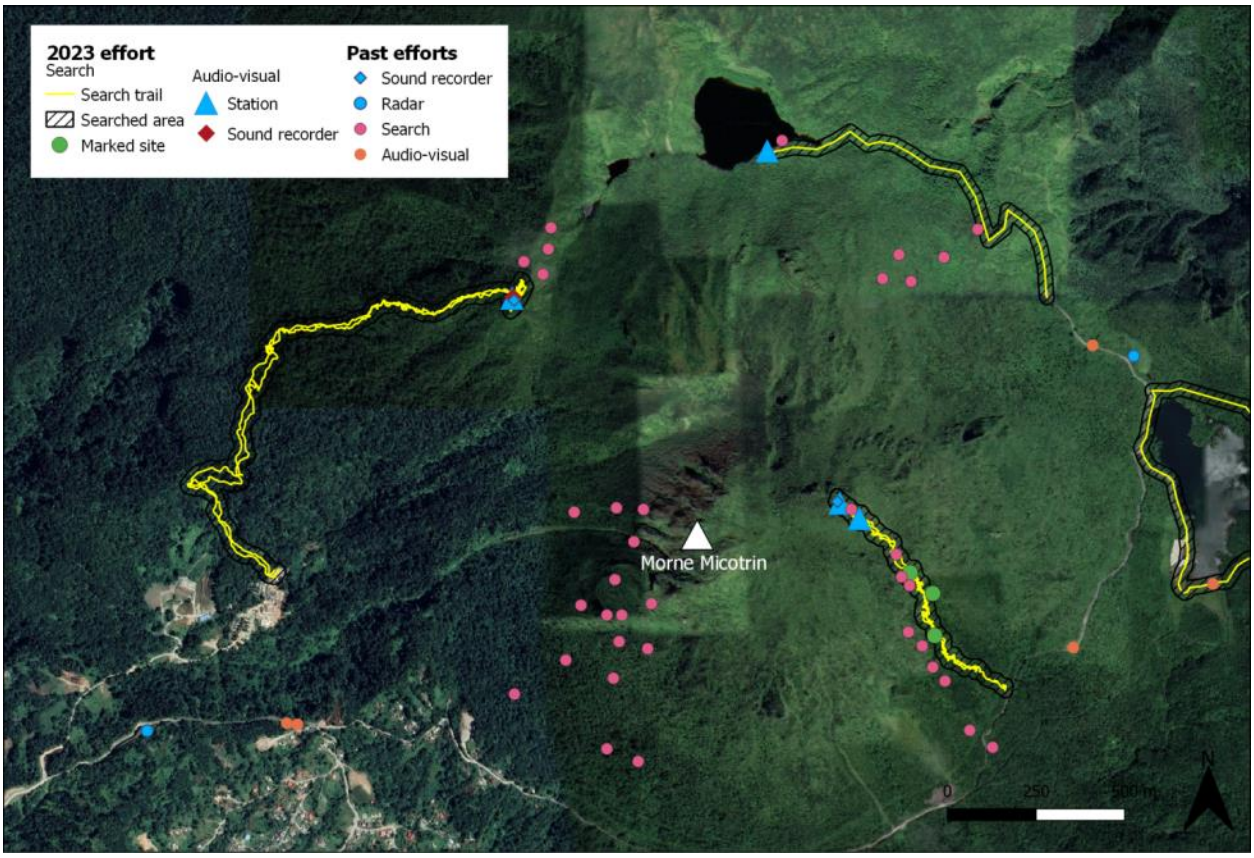


Figure 3. Conservation activity in the Morne Micotrin area of Dominica.

Past efforts include deployment locations for acoustic recording units in 2015 and 2020, radar locations during 2015 and 2020, searches during 2016.



Photograph 1. Search dog África in front of the team's vehicle, during the February 2023 effort.



Photograph 2. Yvan Satgé interviewing boat captains about seabirds, during the 15 February boat trip.



Photograph 3. Cavity marked by search dog África as potential Black-capped Petrel burrow, Micotrin antenna trail, February 2023.



Photograph 4. Cavity marked by search dog África as potential Black-capped Petrel burrow, Morne Diablotin trail, February 2023.



Photograph 5. Stephen Durand, Yvan Satgé, and Jacob González-Solís upon reaching the survey site on Morne Diablotin, and starting the audio-visual survey, 16 February 2023.



Plate 1. Plate used during interviews with people living near suspected Black-capped Petrel nesting areas, and boat captains.

Appendix: Phenology diagram of Diablotin Black-capped Petrel

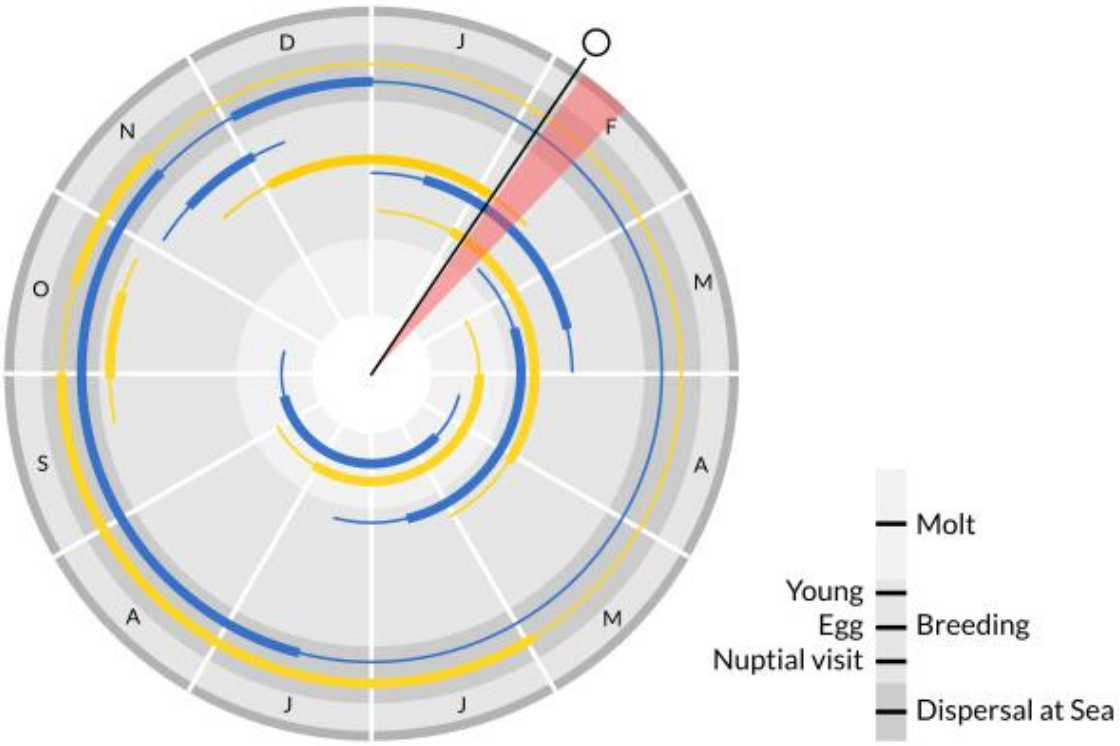


Figure A1. Phenology diagram of Diablotin Black-capped Petrel.

Phenology of dark form petrels is shown in blue; phenology of light-form petrels is shown in yellow. Red shading shows the survey period for this report. Black line shows the date of the full moon. Adapted from Satgé et al. 2023.