

Black-capped Petrel (*Pterodroma hasitata*) Conservation Update and Action Plan

Conserving the Diablotin



Jennifer Wheeler, Yvan Satgé, Adam Brown, James Goetz,
Brad Keitt, Hannah Nevins, Ernst Rupp

*Qu'êtes-vous devenues, oiseaux mystérieux,
Qui quittiez la montagne au soir, et dont les ailes
Dansaient toute la nuit sur les vagues rebelles
Jusqu'à l'heure où l'aurore empourpre les flots bleus?*

Aux Diablotins - Daniel Thaly (1879-1950)

*What has become of you, mysterious birds,
Who soared off the mountain at dusk, your wings
Dancing through the night above the defiant waves
Until the dawn turned the blue surf crimson?*

*To the Diablotins
Translation by Elizabeth Paravisini-Gebert*

INTERNATIONAL CONSERVATION GROUP AND PLANNING TEAM

The **International Black-capped Petrel Conservation Group** is a collaborative association of organizations and individuals with a shared interest in the conservation of species across its range. The working group coalesced in 2008 as a forum for members to share information and generate a comprehensive and cooperative conservation plan. The first version of the Conservation Action Plan for the Black-capped Petrel (Goetz et al. 2012) was produced following a 2010 workshop held in Santo Domingo, Dominican Republic.

The working group operates in collaboration with the regional organization, BirdsCaribbean, to take advantage of its international reach and influence. However, members are voluntary and self-identified, and democratically direct themselves. Group notes and newsletters, as well as unpublished field reports, are archived at <https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg/>

Naturally, some members of the International Black-capped Petrel Conservation Group are more active, especially those involved in research, monitoring and conservation interventions in the field. Of these, a subset committed to a course of weekly conferences from February to September 2020 to revisit and refine the Conservation Action Plan. This core planning team signed a Memorandum of Understanding in which they agreed to share data openly and freely to the benefit of greater understanding and conservation action for the species.

2020 Core Planning Team

Adam Brown: Environmental Protection in the Caribbean - USA/Haiti
James Goetz: Cornell University, Dept. of Nat. Res. & Env. - USA/Haiti
Brad Keitt: American Bird Conservancy - USA
Hannah Nevins: American Bird Conservancy - USA
Ernst Rupp: Grupo Jaragua - Dominican Republic
Yvan Satgé: Clemson University - USA/France
Jennifer Wheeler: BirdsCaribbean - USA

Collaborators and Reviewers

Francoise Benjamin (JACSEH), Frank Cézilly (Caribea Initiative, Université de Bourgogne), Antoine Chabrolle (Muséum National Histoire Naturelle), Dean Demarest (US Fish and Wildlife Service), Jérôme Dubos (Université de la Réunion), Stephen Durand (Forestry, Wildlife and Parks Division – Dominica), Abram Fleishman (Conservation Metrics, Inc.), Hector Garrido (Grupo Jaragua), Christopher Haney (Terra Mar Applied Sciences, LLC), Steve Holmer (American Bird Conservancy), Nick Holmes (The Nature Conservancy), Anderson Jean (Jeunes en Action pour la Sauvegarde de l'Écologie en Haïti), Patrick Jodice (US Geological Survey/Clemson University), Robby Kohley (Pacific Rim Conservation), Yolanda Leon (Grupo Jaragua), Milmer Martinez Vergara (Plant With Purpose), Matthew McKown (Conservation Metrics, Inc.), Pamela Michael (Clemson University), Brian Patteson (Seabirding), Carmen Placencia León (BioECO), Yasit Segovia (BioECO), Ted Simons (North Carolina State University), Caleb Spiegel (US Fish and Wildlife Service), Kate Sutherland (Seabirding), Machel Sulton (Forestry, Wildlife and Parks Division – Dominica), Andrea Thomen (Grupo Jaragua), Nicasio Viña Dávila (Corredor Biológico del Caribe), Shaye Wolfe (Center for Biological Diversity).

Field Technicians

René Jeune, Tinio Louis, Lionel Raymond, Jonel Bazil - Haiti
Pirrín Jairo Matos, Gerson Feliz, José Luis Castillo - Dominican Republic

Suggested Citation: Wheeler, J., Satgé, Y., Brown, A., Goetz, J., Keitt, B., Nevins, H. and Rupp, E. 2021. Black-capped Petrel Conservation Update and Action Plan. Conserving the Diablotin. International Black-capped Petrel Conservation Group. <https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg/>

Designer: Debra Reynolds (USFWS)

Cover Photo Credit: Kate Sutherland



TABLE OF CONTENTS

INTRODUCTION

<u>Vision</u>	2
<u>Mission</u>	2
<u>A Decade of Progress</u>	2
<u>Purpose of the Plan Update</u>	3
<u>Use of Conservation Standards</u>	3

CONSERVATION UPDATE

<u>Current Species Overview</u>	5
<u>Breakout: Habitat Suitability Modeling</u>	8
<u>Targets for Planning</u>	11
<u>Threats Identification</u>	12
<u>Threats Presentation</u>	13
<u>Breakout: Seabird Populations Viability Analysis Model</u>	18
<u>Population and Habitat Goals</u>	21
<u>Breakout: Petrel Modeling with Radar</u>	26

CONSERVATION PLAN

<u>Development of Conservation Strategies</u>	29
<u>Strategy Selection</u>	30
<u>Strategy Rating</u>	30
<u>The Need for Multiple Strategies</u>	31
<u>Presentation of Strategies</u>	31
<u>Strategy 1: Build In-country Capacity</u>	33
<u>Strategy 2: Locate and Characterize Nest Sites</u>	36
<u>Strategy 3: Explore Restoration Methods</u>	37
<u>Strategy 4: Reduce Predator Pressure</u>	39
<u>Strategy 5: Reduce Collisions and Groundings</u>	41
<u>Strategy 6: Support Community Development in Boukan Chat</u>	43
<u>Breakout: Community Development</u>	45
<u>Strategy 7: Undertake Socio-economic Scoping Study in La Visite</u>	48
<u>Strategy 8: Engage DR Government in Park Oversight</u>	50
<u>Strategy 9: Address Threats At Sea Through Advocacy</u>	53

<u>CONTINUING THE PROJECT CYCLE</u>	56
-------------------------------------	----

<u>REFERENCES</u>	59
-------------------	----

APPENDIX

<u>1. Report on Working Group Activities 2012 – 2020 and Planning Process for 2021 Conservation Plan</u>	A1-65
<u>2. Site Profiles</u>	A2-71
<u>3. Threats Assessment</u>	A3-111
<u>4. Situational Analysis/Conceptual Models</u>	A4-127
<u>5. Theory of Change Results Chains</u>	A5-133
<u>6. Strategy Rating</u>	A6-145
<u>7. Information Needs</u>	A7-151
<u>8. National and International Instruments</u>	A8-155

INTRODUCTION



Kate Sutherland

INTERNATIONAL BLACK-CAPPED PETREL CONSERVATION GROUP

The individuals and organizations that make up the International Black-capped Petrel Conservation Group (IBPCG) have a shared interest in the conservation of the species across its range.

VISION

The Black-capped Petrel is flourishing throughout its range on land and at sea.

The planning horizon for this vision remains long-term (i.e., 25-50 years) given the low reproductive rate of the Black-capped Petrel species and the magnitude of threats it faces.

MISSION

While working to secure the long-term viability of the species, the IBPCG is committed to a mission that involves four principles. We will:

1. Engage with diverse stakeholders;
2. Find, conserve, and restore breeding populations in the species' range by addressing key threats on land and at sea;
3. Support the co-existence of Black-capped Petrels and people in surrounding communities; and
4. Use the best science and methods available to advance adaptive, participative, and equitable results-based management.

A DECADE OF PROGRESS

Tremendous advances in our understanding of the Black-capped Petrel (*Pterodroma hasitata*) have been made since the publication of the 2012 Conservation Action Plan (Goetz et al. 2012) by the International Black-capped Petrel Conservation Group (hereafter IBPCG) (Figure 1). That document featured an image of a chick in what was then only the second known active burrow in the world. Now, about a hundred active burrows have been located on Hispaniola, at five different sites (IBPCG 2020). Radar surveys and habitat modeling indicate they likely persist in additional areas on Hispaniola and searches are ongoing (Satgé et al. 2020). Radar surveys five years apart on the East Caribbean island of Dominica provide strong evidence of a breeding population there (Brown 2020a); preliminary radar surveys in Jamaica and Guadeloupe have produced tantalizing results (Brown 2016, Brown 2020b); and some coastal surveys off Cuba support previous suspicions of nesting there (Pointon pers. com., Plasencia León et al. 2020). Our understanding of the movements of petrels at sea has also expanded. Captured at their burrows in the Dominican Republic, three individual petrels were tracked by satellite in 2014 (Jodice et al. 2015) and three others were tracked with GPS in 2018 (Satgé et al. 2019). In 2019, 10 petrels captured at-sea off Cape Hatteras, North Carolina were tracked by satellite (Satgé et al. *In prep.*). Moreover, observations of Black-capped Petrels during seabird surveys in the northern Gulf of Mexico have led to a proposition to expand the accepted marine range for the species to include this area (Jodice et al. 2021). These studies have given us a wealth of information about marine range and foraging patterns, as well as potential exposures to marine threats.

By monitoring nests on Hispaniola, members of the IBPCG have expanded our knowledge of the natural history of the species, have been able to characterize with more specificity the nature of terrestrial threats to Black-capped Petrels, and have begun to develop and implement strategies to reduce these threats. At the main colonies along the border between Haiti and the Dominican Republic, strategies include engagement with local people (citizens, youth, park staff) to

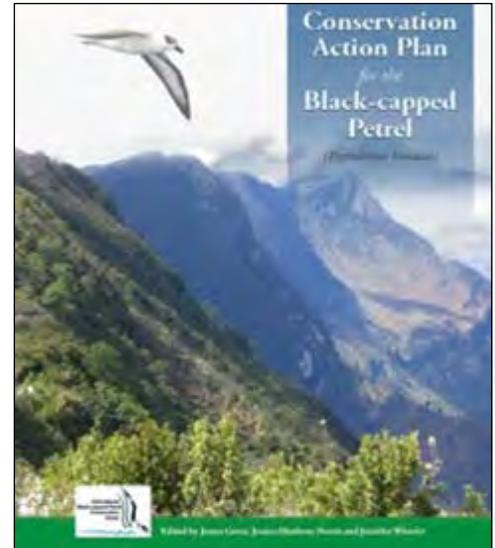


Figure 1: Cover from the 2012 Conservation Action Plan.

increase awareness and concern for the petrel, and to provide them with skills and resources to improve environmental conditions in their fields and forests. Observations of predation by introduced mammals and collisions and groundings due to light attraction have prompted preliminary predator control and public awareness activities.

The policy context for the conservation of the species has also shifted to some degree. As of 2014, the species is listed on Annex II of the SPAW Protocol to the Cartagena Convention (UNEP 2019) and in 2019 the species was proposed to be listed as Threatened under the U.S. Endangered Species Act (USFWS 2018a). The UNESCO La Selle-Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve was created in 2017, spanning the Haiti/Dominican Republic border and encompassing known nest sites there (UNESCO 2019).

All of this progress has been challenged and shaped by the large perturbations associated with political unrest in Haiti, natural disasters in the Caribbean exacerbated by climate change, and a global pandemic.

PURPOSE OF THE PLAN UPDATE

The information gained during the last decade provided us the impetus to reaffirm or refine the vision, goals, and actions laid out in the 2012 Black-capped Petrel Conservation Action Plan. Specifically, we undertook this planning update because:

- Improved techniques for finding petrels in new places has given us opportunities to study threats and to implement various forms of management, which were only hypothetical in 2012.
- We wanted to assess the relative importance of various threats to the viability of the species, to articulate the factors that drive these threats, and to share our assumptions about the way conservation actions are to counteract them.
- We initiated the step of adapting and becoming more explicit in our measures of conservation success, such as Key Ecological Attributes (KEAs) and began to employ new tools, including habitat suitability and population viability models to expand our understanding of future outcomes.

Finally, we wanted an updated plan with which we could engage new partners and supporters interested in securing the future of the Black-capped Petrel.

USE OF CONSERVATION STANDARDS

In undertaking this Conservation Plan update, the planning team chose to use the Open Standards for the Practice of Conservation (hereafter, Conservation Standards), a systematic, comprehensive framework designed to support conservation decision making (CMP 2020). We recognized that although resources for petrel conservation have grown, they remain modest and finite, so in face of multiple new opportunities and threats, strategic action is critical.

The Conservation Standards framework encourages conservationists to think of management of a project as a cycle (Figure 2). The IBPCG activities since 2012, organized by the elements of the cycle, are presented in [Appendix 1: Planning Process](#).

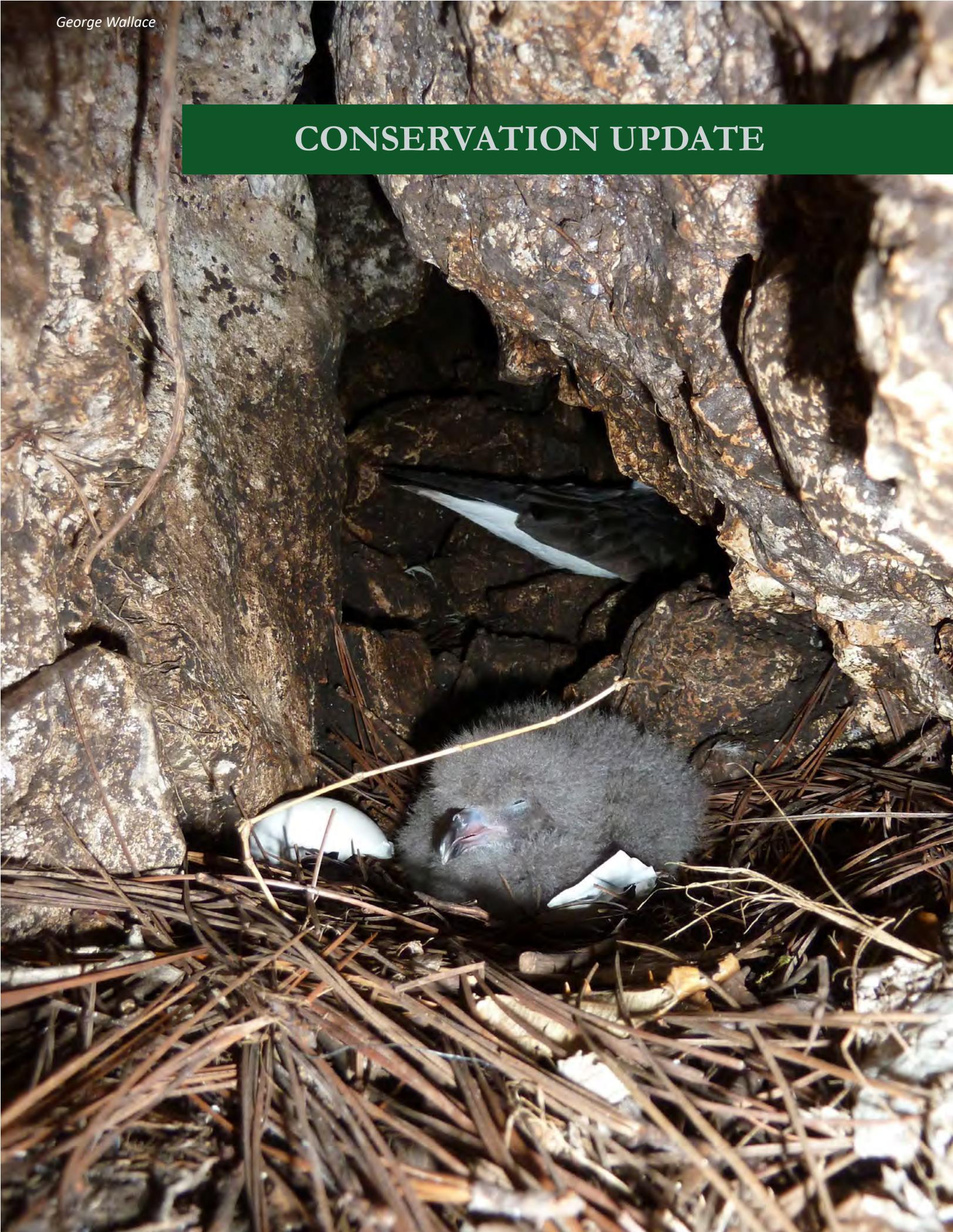
The eight-month planning process that generated this document during 2020 was a concerted effort that involved formally establishing a planning team to work through the many aspects of a conservation challenge together. One team member, James Goetz, provided tutorials and acted as a coach for the team. Use of the CS promoted learning by sharing, with team members being encouraged to share information and assumptions, providing for dialogue and a common understanding. Most attractive was that Conservation Standards compelled us to develop clear criteria for success, which is necessary for determining effectiveness of actions and overall strategies.

The Conservation Standards also encourage disciplined recordkeeping, which supports adaptive implementation and serves as a reference for future plan updates. For this purpose, we used Miradi Software (CMP and Sitka Technology Group 2020), to document our discussions. The Miradi elements of the plan are publicly available at miradishare.org.



Figure 2: Overlapping elements in a project cycle following Conservation Standards.

CONSERVATION UPDATE



CURRENT SPECIES OVERVIEW

Since 2012, several publications provide detailed descriptions of the Black-capped Petrel and its status, including a monograph in the journal *Marine Ornithology* (Simons et al. 2013), a species status assessment (SSA) prepared as the basis for a ruling under the U.S. Endangered Species Act (USFWS 2018b), an update to the IUCN Red List account (BirdLife International 2018), and a Birds of the World account (Satgé et al. *In prep.*). The following is a summary of information most essential to developing the conservation framework.

Known regionally as Diablotin, the Black-capped Petrel is a gadfly petrel endemic to the Caribbean. A pelagic seabird using marine habitat associated with upwelling and eddies, its marine distribution covers the western North Atlantic, Caribbean Sea, and northern Gulf of Mexico (Jodice et al. 2015, Winship et al. 2018, Jodice et al. 2021; Figure 3). While it was previously thought that Black-capped Petrels mostly foraged in the western North Atlantic during the breeding season (Simons et al. 2013), recent tracking studies highlighted the importance of the Caribbean Sea as a key foraging area for breeding petrels (Jodice et al. 2015, Satgé et al. 2019). There, Black-capped Petrels are most common in the central and southern Caribbean Sea, with few records in the east and west despite observation effort in these areas (Leopold et al. 2019).



A petrel chick in one of the about 100 burrows discovered in the last decade. Grupo Jaragua

Until the nineteenth century, Black-capped Petrels were widespread in the Caribbean and nested in abundance on several islands (Simons et al. 2013). To date, 100 nests at five nesting sites have been confirmed in Haiti (Massif de la Selle) and the Dominican Republic (Sierra de Bahoruco and Cordillera Central). Although the only confirmed breeding areas are located on Hispaniola, historic records and recent surveys suggest probable nesting populations in Dominica (Brown 2015 and Brown 2020a) and other areas of Hispaniola (Rupp pers. obs.), and suspected populations in Guadeloupe (Chabrolle 2017, Brown 2020b), Cuba (Plasencia León et al. 2020) and Jamaica (Brown 2016). Criteria used to assign site status are shown in Table 1.

Table 1. Criteria for status of nesting sites

Status	Evidence of breeding
Confirmed	Active nests found since 2000
Probable	Detections on radar, groundings, and/or acoustic evidence
Suspected	Flyway observations or proximity to confirmed sites
Extirpated (not shown)	Extirpated = Historic (>80 years), habitat model only

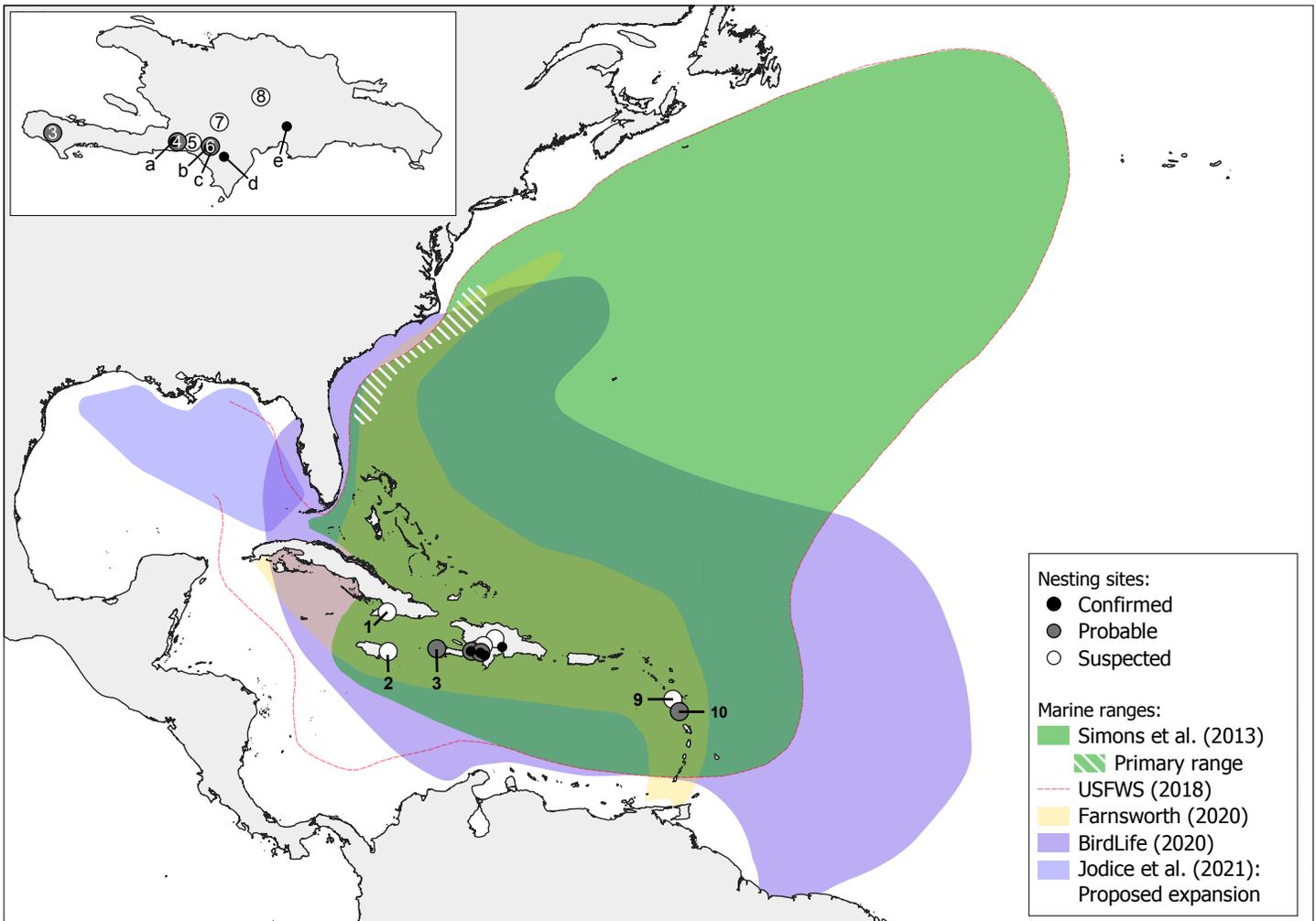


Figure 3: Distribution of the Black-capped Petrel on land and at sea.

Letters indicate confirmed breeding sites: a: La Visite - Tet Opak; b: Morne Vincent; c: Loma del Toro; d: Loma Quemada; e: Valle Nuevo. Numbers indicate probable and suspected sites: 1: Pico Turquino and Pico Bayamesa, Cuba; 2: Blue Mountains, Jamaica; 3: Macaya, Haiti; 4: La Visite Escarpment, Haiti; 5: Pic de la Selle, Haiti; 6: Zapoten, Dominican Republic; 7: Sierra de Neiba, Dominican Republic; 8: Central and northwest Cordillera Central, Dominican Republic; 9: La Soufrière, Guadeloupe; 10: Dominica.



Petrel nesting is probable on Dominica based on recent evidence from radar surveys, direct observation of flying petrels, recovery of grounded birds and from habitat modeling. Jennifer Wheeler

All known nesting sites are in mountainous areas (ca. 2000m above sea level), < 30km from the nearest coastline, and in the understory of montane forests. Spatial modeling suggests that the most highly suitable habitat on Hispaniola is limited to a total area of ca. 170 km² spread out over the Massif de la Hotte, Massif de la Selle, Sierra de Bahoruco and the southeastern Cordillera Central (Satgé et al. 2020; see [Breakout I: Habitat Suitability Modeling](#)).



View of LaVisite escarpment in Haiti, where the highest petrel nest density has been found. EPIC

Black-capped Petrels nest underground, in limestone cavities or in burrows excavated in soil or under tree roots. The topography at known nest sites is generally steep ravines and canyons, but nests have also been found on flatter ridgelines. Nest monitoring in Haiti and the Dominican Republic since 2012 suggests a highly variable reproductive success between years and nest areas, ranging from complete failure to presumed complete success at all nests at a given site. Most failures are attributed to predation and/or abandonment, and unknown causes (Rupp et al. 2012, Rupp and Garrido 2013, ABC 2014, Rupp and Garrido 2016, Rupp 2017, Jean et al. 2018, Rupp 2018, Brown and Jean 2019). Table 2 presents the location, survey effort, habitat characteristics, and management status at confirmed, probable or suspected Black-capped Petrel nesting sites. Detailed information on each site is available in [Appendix 2: Site Profiles](#).

Two color forms (aka morphs) of the Black-capped Petrel have been described: a dark and a light form (with intermediate phenotypes), differing by the amount of white plumage on the face, neck and underwing (Howell and Patteson 2008). Studies suggest a strong genetic divergence between light and intermediate, and dark forms (Manly et al. 2013). Recent tracking of petrels of both forms captured at sea (Satgé et al. In prep.) and camera trap pictures at breeding sites (Rupp pers. obs.) suggest that both forms may use similar nesting areas but light form petrels may start to breed about one month before dark forms. Such differences in phenology among meta-populations have been documented in other *Pterodroma* species.

In 2018, BirdLife International reaffirmed the species as Endangered on the IUCN Red List, because of its very small, fragmented and declining breeding range and population (BirdLife International 2021). The estimate given for the global population has remained as “no more than 1,000 breeding pairs, perhaps as few as 500, and a total population of 2,000–4,000 birds”. The trend justification is that “the population undoubtedly declined through the 19th and 20th centuries during which time breeding populations on [some islands] may have been entirely extirpated. This decline is thought to have continued during recent years but requires confirmation”. Five-year follow-up radar surveys in 2017 (Hispaniola) and 2020 (Dominica) do suggest population declines are ongoing (Brown 2017, Brown 2020a), as does loss of suitable habitat in Hispaniola, including at known nest sites (Satgé et al. 2020).

CONSERVATION PLANNING TOOL: HABITAT SUITABILITY MODELING

Our understanding of the breeding distribution of the Black-capped Petrel in Caribbean is limited by the difficulties of locating nesting sites in remote and rugged mountains. This information is critical to assess threats, and to prioritize conservation actions and research needs. We developed a statistical model to predict suitable habitat to better estimate the extent of available breeding habitat, and to direct future priorities (see Satgé et al. 2020 for further details). We first estimated large-scale habitat characteristics of all known nesting sites, using a set of environmental variables which included, among others, altitude, distance to coast, slope direction, and vegetation indices such as productivity, percent tree cover or wood biomass. We then selected those environmental variables that were most significantly associated with nesting activity (altitude, distance to coast, and a composite of percent tree cover and evapotranspiration index) to output a map of predicted habitat suitability for Hispaniola and the wider Caribbean region (Figures A and B).

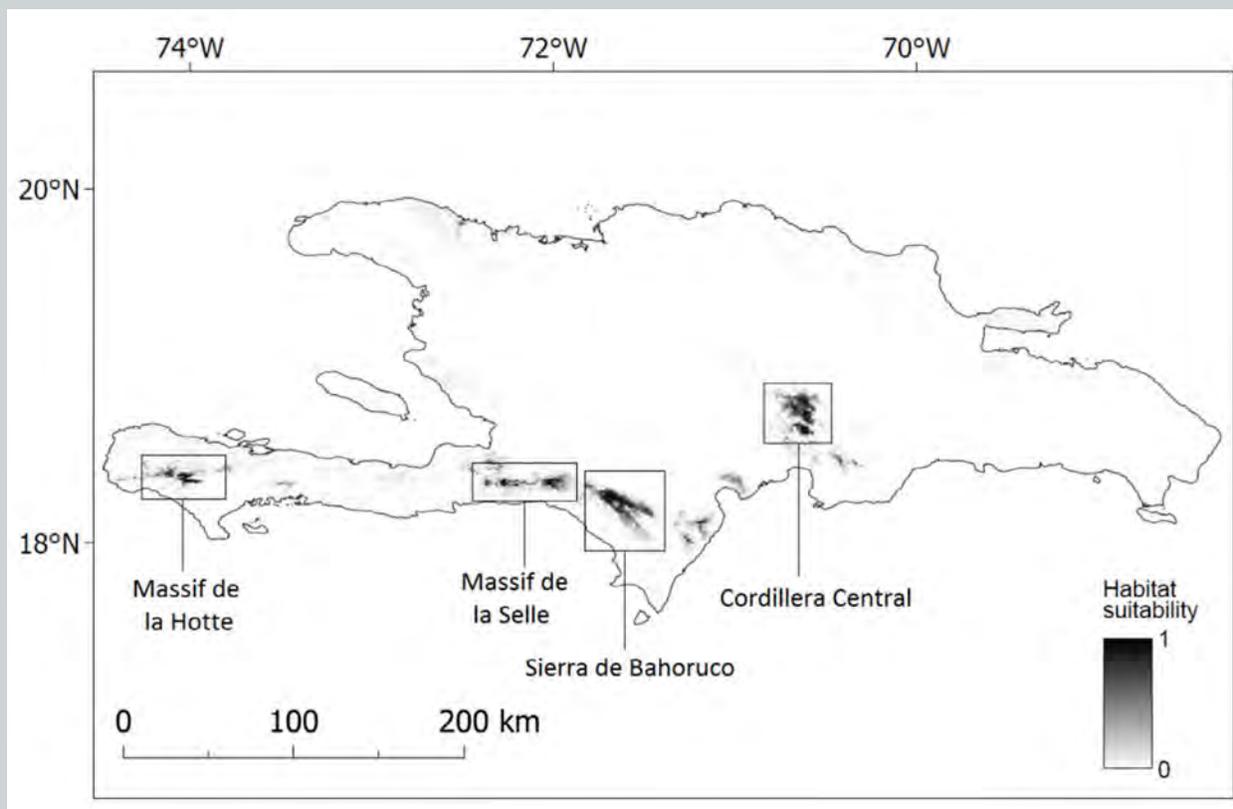


Figure A. Map of predicted nesting habitat suitability for Black-capped Petrel on Hispaniola. From Satgé et al. (2020).

CONSERVATION PLANNING TOOL: HABITAT SUITABILITY MODELING

On Hispaniola, highly suitable habitat is predicted in all four elevated areas where the species is currently known to nest in Haiti (Massif de la Hotte, Massif de la Selle) and the Dominican Republic (Sierra de Bahoruco, and southern Cordillera Central). Lower areas near Sierra de Bahoruco are also predicted as suitable, whereas suitable habitat is not predicted in the occidental Cordillera Central. In total, the model estimated that 167–563 km² are suitable for petrel nesting on Hispaniola, 75% in the Dominican Republic and 25% in Haiti. Between 2000 and 2018, 15–17% of nesting habitat predicted on Hispaniola was affected by forest loss, likely due to hurricanes, forest fires, and deforestation for agriculture.

In the Caribbean, our analysis predicts that suitable nesting habitat is available in Cuba, Jamaica, Dominica and Guadeloupe (Figure B). In Cuba, suitable habitat is limited to montane forests surrounding Pico Turquino and Pico de la Bayamesa, in the southeastern region. In Jamaica, the highest elevations of the Blue Mountains ridge host suitable habitat. In Guadeloupe, suitable habitat is limited to the top of La Soufrière Volcano. Finally, in Dominica, suitable habitat is concentrated on both main peaks, Morne Diablotin and Morne Trois Pitons. In Guadeloupe and Dominica, these results confirm the choice of the areas selected for recent nest search efforts (see [Appendix 2: Site Profiles](#) for more details).

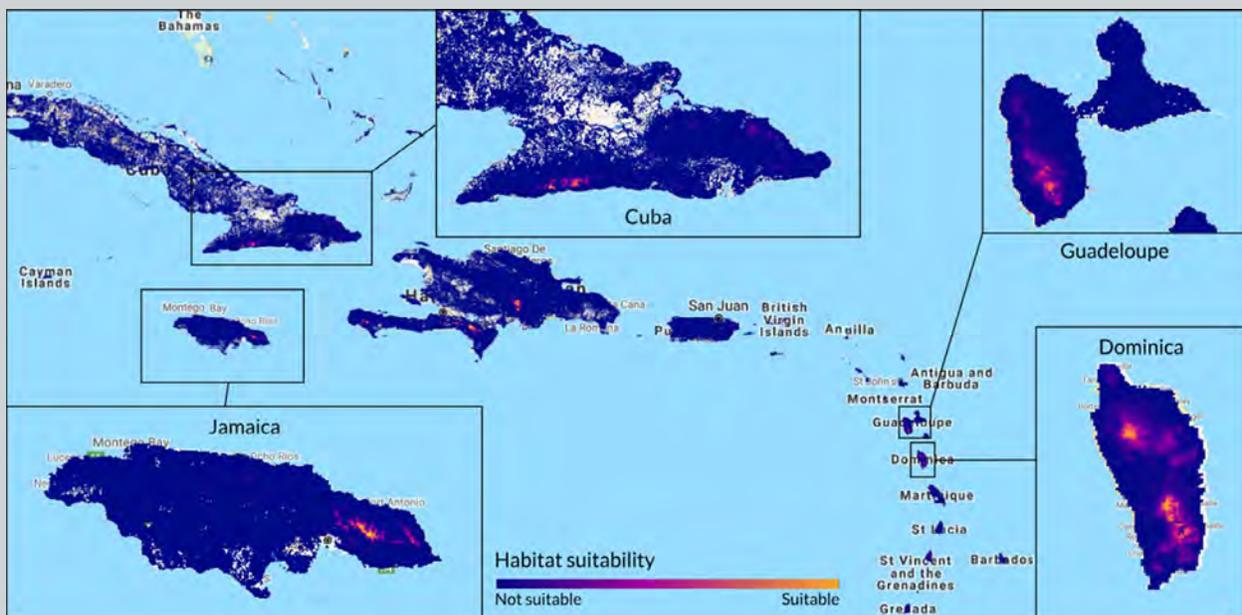


Figure B. Map of predicted nesting habitat suitability for Black-capped Petrel in the Caribbean (Satgé et al. In prep).

Table 2. Location, survey effort, habitat characteristics, and management status at confirmed, probable and suspected Black-capped Petrel nesting sites.

Location			Survey effort ^a			Habitat characteristics				Management			
Site Name	Geographic Area	Country	Audio/ Visual	Ground Searches	Radar	Number of known Nests ^b	Known nesting surface (km ²) ^c	Suitable contiguous habitat? ^d	Habitat Quality ^e	National Park ^f	IBA ^g	KBA ^h	Mng level ⁱ
CONFIRMED BREEDING LOCATIONS													
La Visite (Tet Opak)	Massif de la Selle	Haiti	high	high	fully covered	57	0.06	Y	2	La Visite	Y	Y	1
Morne Vincent (Boukan Chat)	Massif de la Selle	Haiti	high	high	fully covered	17	0.13	N	3	Foret de Pins I	N	Y	1
Loma del Toro	Sierra de Bahoruco	Dominican Republic	high	thorough	fully covered	28	1.48	Y	5	Sierra de Bahoruco	Y	Y	3
Loma Quemada	Sierra de Bahoruco	Dominican Republic	med	med	fully covered	7	0.11	Y	5	Sierra de Bahoruco	Y	Y	3
Valle Nuevo	Cordillera Central	Dominican Republic	low	med	fully covered	11	0.14	Y	4	Valle Nuevo	Y	Y	4
PROBABLE OR SUSPECTED LOCATIONS ON HISPANIOLA													
Macaya ⁽¹⁾	Massif de la Hotte	Haiti	low	low	¼ covered	0	-	N	5	Macaya	N	Y	2
La Visite (remainder of escarpment)	Massif de la Selle	Haiti	medium	low	fully covered	0	-	Y	2	La Visite	Y	Y	1
Zapoten	Sierra de Bahoruco	Dominican Republic	medium	medium	fully covered	0	-	Y	5	Sierra de Bahoruco	Y	Y	4
Pic de la Selle	Massif de la Selle	Haiti	low	low	¼ covered	0	-	Y	3	Foret de Pins II	N	Y	1
Neiba (suspected)	Sierra de Neiba	Dominican Republic	low	low	⅓ covered	0	-	N	5*	Sierra de Neiba	Y	Y	3
Central and Northern range (suspected)	Cordillera Central	Dominican Republic	none	none	¼ covered	0	-	Y	5*	Del Carmen Ramirez, Bermudez	Y	Y	4
PROBABLE OR SUSPECTED LOCATIONS ON OTHER ISLANDS													
Dominica	Various peaks	Dominica	medium	medium	covered	0	-	N	5	Morne Trois Pitons, Morne Diablotin	Y	Y	4
Guadeloupe (suspected)	Nez Cassé/ Soufrière	Guadeloupe	low	low	½ covered	0	-	N	5	Guadeloupe	Y	Y	5
Pico Turquino (suspected)	Sierra Maestra	Cuba	low	none	No coverage	0	-	N	5	Pico Turquino Pico La Bayamesa	Y	Y	?
Blue Mountains (suspected)	Blue Mountains	Jamaica	low	low	1/10 covered	0	-	N	5	Blue Mountains	Y	Y	2

Geographic location of each site may be found in Figure 3. Detailed information on each site is available in [Appendix 2: Site Profiles](#).

^a Survey effort information provided by Rupp (pers. comm.) and Brown (2015, 2016, 2017, 2020a, 2020b). Due to variation in habitat and conditions, the level of effort for audio/visual and ground searches are the surveyors' qualitative rating of coverage, rather than a specific number of hours spent listening, recording or searching. For radar coverage, coverage refers to the proportion of likely flyways (drainages) surveyed.

^b Number of known nests at the site as of October 2020.

^c Calculated as the surface of the 95% minimum convex polygon around known nest sites in the nesting area.

^d Refers to the likelihood that nests are likely to be found nearby, based on surveyor's opinion and habitat suitability modeling by Satgé et al. (2020).

^e Defined as: 5 = intact vegetative cover, to 1 = cleared of vegetation. * Indicates that habitat modeling did not define areas as suitable for nesting (Satgé et al. 2020).

^f UNEP-WCMC and IUCN (2020).

^g Area defined within an IBA: Important Bird Area (BirdLife International 2020).

^h Area defined within a KBA: Key Biodiversity Area (Key Biodiversity Areas Partnership 2020).

ⁱ Defined institutional infrastructure, services and activities to protect and manage the area as it relates to the Black-capped Petrel: 5 = park fully staffed (guards or rangers); park leads projects that benefit petrels, 4 = staff present regularly; park supportive with equipment, housing or services, 3 = staff presence irregular; periodic logistical support for activities, 2 = staff rarely present; rarely support for activities, 1 = essentially none.

⁽¹⁾ Macaya was listed as confirmed in the 2012 Conservation Action Plan, based on the observations of flying and vocalizing birds; however, in the 2020 Plan, this site was considered "probable" based on the fact that no nests have been located yet.

TARGETS FOR PLANNING

In the terminology of the Conservation Standards, **targets** are specific, tangible entities that a project is working to conserve. Targets represent and encompass the ultimate aims of the project, and they form the basis for goals, selecting strategies, and measuring effectiveness.

The Black-capped Petrel as a species is the overarching target for our conservation planning. Our team also developed sub-population targets based on terrestrial location. Petrel populations at each nesting site or island were considered as separate targets, because of the varying threats at these nesting areas and the nature of conservation interventions that are possible there. In defining targets by a particular site, we include consideration of the habitat used by the petrels and its specific characteristics (vegetative cover, burrow availability). Birds at sea were also conceived as a discrete target for conservation planning, for the reason that marine threats and conservation interventions are quite different than on land. The marine range was assessed by location – Caribbean Sea, Gulf Stream waters, and Gulf of Mexico – but the target of “birds at sea” was not subdivided.

Conservation targets may be re-defined or refined in the future, especially as more information emerges about Black-capped Petrel distribution and population dynamics. Specifically:

- Nest site names were generated for the purposes of planning and may be split or grouped in the future depending on where nests are discovered.
- The two Black-capped Petrel color forms reflect important genetic and behavioral diversity in the species. However, not enough information is available to assess, much less manage, the forms as distinct targets. Thus far, most nesting areas are composed of dark form petrels, with intermediate forms observed recently in Valle Nuevo.
- Tracking results support the idea that sub-populations, defined by age class, breeding status, breeding location, and color form, potentially use marine areas differently.

Additionally, it is anticipated that future range-wide plans, and those made at the national or local level, may include explicit human well-being targets. Human welfare targets are components of human well-being affected by the status of conservation targets and associated ecosystem services. The mountainous forest areas comprising petrel habitat do provide important services such as water retention, erosion control, wood and other forest products. Moreover, it is recognized that the conservation of the petrel and its habitat, especially in Haiti, relies on improving the welfare of local communities. In accordance with our Mission, IBPCG will pursue human well-being targets in partnership with organizations for which human well-being is a primary focus.

THREATS IDENTIFICATION

Direct threats are anthropogenic in nature and negatively affect petrel populations (i.e., increased mortality, reduced reproduction) or their habitats (i.e., decreased quality or quantity) (CMP 2020). Natural phenomenon can also be considered direct threats if they are altered or exacerbated by human activities or human influences (e.g., changing patterns of hurricane activity due to anthropogenic climate change). We identified the following threats as significant to one or more of the conservation targets (petrel populations at confirmed, probable or suspected nesting sites, and petrels at sea)¹:

- **On Land Threats of Direct Mortality**
 - Introduced Mammalian Predators
 - Fire Mortality
 - Tower Collisions and Groundings
 - Harvest by Humans
 - Light Pollution Collisions and Groundings*

- **On Land Threats of Degradation and Loss of Nesting Habitat**
 - Agricultural Expansion
 - Expansion of Grazing
 - Fire Damage to Habitat
 - Invasive Ferns
 - Wood Harvest
 - Non-timber Forest Product Collection
 - Destruction of Burrows by Feral Pigs*

- **Threats at Sea**
 - Reduced Prey Availability
 - Oil Spills
 - Fisheries Bycatch
 - Attraction/Collision with Marine Infrastructure
 - Mercury
 - Plastics*
 - Other Contaminants*
 - Hurricane Fallout*



Petrels are highly attracted to light, and illuminated towers pose a collision risk to birds in flight. James Goetz

*Added to the suite of threats described in the 2012 Conservation Action Plan (Goetz et al. 2012), based on emerging information.

¹Threats are ordered by the numbering scheme in the CMP Direct Threats Classification v2.0. <https://conservationstandards.org/library-item/direct-threats-classification-v2-0/>

THREATS PRESENTATION

On Land -- Direct Mortality

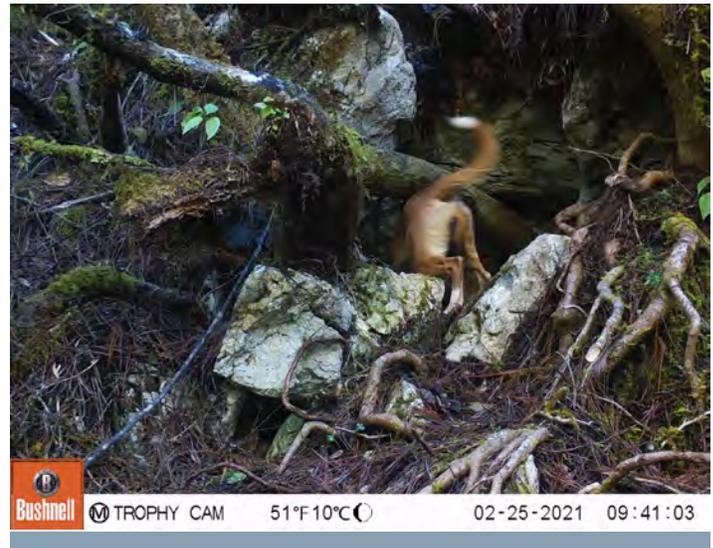
Predation by Introduced Mammals: Introduced mammals known to prey on Black-capped Petrel are present at all probable and suspected nesting sites within the Caribbean region (Threatened Island Biodiversity Database Partners 2018). The introduced, non-native mammals that have been documented by camera trap or human observation at confirmed petrel nesting sites in Hispaniola include Norway rats (*Rattus norvegicus*), black rats (*Rattus rattus*), Indian mongoose (*Herpestes javanicus*), domestic dogs (*Canis familiaris*), domestic cats (*Felis domesticus*), and feral pigs (*Sus scrofa*) (Rupp and Garrido 2016, Rupp 2017, Rupp 2018, Jean et al. 2018, Brown and Jean 2019).

Monitoring at Hispaniola sites has shown that the presence of cats and mongoose can cause reproductive failure of an entire colony (Rupp 2018, Brown and Jean 2019). Based on 20+ species of *Pterodroma* petrels worldwide, predation of eggs and chicks by non-native mammals is a main driver of nest failure and adult abandonment (Rodríguez et al. 2019). Direct mortality of adult petrels by dogs was documented at two confirmed sites in late 2020 and early 2021 (IBPCG 2021); studies show that predation of adults is particularly damaging to petrel populations and can increase the risk of extinction (Rodríguez et al. 2019). Although not yet documented for the Black-capped Petrel, depredations by cats are likely; in other parts of the world, single cats have caused numerous adult fatalities (Faulquier et al. 2009, Raine pers. comm.).

Fire Mortality: Black-capped Petrels may die in natural or intentional forest fires affecting nesting areas; fires during incubation could be fatal to adults, chicks or eggs in burrows. There are documented cases of as many as one hundred Black-capped Petrels fatally attracted to large fires burning at night during peak breeding season (IBPCG 2014, Brown and Jean 2019). In early 2021, high-intensity fires threatened colonies on the Haiti-Dominican border; camera traps on confirmed nests captured images of nearby smoke and flames, which destroyed Park buildings and towers (IBPCG 2021).

Tower Collisions and Groundings: Communication towers, wind turbines, or other tall, lighted structures, especially those near nesting areas, pose a particular threat for collisions and groundings. Protruding into Black-capped Petrel flyways, lighted towers attract petrels in courtship flights or commuting in and out of nesting sites. Petrels also collide with hard-to-see supporting cables (guy wires) or fences associated with towers, especially on foggy nights. Mortalities have been documented at towers near La Visite and Loma del Toro nest sites (Hardesty and Rupp 2012, Brown et al. 2013).

Harvest by Humans: Systematic harvest of Black-capped Petrels as a food source is known only from historical records; planned collection has not been documented in recent times. Petrels burnt in fires, or discovered as habitat is being cleared, are collected for human consumption, but this harvest appears to be purely opportunistic (Rupp and Goetz pers. obs.).



Threats that result in adult mortality are particularly concerning, including depredations by dogs or petrels fatally attracted to fire. Grupo Jaragua/James Goetz

Light Pollution Collisions and Groundings: Black-capped Petrels, like many other seabird species, are highly attracted to light (Rodríguez et al. 2017). A myriad of sources of light pollution from towns and cities may disorient birds as they traverse a flyway, causing collisions or groundings. Fledgling juveniles are more likely to become disoriented as they leave the nesting area for the first time (Rodríguez et al. 2017), but adults are attracted as well, particularly during periods of no moon. Over the last decade, several grounded petrels have been collected around homes and businesses, inland and in coastal towns (Rupp pers. obs.).

On Land -- Nesting Habitat Degradation and Loss

Agricultural expansion: All Black-capped Petrel habitat remaining in Haiti is adjacent to communities that work hard for daily existence. Observed deforestation at known and probable Haitian nesting sites is primarily for row crop agriculture, undertaken by people who struggle economically, use poor agronomic techniques and lack environmental knowledge. Estimates of existing forest cover and conversion of land to agriculture vary depending on data sources and classification, but there is widespread agreement that Haiti has suffered significant deforestation and agricultural land degradation (FAO 2010, Churches 2014, Pauleus and Aide 2020).

In all countries, most of the confirmed, probable or suspected Black-capped Petrel nesting sites fall within protected area (i.e., national parks and reserves) boundaries. However, in Haiti, this designation provides no real protection from clearing for agriculture, as land is occupied and worked by citizens. In the Dominican Republic and on other islands, national parks are better protected from conversion, although incursions into parks for commercial and subsistence agriculture have occurred.



Black-capped Petrels habitat in Haiti is degraded and lost when land is converted to row crop agriculture. EPIC

Expansion of Grazing & Destruction of Burrows by Feral Pigs:

In Haiti, the expansion of row crop agriculture into forest areas is often preceded by the use of forested land for **livestock grazing**. Grazing removes understory vegetation and burrows can be destroyed by trampling ungulates or rooting feral pigs. Feral pigs can also depredate the burrow occupants (Rodríguez et al. 2019); feral pig presence was most notable at Loma Quemada (Dominican Republic), Dominica, and Guadeloupe.

Fire Damage to Habitat & Invasive Ferns: Fires lit intentionally (for clearing underbrush) or unintentionally are rarely big enough to destroy trees or destroy burrows, but they may pave the way for agriculture or facilitate the spread of invasive vegetation. The invasive fern *Dicranopteris pectinata* is particularly noted in the Valle Nuevo nesting site in the Dominican Republic; these fern thickets are too dense for petrel use, and are an obstruction to field teams (Rupp pers. obs.).

Wood Harvest & Non-timber Forest Product Collection: In addition to livestock grazing, expansion of row crop agriculture into forest areas is often preceded by the harvest of wood and other forest products. These practices appear to be less damaging to petrel habitat than tilling, but cause gradual deforestation and/or disturbance. In La Visite, the recent harvest of live tree ferns (sold for landscaping purposes) has impacted Black-capped Petrel reproduction (Jean et al. 2018).

Threats at Sea

Black-capped Petrels at sea face a range of suspected threats but data gaps about exposures and impacts in the marine environment preclude more definitive statements. Petrels at sea may be directly harmed by **lethal, discrete marine pollution**, notably **oil spills** (Lee 1999). Spills are more likely to occur near oil and gas infrastructures in the south Caribbean Sea and the Gulf of Mexico but may also happen in dense shipping lanes along the North American coast (Camphuysen et al. 2005, Chrastansky et al. 2009). Exploration is ongoing in the southeastern Canadian exclusive economic zone, with the possibility of future oil extraction in this area used by petrels. Direct mortality may also result from **attraction to and collisions with at-sea structures** (e.g., oil platforms, offshore wind farms) especially if lighted or flaring (Montevecchi 2006, Jodice et al. 2021). Petrels may also face **threats linked to fisheries**, through entanglement in gear, collision with trawling cables, or attraction to lighted vessels (Zhou et al. 2019). A petrel was documented colliding with a fisheries research vessel in the northern Gulf of Mexico in late July 2018 (Haney, pers. comm.) Finally, the changing pattern of **hurricanes**, an effect of climate change, may be causing increased mortality of petrels blown off-course (Hass et al. 2012, Jodice et al. 2021).

Some threats at sea such as **sublethal, diffuse pollution** (i.e., plastic, Moser and Lee 1992, Wilcox et al 2015; mercury, Whitney and Cristol 2017; and other contaminants from produced waters, Veil et al. 2004, Welch & Rychel 2004) are more likely to reduce fitness or productivity (e.g. low hatching success, death of offspring), than cause direct mortality of adults. Finally, climate change is expected to weaken or disturb oceanic processes such as the Guajira upwelling (Taylor et al. 2012) and the Gulf Stream (Yang et al. 2016) which may **reduce prey availability**.

THREATS RATING

Evaluating threats is a central part of conservation planning and forms the basis for identifying and rating conservation strategies. For this reason, our team attempted to assess the relative importance of the identified threats to the viability of the Black-capped Petrel (something that had not been included in the 2012 Conservation Action Plan, Goetz et al. 2012). Our planning team used the Simple Threats Rating system within the Miradi software (Version 4.5) to rate each threat at individual nesting sites and at sea. We also used a new population viability analysis (PVA) model designed specifically of seabirds in order to explore the effects of threats (or their reduction) on the global petrel population (Croll et al. 2019, Seabird mPVA 2020). See [Breakout: Population Viability Analysis Model](#).

The Simple Threats Rating system (TNC 2007) involves using a four-level qualitative scale (Low, Medium, High, and Very High) applied to three criteria:

- **Scope:** The proportion of the target population (or geographic extent of a nesting site) that can reasonably be expected to be affected by a threat within 10 years given the continuation of current circumstances and trends.
- **Severity:** The level of damage to the conservation target that can reasonably be expected within 10 years given the continuation of current circumstances and trends.
- **Irreversibility:** The degree to which the effects of a threat can be undone (and the target restored).

Ratings for Scope, Severity, and Irreversibility are combined according to a set of rules, to provide an overall threat rating for each target. See [Appendix 2](#) and [Appendix 3: Threats Assessment](#) for a full description of site-specific threats, scales, the rule sets, and specific target-threat ratings.

The suite of on-land threats and their ratings are shown in Table 3.

For threats to Black-capped Petrels at sea, we used the same Simple Threats Rating, considering as targets both directly-affected foraging birds (adults and subadults) and their indirectly-affected offspring on land. All marine threats were rated Medium or Low. There is, however, a notable amount of uncertainty associated with marine exposures and impacts, as shown in Table 4.

Table 3. On land threats to Black-capped Petrels at select nest sites ^a

RATING OF THREATS TO PETRELS AT NESTING SITES	Haiti			Dominican Republic			Dominica, Guadeloupe, Cuba, Jamaica ^e
	La Visite Tet Opak ^b	Morne Vincent	Macaya ^c	Loma del Toro ^d	Loma Quemada	Valle Nuevo	
Threats of direct mortality							
Predation by Introduced mammals	High	High	High	High	High	High	High
Fire Mortality	High	Medium	Medium	Medium	Medium	Medium	Medium
Tower Collisions and Groundings ^f	Low	High	Low	High	Not occurring	Not occurring	Data needed
Light Pollution Collisions and Groundings	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Harvest by Humans	Low	Low	Low	Not occurring	Not occurring	Not occurring	Not occurring
Threats of nesting habitat degradation and loss							
Agricultural Expansion	Very High	Very High ^g	Very High	Not occurring	Not occurring	Low ^h	Data needed
Expansion of Grazing	High	Low	High	Not occurring	Not occurring	Not occurring	Not occurring
Burrow Destruction by Feral Pigs	Not occurring	Not occurring	Not occurring	Not occurring	High	Not occurring	Data needed
Fire Damage to Habitat	Low	Low	Low	Low	Low	Medium	Low
Invasive Ferns	Not occurring	Not occurring	Not occurring	Not occurring	Not occurring	Low	Data needed
Wood or NTFP Collection	Low	Low	High	Not occurring	Not occurring	Low (h)	Not occurring

^a We rated threats for all confirmed and some probable nesting sites on Hispaniola, those where our core planning team had spent considerable time. We also undertook preliminary ratings of threats on other islands (Dominica, Guadeloupe, Cuba and Jamaica) based on more geographically generalized information; confirmation of nest sites on these islands will allow for more informed ratings.

^b Ratings for Pic de la Selle, and the remainder of the La Visite escarpment are considered to be the same as for the confirmed site at Tet Opak.

^c Although nests have yet to be located at Macaya, we rated threats at the probable nest site based on team members’ strong familiarity with the site.

^d Ratings for probable nesting site Zapoten are likely the same as for close-by Loma del Toro.

^e Preliminary ratings for islands other than Hispaniola are based on information about conditions on peaks most likely to host petrels. The probable or suspected sites on Dominica, Guadeloupe, Cuba and Jamaica have protected status, but all of these islands have a host of introduced mammalian predators, may be subject to fires, and host human populations such that light pollution will likely threaten petrels to some extent.

^f The ratings for Tower Collisions and Mortality are based on the presence of towers in the close vicinity of nesting sites.

^g Agricultural Expansion is rated as Very High in the absence of interventions; ongoing interventions have apparently reduced the present threat to Low, but these interventions require a sustained and dedicated effort.

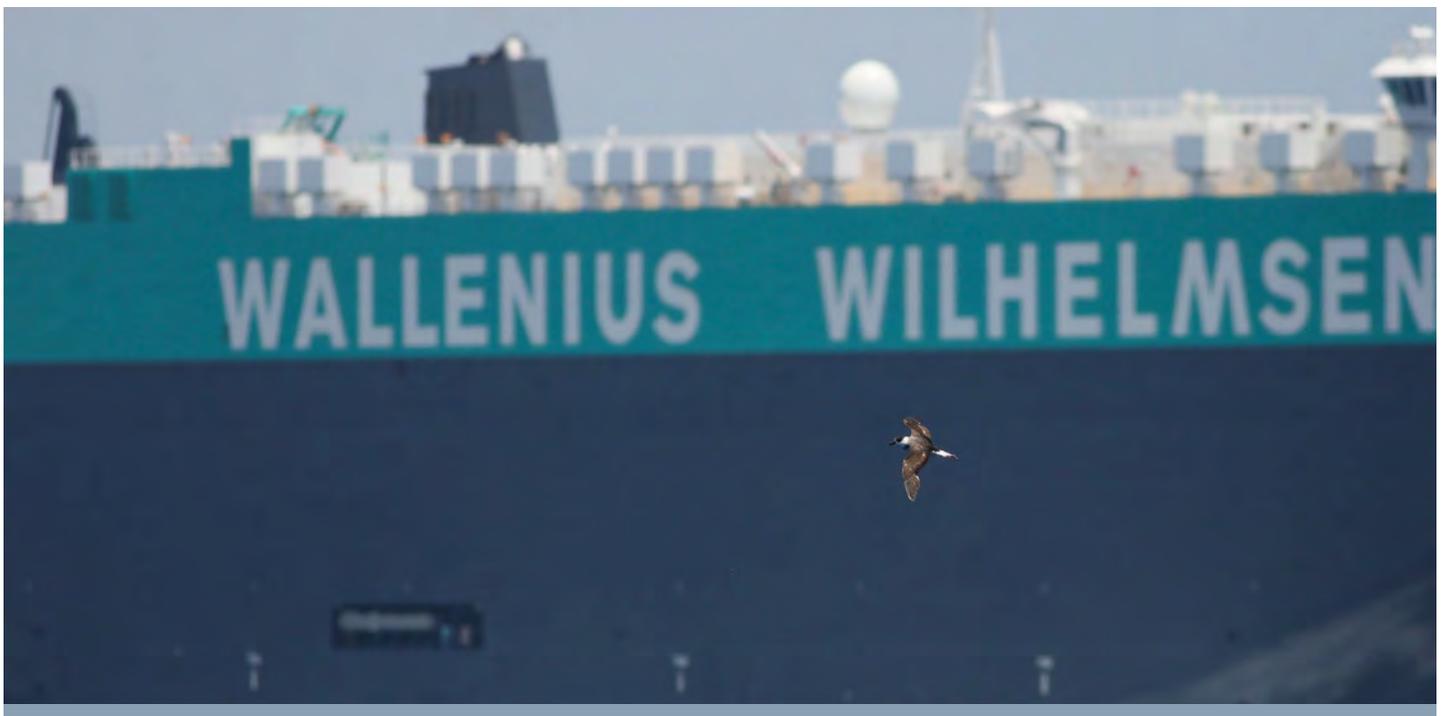
^h Agricultural Expansion in Valle Nuevo has “Low” (rather than “Not occurring”) because of past incursions. Rupp believes that nests may have been lost due to impact by fires from land clearing within the last ten years.

Table 4. Threats at Sea to Black-capped Petrels

Threats at sea (Highest to Lowest)	Rating	Suggested impact on BCPE populations ^a	Uncertainty level ^b	Uncertainty
Reduced Prey Availability	Medium	Reduced life expectancy (all), reduced survival (all), reduced fitness (breeding adults), reduced reproductive success (breeding adults).	High	Diet; Factors contributing to prey availability; Impact of climate change on oceanic regimes; Occurrence and extent of overfishing
Oil spills	Medium	Direct mortality (flying individuals; offspring probably affected by death of parent), reduced survival (all), reduced reproductive success (breeding adults).	Low	Proportion of population affected
Mercury	Medium	Reduced survival (all), reduced life expectancy (all), reduced fitness (breeding adults), reduced reproductive success (breeding adults).	High	Extent of contamination; Impacts of contamination on age classes
Plastics	High	Direct mortality (all), reduced survival (all), reduced fitness (breeding adults), reduced reproductive success (breeding adults).	Low	Extent of exposure; Impact of exposure
Other contaminants	Medium	Reduced survival (all), reduced life expectancy (all), reduced fitness (breeding adults), reduced reproductive success (breeding adults).	Medium	Types of contaminants; Extent of contamination; Impacts of contamination
Hurricane Fallout	Low-Medium	Direct mortality of birds displaced on land (non-breeding adults and immatures)	Low	Impact of climate change on frequency of fatal hurricanes
Fisheries Bycatch	Low	Direct mortality (flying individuals; offspring probably affected by death of parent).	Medium	Diet; Level of petrel attraction to fisheries; Types of fisheries affecting petrels; Proportion of population affected
Attraction/Collision with Marine Infrastructure	Medium	Direct mortality (flying individuals; offspring probably affected by death of parent).	Low	Proportion of population affected; Impact of displacement from foraging areas

^a Target populations include: land-based breeding adults; sea-based non-breeding adults and sub-adults; land-based offspring.

^b Level of uncertainty associated with how the threat processes affect the Black-capped Petrel population (Low, Medium, High). A baseline for all threats is the extent to which the effects of the threat on the petrel populations can be reversed.



Black-capped Petrels face many threats at sea, including collision with lighted ships and pollution from busy shipping lanes. Kate Sutherland

CONSERVATION PLANNING TOOL: SEABIRD POPULATION VIABILITY ANALYSES

INTRODUCTION

Population viability analysis (PVA) has long been a tool for conservation; it is a species-specific method of risk assessment that combines life history characteristics and environmental variability to forecast population trends and extinction risk. Meta- or multiple-population PVA (mPVA) integrates models that account for fluctuations in spatiotemporal abundance¹. To inform the 2020 planning process for Black-capped Petrels, we employed an mPVA program specifically designed for seabirds of high conservation concern, developed in the Coastal Conservation Lab, University of California at Santa Cruz (Seabird mPVA)². The Seabird mPVA takes into account biological and ecological particularities of seabirds, such as their high foraging and migratory mobility, as well as their philopatry and demographic connectivity. The program focuses on threatened, island-breeding seabird species and integrates data from multiple sources of information relevant to seabirds, including IUCN Red List of Threatened Species, the Threatened Island Biodiversity database, literature-reported values of seabird vital rates, and solicited expert opinion.

Demographic information for the Black-capped Petrel is lacking, but the Seabird mPVA model allows a “sister taxa” approach using data from 35 closely-related *Pterodroma* species to generate vital rates and associated estimates of variability. These vital rates, along with estimates about breeding sites (number of sites, number of birds per site, invasive species present), can be varied to explore how various assumptions (impact of threats over time, or effects of management) affect predictions of viability. We explored scenarios such as *status quo*, deteriorating/improving conditions, and strategies to reduce key threats, using the Seabird mPVA model to project future population trajectories and quasi-extinction risk³ over the next 100 years.

Parameter	Value
Age at 1 st reproduction	6.36
Breeding probability	0.85
Clutch size	1
Hatch probability	0.68
Fledge probability	0.75
Juvenile survival	0.68
Subadult survival	0.94
Adults survival	0.95
Number of breeding islands	6
Number of invasive species	100

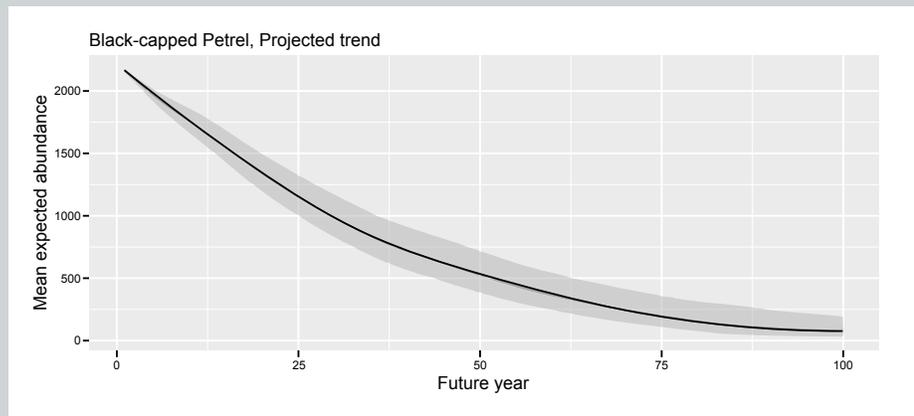


Figure 1. An analysis of status quo conditions for the Black-capped Petrel

¹Wenger, Seth J., Douglas R. Leasure, Daniel C. Dauwalter, Mary M. Peacock, Jason B. Dunham, Nathan D. Chelgren, Helen M. Neville. Viability analysis for multiple populations. *Biological Conservation*, Volume 216, 2017, Pages 69-77, ISSN 0006-3207, <https://doi.org/10.1016/j.biocon.2017.10.006>.

²Seabird mPVA. 2020. Seabird mPVA Online Tool developed by the UC Santa Cruz Conservation Action Lab. <https://nhydra.shinyapps.io/mPVA1/>

³Quasi-extinction, a threshold value reflecting the point at which a population is functionally extinct, was set at 50 female petrels.

CONSERVATION PLANNING TOOL: SEABIRD POPULATION VIABILITY ANALYSES

Modeling involved making assumptions about changes in vital rates and/or varying the number of birds/nesting sites. To assess strategies designed to counteract threats of habitat degradation, we translated the loss/gain of habitat into population parameters as was done for strategies to address direct mortality. Results of the model should not be interpreted as estimates of absolute abundance. Rather, the results should be used as clues into how conservation actions could slow and buffer the rate of decline and decrease quasi-extinction risk, and what combinations of actions might be necessary to see an increase in population trends. Additionally, the model was helpful in identifying key information gaps about the relative benefits of alternate conservation actions.

SEABIRD MPVA RESULTS

An analysis of *status quo* conditions for the Black-capped Petrel affirms that the population is likely in a long-term trajectory of decline (Figure 1). The model suggests a high probability (73%) of quasi-extinction within the next 100 years (confidence interval 47%- 90%) without active management to reduce threats and improve the vital rates.

As is the case for long-lived, slow-to-reproduce seabirds, population trends for the Black-capped Petrel are most sensitive to changes in adult survival. The model confirms that this vital rate underpins trends and conservation urgency. For example, a reduction of adult survival from 0.95 to 0.85 hastens functional extinction of the species to within 25 years. Thus, understanding adult survival is a key research need.

New Nests Discovered

To examine the implications of locating additional nest sites of the Black-capped Petrel, we modeled scenarios in which 200 additional nesting birds were added to one of the islands included in the status quo scenario. Regardless of which island was assigned the additional birds, the modeling results were similar: the population viability is not greatly increased. The scenarios show a short term increase in the numbers of petrels into the target population (<25 yr time frame), but over long-term, the overall trend of the population continues to decrease, with a similar risk of extinction at 100 years. In short, while the re-discovery of nesting sites would be gratifying, it does not reflect long-term security for the petrel population, unless threats are addressed.

Colony Creation

We modeled a successful restoration project by including a new hypothetical island or site (2 km², Lat 16, Long -68) free from invasive species, and allocating some number of birds to it. Across multiple scenarios (placing 25, 50, 100, or 200 birds at the hypothetical predator-free site), the overall Black-capped Petrel population is shown likely to persist at low numbers beyond 100 years. This long-term outcome is less pronounced with scenarios involving fewer translocated birds and it assumes that the population at the restoration location can grow and expand (i.e. is not site-limited). Finally, since the population trend is still predicted to decline, colony creation should thus be used in association with other strategies focused on reducing threats at existing locations.

CONSERVATION PLANNING TOOL: SEABIRD POPULATION VIABILITY ANALYSES

Reduced Predation

To model the effects of reduced predation, we reduced the number of invasive species on Hispaniola to zero in the Seabird mPVA. This was done to explore the optimal outcome of the strategy; it is unrealistic to expect complete control or protection at all sites in the Dominican Republic and Haiti. The absence of predation on the Hispaniola population reduces the modeled rate of population decline and essentially eliminates extinction risk over 100 years. Even so, this scenario does not result in a population increase/recovery trajectory. For this, other strategies are required to increase the number of birds or nest sites in the population or reduce predation on other islands.



Fire is another threat Black-capped Petrels are faced with. James Goetz

Other Mortality Threats

We modeled the outcome of birds “saved” from collisions and light attraction by adding some number of birds per year into the model. The rate of decline slowed and risk of extinction decreased, but obviously, the lower the number of saves, the smaller the impact. Moreover, the effect on the decline is mainly in the early years (10-20yr). Conversely, repeated high mortality events (e.g., large fire event, collision in fog event) modeled by removing 50 birds per year results in quasi-extinction within 100 years.

Population Recovery

The model was used to examine the effects of multiple strategies together. The results from a variety of scenarios included:

- A population that gained stability through translocation of 100 birds to a threat-free nest site plus discovery of another site with 200 birds.
- A population that gained stability through translocation of 50 birds plus removal of threats on Hispaniola (no loss due to encroachment, predation, or collisions/groundings).
- A positive population trajectory required an optimistic scenario such as discovery of another site with 200 birds, translocation of 50 birds to a new site, and reduction of threats at all nest sites.

The Seabird mPVA helps us to appreciate the level and length of effort that will be needed to secure a resilient Black-capped Petrel population.

POPULATION AND HABITAT GOALS

Use of Key Ecological Attributes

Goals are defined as formal statements detailing a desired impact of a project on the desired status of conservation targets over the long term (CMP 2020). Goal-setting is an iterative process, and goals should be revised as new information becomes available, new partnerships are established, resources are developed.

The 2012 Black-capped Petrel Conservation Plan (Goetz et al. 2012) proposed the following 10 to 20-year goal: “Ensure the long-term survival of a stable population of Black-capped Petrel whose conservation status has improved from Endangered to Near Threatened on the IUCN Red List¹”.

This goal remains valid but it should be accompanied by other goals with metrics to gauge incremental change.

In this round of planning, our team took the Conservation Standards approach of identifying Key Ecological Attributes (KEAs). KEAs are aspects of a target’s biology or ecology that define the health of a target (FOS 2009). Conversely, a missing or diminished KEA would lead to the outright loss or extreme degradation of its associated target over time. Then, using the best available information, we assigned levels of target health (poor, fair, good, very good) to expected ranges of variation for each indicator. There is plenty of uncertainty in setting ranges due to lack of data. For example, if the total population is estimated at up to 1,000 nests; then only 10% have been found and monitored (100 nests). Whenever possible, we drew upon analogous studies with related species.

We identified Black-capped Petrel KEAs (Table 5) that relate to demographic parameters (i.e., population size, productivity, survival) and to its nesting habitat (i.e., distribution, intactness and management). The KEAs are those for which indicator data are already available or that can soon be available. These KEAs comprise the basic elements of a monitoring plan for the species.

For some of the KEAs, baselines are required because the status is a relative, not absolute, measure. For example, the absolute number of birds was not designated as an indicator even though global Black-capped Petrel population was identified as a planning target. This is because of the high level of uncertainty in an absolute population estimate for this species. Rather, relative change in numbers of targets observed in radar surveys at established sites and intervals has been selected as one of the primary means of assessing long-term trends in global petrel populations. See [Breakout: Petrel Monitoring with Radar](#).

Moreover, absolute areal extent of petrel habitat was also not selected as an indicator. Nest density varies greatly from site to site, likely due to site characteristics as well as level of threat. Our understanding of habitat preferences and needs by petrels is limited (e.g., burrow availability or extent of vegetative cover), but it appears that Black-capped Petrels are plastic in their selection of habitat for nesting. Thus, absolute area of petrel habitat (based on modeling or nest-polygons) is not a suitable attribute for conservation planning. It is better to assess the distribution of habitat over discrete sites, and the number of nests located within this habitat.

¹The Black-capped Petrel’s listing as Endangered on the IUCN Red List is due to its very small, fragmented and declining breeding range and population. Criteria B2ab(ii, iii, v) apply. The petrel’s geographic range is specifically relevant in the form of Criteria B2: Area of occupancy is:

- a) Severely fragmented or known to exist at no more than five locations;
- b) There is continuing decline, observed, inferred or projected, in:
 - (ii) area of occupancy;
 - (iii) area, extent and/or quality of habitat; and
 - (v) number of mature individuals.

One KEA refers to the percent of the habitat known to support nests that is cleared. Habitat degradation and loss observed in the past is typically sequential: 1) an area is utilized for wood and forest product collection, 2) underbrush is cleared by grazing, 3) remaining trees are removed, and 4) the ground is tilled. This serial manner of degradation is useful to predict where more damaging activities will follow and it requires vigilance to focus efforts on conservation before forest clearing occurs.

Table 5. Key Ecological Attributes

Key Ecological Attribute	Indicator	Status of Target				Basis of status ranges	Information Needs
		Poor	Fair	Good	Very Good		
Flyway Population Index	Number of radar targets/effort at selected flyways	Any loss	No change	+0-5%	≥10%	IBPCG expertise	Refine sampling and analytic protocols; specifically select drainages/flyways and decide frequency and timing that give power to detect trends. Look to Marbled Murrelet monitoring as an example.
Breeding Vocal Activity	Call rate (calls per minute, during peak activity period) at nesting sites	0.04-0.8	1 to 5	9 to 20	> 20	Based on data from Hawaiian Petrel*	Develop sampling and analytic protocols, considering density and range; intensify ARU deployment for baseline.
Colony Occupancy	Active nests/Total nests at each nesting site	<30%	30-50%	50-70%	>70%	Sister taxa**	Establish study zones (consistent across years) within sites; develop a protocol that is consistent across sites, including dates or period for assessing activity, accepted proofs of activity.
Reproductive Success	Fledged nests/Active nests at each nesting site	<30%	30-55%	55-75%	>75%	Sister taxa**	Establish study zones (consistent across years) within sites; develop a protocol that is consistent across sites, including dates or period for assessing fledging, accepted proofs of fledging; tools to standardize data.
Breeder Return Rate	Number of individual breeders that return in following year (%)	<25%	25-50%	50-75%	>75%	Sister taxa**	Develop a mark-recapture program.
Habitat Intactness	% of Minimum Suitable Breeding Habitat Cleared	>50%	50% - 10%	10%	No loss, or habitat gain	IBPCG expertise	Establish minimum suitable polygons consistent across years***.
Breeding Distribution	Number of confirmed nesting sites****	<4	4-5	6-7	>7	Number of probable and suspected breeding areas	Continue searches in probable and suspected areas.

* M. Mckown & A. Raine, pers comm. These values need to be calibrated for the Black-capped Petrel.

** Values based on sister taxa <https://docs.google.com/spreadsheets/d/1aylOjkhsk5Jkz4n9UNHSiguT7p5NS4BETDqKASK7WTA>

*** The development of minimum convex polygons area encompassing the current petrel nests at each site is a useful tool for registering vegetative changes, but it is a less telling parameter than number of active nests.

**** Immigration/emigration (demographic connectivity) between nesting sites is expected to be low; thus, the number of sites is an important driver of global population viability.

Our KEAs are quite similar to the factors used to assess species viability in the SSA prepared under the U.S. Endangered Species Act (USFWS 2018b; Section 3.2). Authors of the SSA characterized the condition of the Black-capped Petrel population in terms of resiliency, redundancy and representation. Resiliency factors included number of individuals per breeding population (measured by acoustic detections and radar detections) and nest success (measured by percent of nests fledging). These factors were also selected as KEAs. In the SSA, redundancy is characterized by the number and geographic dispersion of breeding populations; this factor is also a KEA. Finally, the SSA characterizes representation by examining what is known about genetic and phenotypic diversity for the Black-capped Petrel, including diversity in use of breeding and foraging habitats. Conclusions are limited by information gaps. Similarly, our team felt that the paucity of data prevented us from considering different genetic forms of the petrel as separate conservation targets (for which KEAs could be established). The close agreement between the viability factors in the SSA and the KEAs serves to validate each. The small differences in metrics and the ranges established to characterize condition reflect the paucity of data; these can be revisited as more information becomes available.

KEA Status and Goals

In three cases, current data are insufficient to assess relative change or absolute values, either because a method needs to be developed or because data need to be analyzed. In these cases, developing and implementing the method serves as the goal. In four cases, data are sufficient to assess status at a baseline level and/or in recent years. The generic goal across all KEAs is to see improvement, or at minimum, stabilization in KEA status in the short-term. Our goals are generally set from one to five years in the future.



Radar surveys will be used to assess changes in population size, a Key Ecological Attribute. EPIC

Table 6. Tracking Goals for Key Ecological Attributes

Target	Indicator	Baseline Source	Status [Year]				GOAL
			Poor	Fair	Good	Very Good	
Flyway Population Index (proxy for Population Size)	Number of radar targets/ effort at selected flyways	Radar surveys (years)	Any loss	No change	+0-5%	≥10%	Radar surveys to be repeated every 5 years.
Selected Flyways for Haiti/Dominican Republic border area (MV,LdT, Zapoten)		Surveys 2012-2014	[2017]				Fair by 2022 Survey
Selected Flyways for La Visite		Surveys 2012-2014	[2017]				Fair by 2022 Survey
Selected Flyways for Macaya		Surveys 2012-2014	[2017]				Fair by 2022 Survey
Selected Flyways for Valle Nuevo		Surveys 2012-2014	[2017]				Fair by 2022 Survey
Selected Flyways on Dominica		Survey 2015	[2020]				Fair by 2025 Survey
Selected Flyways on Guadeloupe		Survey 2020	To be determined				Conduct 2025 Survey
Breeding Vocal Activity (proxy for Population Size)	Call rate (calls per minute, during peak activity period) at nesting sites	To date, BCPE acoustic activity has only been used to help direct ground searches.	<1	1 to 3	5 to 10	> 10	By 2022, establish and implement a method so vocal activity can provide an index for comparing relative abundance of petrels across sites and through time.
Confirmed nesting sites		To be established.	To be determined				To be determined
Colony Occupancy*	Active nests/ Total nests at each nesting site	Nest monitoring, all years.	<30%	30-50%	50-70%	>70%	By 2021, review data to assess whether total nest number is known from early season check.
Confirmed nesting sites		To be established	To be determined				To be determined
Reproductive Success*	Fledged nests/ Active nests at each nesting site	Nest monitoring, all years.	<25%	25-50%	50-80%	>80%	Note: Uncertainty in limited number of visits. May miss early season predation.
	Loma del Toro	Monitoring since 2012**		[2018]	[2012-2019]	[2016]	Remain Good

Target	Indicator	Baseline Source	Status [Year]				GOAL
			Poor	Fair	Good	Very Good	
	Loma Quemada	Monitoring since 2016**		[2016, 2018]	[2019]		Remain Good
	Valle Nuevo	Monitoring since 2019**	[2020]	[2019]			Good by 2025
	La Visite - Tet Opak	Monitoring since 2018**		[2018, 2019]		[2020]	Good by 2025
Breeder Return Rate	Number of individual breeders that return in following year (%)	Requires mark-recapture	<25%	25-50%	50-75%	>75%	Establish a mark-recapture program by 2025.
Confirmed nesting sites		To be established	To be determined				To be determined
Habitat Intactness	% of Minimum Suitable Breeding Habitat Cleared	Visual observation/ opinion from year when nests were first detected	>50%	50% - 10%	10%	No loss, or habitat gain	Improve Baseline and follow-up assessments with method using nesting polygons and habitat surveys
Clearing at Morne Vincent		Observations in 2011 (Rupp)				[2020, all nests vegetated]	Remain Very Good
Clearing at Valle Nuevo		Observations in 2017 (Rupp)				[2020, all nests vegetated]	Remain Very Good
Clearing at La Visite - Tet Opak		Observations in 2018 (Brown)		[2020, 10 of 42 nests exposed]			Good by 2025
Clearing on entire La Visite escarpment		Based on observations since 2009 (Goetz), Tet Opak exemplifies greater escarpment.	Until nests located, cannot establish baseline (unless we use some other polygon as a proxy, e.g., suitable habitat)				Good by 2025 - same as Tet Opak
Global petrel population	Number of breeding areas	Search results to date	<4	4-5	6-7	>7	
Number of confirmed discrete breeding areas		In 2017, 4 areas: La Visite, Border (Morne Vincent + Loma del Toro), Loma Quemada, Valle Nuevo		[2020]			Good by 2025

* Values based on sister taxa <https://docs.google.com/spreadsheets/d/1aylOjkhsk5Jkz4n9UNHSiguT7p5NS4BETDqKASK7WTA>

** Where years are missing, data are insufficient to calculate fledging success

CONSERVATION PLANNING TOOL: PETREL MONITORING WITH RADAR

Since 2012, we have used marine radar technology to survey for Black-capped Petrels in flyways, to locate nesting areas, and to determine trends at sites with multiple years of data. This work is being led by EPIC in tandem with local partners.

Reaching the remote, rugged nesting sites of Black-capped Petrels is fraught with logistical challenges. Further, audio and visual methods typically used to assess nesting activity are extremely limited when used for species which visit breeding areas only at night. Ordinarily used at sea to avoid collision with other boats, marine radar can also be used to locate small flying objects on land, including birds and bats. This method thus extends our ability to observe and monitor petrels, by enabling accurate, consistent counts. In 2012-2014, EPIC conducted radar surveys in parallel with conventional audio/visual surveys on Hispaniola, demonstrating that radar is indeed an effective observation and monitoring tool for Black-capped Petrels.

In 2012-2014 and 2017, we monitored several sites on Hispaniola (Figure C); we used the same sites each time to allow for comparisons. Each monitoring night, we started radar surveys at sunset, when petrels become active at flight corridors and nesting areas, and ended them three

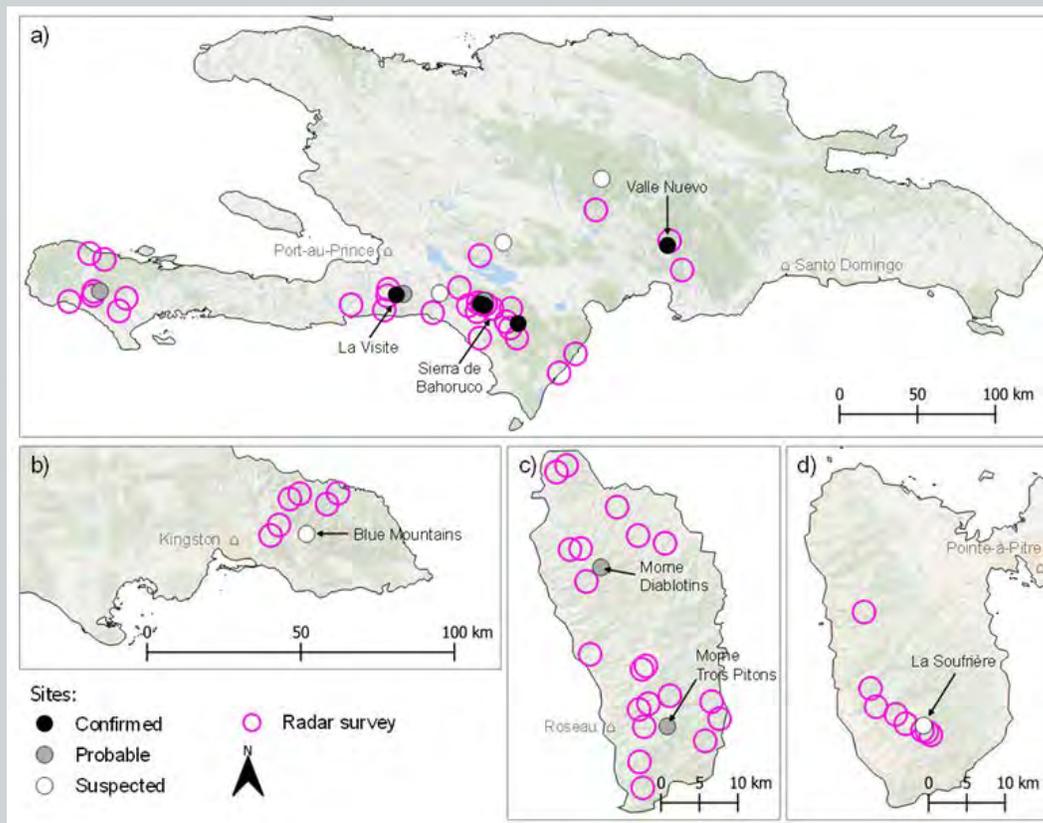


Figure C: Location of radar surveys for Black-capped Petrels in the Caribbean, 2012-2020. a) Hispaniola, b) Jamaica, c) Dominica, and d) Guadeloupe.

CONSERVATION PLANNING TOOL: PETREL MONITORING WITH RADAR

hours later, when petrel activity slows¹. We set up the radar within 1.5 km of sites of interest, allowing for the detection of flying targets at a substantial distance while still recording a clear radar signal. Using these methods developed on Hispaniola, we identified petrel flyways and potential nesting areas on Dominica (2015 and 2020), Jamaica (2016) and Guadeloupe (2020). In all places, we conducted surveys with the assistance of local conservation partners, both for the necessary logistical support and to train local biologists in radar techniques. Once baseline population indexes for petrel activity centers have been established, we seek to repeat surveys every five years at each site. While surveys have been completed at all suspected high activity flyways and centers on Hispaniola, surveys with radar for new flight corridors and new nest colonies is not complete; some additional areas should be visited to rule out activity.

Results of repeated surveys on selected flyways on Hispaniola (2012-2014, 2017) and Dominica (2015, 2020) indicate that Black-capped Petrel population numbers are declining². On Hispaniola, the total number of radar targets on re-surveyed flyways decreased. In the Dominican Republic, downward trends were seen in the Cordillera Central with more pronounced downward trends in both the eastern and western Sierra de Bahoruco. In Haiti, opposite trends were detected between the eastern area where there was a significant decrease, and western Massif de la Selle where there was a robust increase. On Dominica, the total number of detected targets in 2020 was concerningly lower than the number detected in 2015.

We continue to recommend radar as a critical tool for locating Black-capped Petrel terrestrial flyways and nesting areas (Strategy #3). Furthermore, use of radar at established sites at intervals has been selected as one of the primary means of assessing long-term trends in the petrel populations (see main text discussion of Key Ecological Attributes), and has been demonstrated for Hawaiian Petrel³.

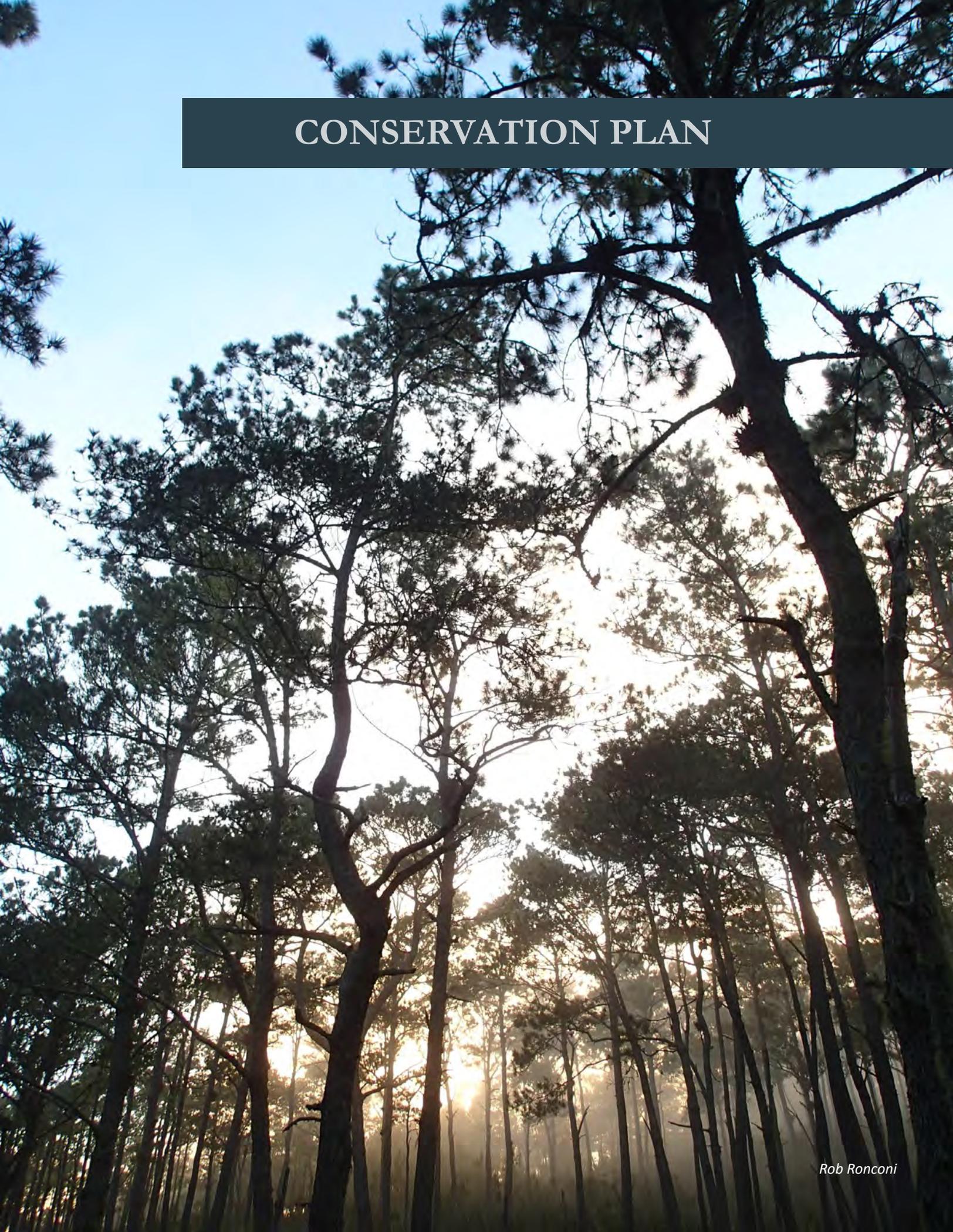
¹Brown, A. 2012. Towards Black-capped Petrel Conservation; Report to the Disney Conservation Fund. Unpublished Report. 6 pp. Green Cove Spring, Florida, USA: Environmental Protection in the Caribbean.

Brown, A. 2014. Radar Surveys for Black-capped Petrels on Hispaniola: January – March 2014. 11 pp. Green Cove Spring, Florida, USA: Environmental Protection in the Caribbean.

²Brown, A. 2017. Radar Surveys, Nest Monitoring and Conservation of the Black-capped Petrel on Hispaniola: February 2017. Unpublished Report. 7 pp. Green Cove Spring, Florida, USA: Environmental Protection in the Caribbean.

Brown, A. 2020. Radar Surveys for Black-capped Petrels on Dominica: Results from an Expedition During January and February 2020. Unpublished Report. 12 pp. Green Cove Spring, Florida, USA: Environmental Protection in the Caribbean.

³Raine et al. 2017.



CONSERVATION PLAN

Rob Ronconi

DEVELOPMENT OF CONSERVATION STRATEGIES

Once targets and threats are identified, the Conservation Standards recommend that a planning team undertake situational analyses. This process allowed us to describe the context of Black-capped Petrel conservation and it facilitated the identification and rating of strategies (CMP 2020). Specifically, we created conceptual models to depict the links between targets, their direct threats, the factors contributing to these threats, and the possible strategies to ultimately reduce the threats (Figure 4). In theory, any factor in a conceptual model offers an opportunity for intervention. In some cases, the most obvious key intervention point is the direct threat itself (e.g., reducing predation by invasive mammals). In other cases, interventions may be directed towards one of the chain of factors affecting a direct threat (e.g., influencing an ocean-use policy or improving land management practices). Some interventions may directly benefit the target (e.g., colony creation by translocation) or enable conservation activities generally (e.g., raise capacity of local partners). By convention, conceptual models shown strategies to the left or right of the target, depending on their type.

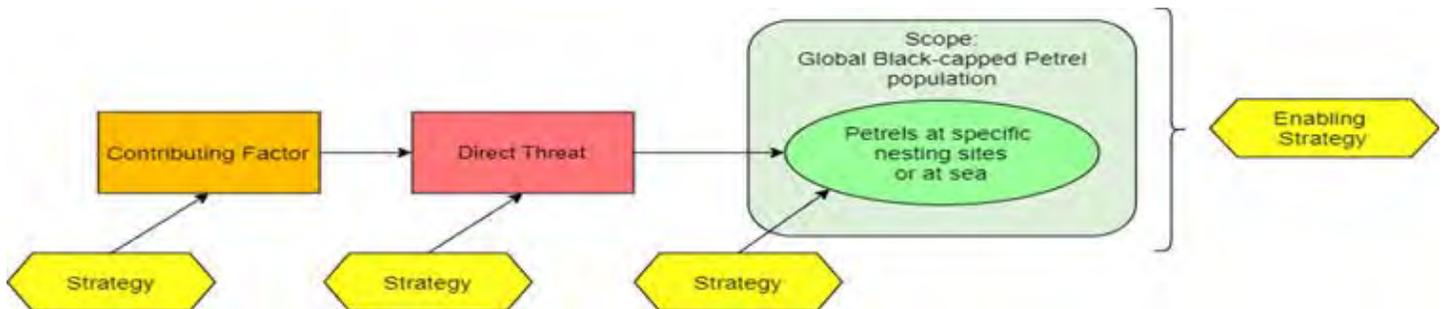


Figure 4: Conceptual model and types of strategies.

Our team developed conceptual models for petrels at the five confirmed nest sites; these have had enough recent study and engagement to understand specific contributing factors and strategies that could be undertaken. We also created conceptual models that depicted the factors that contribute to threats at sea. See [Appendix 4: Situational Analyses – Conceptual Models](#). These models are an expansion of more generic models depicted in other planning exercises (i.e., Gulf Avian Monitoring Strategy Guidelines; Jodice et al. 2019).

The Conservation Standards suggest the use of results chains to depict “theory of change”, defined as a series of causally linked assumptions about how strategies lead to the achievement of both intermediate results and longer term conservation goals. A chain of results is used to show how a set of actions tied to a strategy will influence a situation, and explicitly define relationships among actions, impacts of actions, and how they lead to the desired outcomes. Two generic results chains are shown in Figure 5; one shows a strategy to reduce a threat (shown from left to right); while the other is an enabling strategy (shown from right to left). Similar to conceptual models, theory of change models are intended to make assumptions clearer, allow discussion of uncertainty, and entertain varying opinions, concerns, and clarifications (CMP 2020). We developed these models iteratively; they will continue to evolve as strategies are tested, new information becomes available and/or conditions change.



Figure 5: Result chains depicting theory of change

STRATEGY SELECTION

In the face of limited resources, a project team needs to decide which of all possible strategies it will undertake immediately, defer until later, or which it will not undertake (CMP 2020). In building our conceptual models, our team attempted to show the situation with the petrel today and include all the strategies that we think are important and relevant. Implicit in that step was the dismissal of strategies that were felt to be wholly ineffective or infeasible. For example, strategies of government enforcement of Haitian National Parks borders are not viewed as feasible; historic attempts to evict residents and users proved unpopular, inhumane and incited violence. Likewise, there is no known intervention that could be proposed to directly reduce the threat of increasing hurricane fallout due to anthropogenic climate change.

In other cases, potential interventions were identified in conceptual models, but continued development of the strategies was deferred until more information could be acquired. An example of this is the set of potential community interventions identified for La Visite, but not developed further, in favor of a scoping study – an enabling strategy – to better understand the socio-economic drivers within the community.

Finally, in some cases, it was recognized that some outcomes are beyond the manageable interests of the team; for example, reduction in the at-sea threats of depleted prey, marine energy activities, plastics and other contamination. In this case, the strategies included in the theory of change models are limited to those relevant to our team (e.g., communicating to organizations who do advocacy work), rather than the strategies beyond the scope of the team's organizations (e.g., researching at-sea plastic cleanup technologies).

Then, we developed theory of change diagrams for nine strategies. These included enabling strategies to overcome the challenges posed by lack of information and lack of local capacity, as well as to take advantage of colony restoration opportunities. Other strategies are those proposed to address land-based and at-sea threats. (See [Appendix 5: Theory of Change – Results Chains](#)). Some of the identified strategies are already well underway; others are in preliminary stages or yet to be commenced.

STRATEGY RATING

Once strategies were developed, we undertook a criteria-based comparison to further differentiate between strategies. Each strategy or sub-strategy was scored on a four-point scale for criteria relating to impact (probability of change, duration of change) and feasibility (financial, technical, organizational, and social/ethical). Scores were averaged across team members involved in the rating, then the averages combined to generate ratings of overall impact and feasibility.

For strategies of threat reduction (that is, interventions directed at threats or at one of the factors contributing to that threat), we developed an additional rating that integrated the level of the threat. [Appendix 6: Strategy Rating](#) presents the details of the exercise, along with concerns about strategy limitations and risks.

Table 7 presents the strategies and substrategies recommended for the conservation on the Black-capped Petrel. Those strategies which we believe are paramount or most pressing are in bold. Enabling strategies by definition are paramount (Strategies 1,2,3 and 7), and those with the highest impact and feasibility rating coupled with and highest threat rating were Strategies 4 and 6a,b.

Table 7 – Strategies for the Conservation of the Black-capped Petrel*

Strategy ID	Enabling Strategies	Applicable to which target?
1	Build in-country capacity	Range-wide
2	Locate & characterize nesting sites throughout Caribbean	Range-wide
3	Explore Restoration Methods	Range-wide
	Strategies to Address Threats	
4	Reduce predator pressure	All Land Sites
5	Reduce flight hazards (collisions and groundings)	All Land Sites
5a	Voluntary solutions with tower industries	All Land Sites
5b	Regulatory solutions with government to tower issues	All Land Sites
5c	Awareness campaign to decrease light pollution	All Land Sites
6	Support of community development in Boukan Chat	
6a	Sustainable agriculture and reforestation programs	Morne Vincent
6b	Environmental awareness and education programs	Morne Vincent
6c	Economic empowerment - VSLA facilitation	Morne Vincent
6d	Economic empowerment - livelihood training	Morne Vincent
6e	Engage with government to clarify and strengthen oversight of forested areas	Morne Vincent
6f	Stove Program	Morne Vincent
7	Undertake scoping study of socio-economic drivers of the threats at La Visite**	La Visite
8	Engage Dominica Republic government to plan and strengthen oversight of parks	
8a	Direct engagement	DR Parks
8b	Public advocacy	DR Parks
8c	Habitat restoration	Valle Nuevo
9	Address threats at sea through advocacy	
9a	Better incorporation of pelagic seabirds in fishery management plans	At sea
9b	Stronger regulation of and mitigation from marine energy	At sea
9c	Better compliance of marine energy industries to regulations	At sea
9d	Stronger regulation of contaminant releases	At sea
9e	Stronger regulations of plastic usage regionally	At sea

*Strategies in bold are those considered paramount, based on consideration of need, impact, feasibility and threat level.

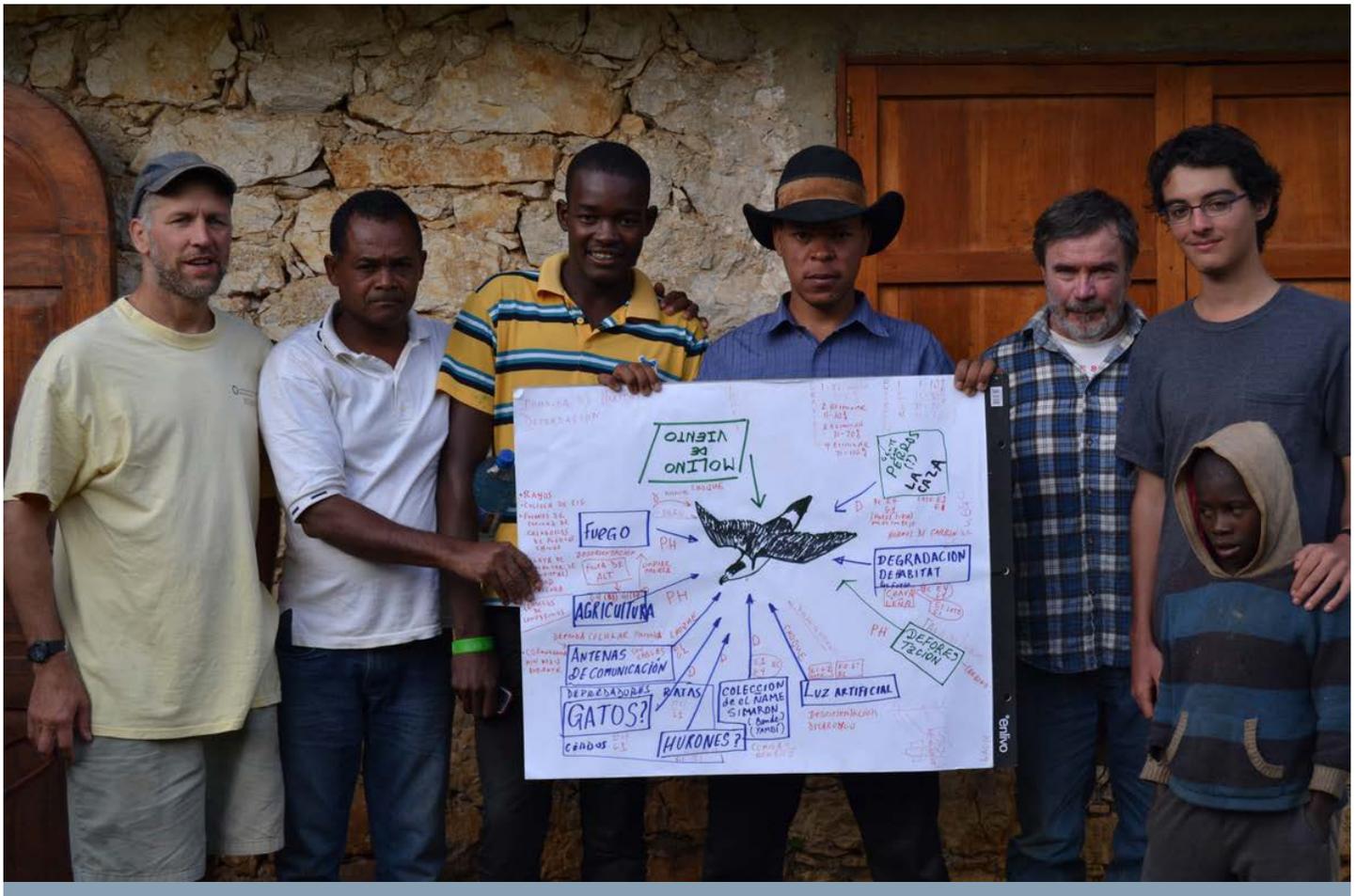
**Initially several strategies to address threats were proposed for La Visite, but these were deferred in favor of undertaking an enabling strategy to fill information gaps.

THE NEED FOR MULTIPLE STRATEGIES

These paramount strategies must be undertaken in combination to achieve the ultimate vision that the Black-capped Petrel is flourishing throughout its range on land and at sea. In fact, we believe no single strategy can result in a population increase, much less a flourishing population. Only by pursuing a number of strategies that synergistically compound the gains from reduced threats and active restoration can we expect to see an upward population trajectory.

PRESENTATION OF STRATEGIES

The following sections detail the strategies identified for Black-capped Petrel conservation. For each, we provide a short introduction to ongoing activities relating to the strategy. We provide a simple diagram (i.e., one condensed from the full diagrams shown in [Appendix 5](#)) and a description of the theory of change. Key information needs relevant to the strategies are highlighted. Finally, a table of specific objectives and activities is provided.



Multiple threats to the Diablotin have been identified, calling for multiple conservation strategies. James Goetz

STRATEGY 1: BUILD IN-COUNTRY CAPACITY

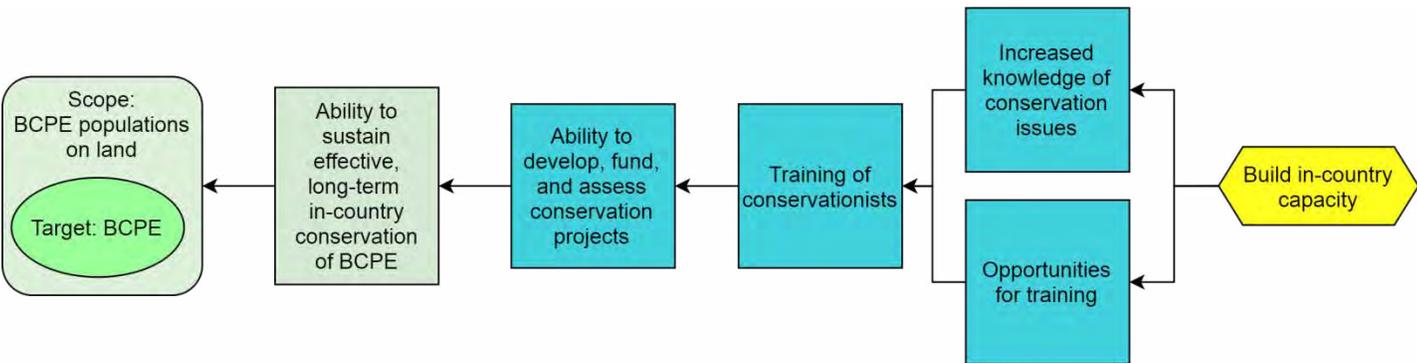
Background

We recognize that the conservation of Black-capped Petrel relies on engaging individuals and organizations that are “in-country” – that can operate at the local-scale (where many conservation projects operate) to national scale (where much conservation policy is decided). Support for these partners has involved outreach to in-country partners, development and administration of international grant support for institutional strengthening¹ as well as for field projects, and an emphasis on training and relationship-building².

Regarding current leadership and capacity: the nongovernmental organization Grupo Jaragua has taken the lead in conducting field work in the Dominican Republic in collaboration with international partners. Grupo Jaragua has permanent professional staff and a good capacity for funding-raising, but is challenged by aging field equipment (e.g., vehicles). In Haiti, the recently-formed nongovernmental organization JASCEH is growing into leadership for field efforts in Haiti, for which Société Audubon Haiti and Fondation Seguin have long provided support. The islands of Dominica, Guadeloupe, Cuba and Jamaica have good conservation capacity (professional conservationists in government and nongovernment agencies), but until nests are confirmed there, the resources necessary and available for focused study and conservation of the petrel are undetermined.

Ensuring this capacity into the future and for the planning horizon (25-50 years) requires long-term work fostering the practice of conservation in general. Regardless of existing coverage, and especially if more sites are located on or outside Hispaniola, there is an ongoing need for trained conservationists with experience not only in nest searching or monitoring but also in conservation and academic leadership including project management, project funding, and development of research programs.

Strategy Logic



Strategy Description

Building in-country capacity is central to launching or expanding projects, as well as for the long-term sustainability of current conservation interventions in-country. We believe that through a variety of outreach activities, knowledge and concern about conservation issues can become more widespread in society. The international organization BirdsCaribbean has developed programs such as the annual Caribbean Endemic Bird Festival (CEBF) and Caribbean

¹Examples include: MacArthur Foundation and U.S. Forest Service allowed BirdLife to support Société Audubon Haiti biologist positions 2011-2013; MacArthur Foundation and National Fish and Wildlife Foundation provided a capacity grant to BirdLife partner, Grupo Jaragua 2015-2017

²Examples include: Vermont Center for Ecostudies international trainings in the northeast U.S.; Grupo Jaragua and J. Goetz have provided trainings for multiple biologists and technicians on Hispaniola; a technical exchange involving teams from the Dominican Republic and Dominica took place in those countries in 2014 and 2017.

Birdsleuth school curriculum to help develop a conservation ethic; when implemented by local partners these also work to increase local capacity, local leadership, and participation of partners and conservation outcomes. That is, local institutions already tied to conservation work strengthen as they work to engage their communities.

As a conservation ethic grows in society, individuals, especially youth, will develop an interest in additional education and training. Opportunities for training and employment must also be made known to these individuals, in order to foster long-term personal and professional commitment to conservation. Supported by the international conservation community, trained in-country conservationists will be in a position to develop, fund, implement and assess petrel conservation projects. Ideally, there should be at least one locally-based partner on every nesting island who is willing and able to implement a petrel-focused project. These petrel “champions” might be students, academics, agency or nongovernmental organization (NGO) biologists; the most important quality is a keeping an ongoing focus on petrel conservation.

Key Information Need: Social science on effective institutional strengthening for relevant Caribbean nations, as well as the factors influencing the development of natural resource conservation ethic in their societies.



Cross-island training between Dominican Republic and Dominica raised on-island research capacity. ABC

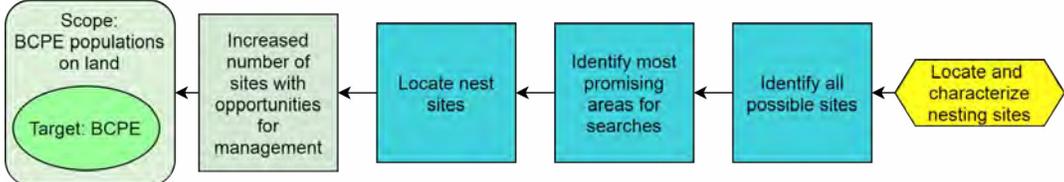
Strategy #1: Build In-Country Capacity		
Objective 1	Societal awareness and positive attitudes towards petrels and their habitats foster engagement and support for conservation activities over the long-term.	
	Activity 1.1	Highlight the Black-capped Petrel in broad public outreach, awareness and education programs about the importance of conservation.
		<i>Examples: Media coverage of survey expeditions; a “Save the Devil” documentary film series led by filmmaker Aaron Straight, in collaboration with EPIC; Diablotin Festival in Boukan Chat, led by JACSEH and EPIC; Grupo Jaragua’s work to compile teacher resources .</i>
		Indicators: Proximate: Number of festivals; number of media items, number of new teaching tools, number of schools reached, number of people reached. Ultimate: Government and civic engagement in conservation-related activities.
	Activity 1.2	Engage Caribbean biologists from across taxonomic fields who can collaborate on addressing shared threats or habitats (e.g., forest ecologists, herpetologists, etc.).
Objective 2	Students in secondary and undergraduate programs are aware of Black-capped Petrel conservation, and have opportunities to attend internships, fellowships and graduate education programs.	
	Activity 2.1	Identify and promote academic opportunities relevant to petrel conservation and support interested students.
		<i>Examples:</i> <ul style="list-style-type: none"> • Graduate programs (MS, PhD) supported by Caribbea initiative • Grupo Jaragua’s environmental education programs for secondary students
		Indicators: Proximate: Science faculty leads contacted, students reached. Ultimate: Number of secondary students reached; Increased academic engagement in BCPE research (e.g., number of Caribbean universities and students working on BCPE or with communities with BCPE); number of Caribbean graduate students with projects on BCPE.
Objective 3	In-country conservationists (field technicians, resource managers, program leaders) have opportunities for training in programs that will benefit BCPE.	
	Activity 3.1	Identify and promote opportunities for field technicians and environmental leadership opportunities relevant to BCPE to in-country conservationists
		<i>Examples:</i> <ul style="list-style-type: none"> • Field opportunities like Project Puffin • Fellowships such as Edge of Existence or Conservation Leadership Programme • BirdsCaribbean’s periodic trainings in grant-writing, outreach.
		Indicators: Proximate: Communiques/listings of opportunities. Ultimate: Number of individuals who have taken advantage of training, gaining knowledge of BCPE, the threats to their nesting habitat, management practices to reduce impacts to BCPE, and the means to implement best practices.
Objective 4	Government and non-government organizations have positions that allow nationals to undertake BCPE conservation as paid professionals.	
	Activity 4.1	Encourage governments to fulfill national and international conservation mandates by hiring conservation professionals
	Activity 4.2	Support in-country organizations in building up staff and capacity.
		Indicators: Proximate: Institutional growth government and non-government agencies engaged in species conservation.

STRATEGY 2: LOCATE AND CHARACTERIZE NEST SITES

Background

During the last ten years, the working group has focused on locating and characterizing nest sites. As a result, 100 nests have been identified since the first plan was drafted. A scheme of radar surveys for flying petrels and ground-searches aided by acoustic monitoring were conducted on Hispaniola to determine the extent of nesting petrels at historical and potential petrel activity centers. Despite technology, locating nests has been a laborious process especially since areas are remote and difficult to access, and steep and forested and difficult to survey. Many areas remain to be searched. Successful at-sea capture and tracking of petrels in 2019 offers a method to locating nest areas, especially of targeted light forms (Satsgé et al. In prep.). Additionally, habitat suitability modeling provides a tool to direct nest searching efforts to areas of suitable habitat (Satsgé et al. 2020).

Strategy Logic



Strategy Description

Key Information Need: Confirmation and detailed information on nesting locations.

Knowing the location and numbers of petrel nests gives the clearest picture of the species’ breeding distribution and success. More impactfully, as more nests are located, there are more options and opportunities for management. If we know where sites are, we can better characterize threats and pursue interventions to reduce threats or enhance populations.

We do note that, although nest confirmation should be a precursor for large-scale investment in conservation actions at any site, some strategies may be worth pursuing at probable and suspected sites. For example, low-cost activities to reduce flyway hazards, increase community awareness, and control invasive mammals can benefit petrels in the absence of nest confirmation and will have benefits for other native species regardless of petrel presence.

Strategy #2: Locate and Characterize Nest Sites	
Objective 1:	All confirmed, probable and suspected sites <u>on Hispaniola</u> have received comprehensive search effort with all relevant methods and tools by 2025.
Objective 2:	By 2025, at least one additional island (Dominica, Cuba, Jamaica, Guadeloupe) has been explored more thoroughly for nesting sites.
Activity 2.1:	Implement ground searches using all known efficient methods and tools to narrow search areas, prioritizing search areas by strength of evidence of nesting.
	Indicators: Number of studies/level of search effort at all known, probable and suspected sites; Percentage of suitable habitat searched.
Activity 2.2:	Explore and integrate additional techniques (sniffer dogs, thermal cameras, community interviews, at-sea capture and tracking) to direct searches to new nest sites.
	<i>Example: In Cape Verde islands, Militao and colleagues (pers. comm.) conducted interviews with hundreds of local people to gain knowledge of old colonies of Fea’s Petrel or Gongon.</i>
Activity 2.3:	Pursue other clues and techniques (for example, examination of color forms, genetic analysis) to assess whether the located colonies represent the full population (account for the observed variation).
Objective 3:	Threats are characterized at all newly discovered sites through appropriate research and monitoring (e.g., nest visits, camera traps, flight hazard mapping).

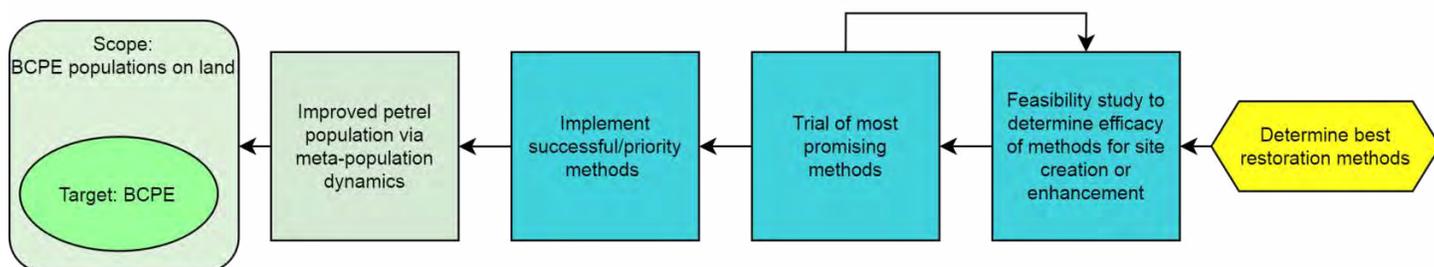
STRATEGY 3: EXPLORE RESTORATION METHODS

Background

Seabird restoration can be defined as the “deliberate human-aided movement or attraction of seabirds to establish or enhance a colony” (The Seabird Restoration Database 2020). The two primary restoration methods advanced for imperiled petrel species around the world are (1) Translocation – in which individual near-fledged chicks are physically moved by humans from a source location to a restoration location; and (2) Social Attraction – in which sensory cues (e.g., broadcast vocalizations, deploying decoys, olfactory lures) are used to attract breeding birds to restoration locations (Jones and Kress 2012). Restoration locations may be at sites where the species previously struggled or was extirpated or may be novel to the species, but any site must provide habitat suitable for nesting and be free from significant threats (i.e., predator-free sites; Jacobs et al. 2020).

Seabird restoration methods actively restore seabirds through management rather than allowing seabirds to passively recover following the removal or reduction of threats. Restoration is especially valuable in cases where: seabirds do not readily colonize new breeding sites, risks cannot be eliminated at existing breeding sites, productive restoration sites can accelerate population growth by offsetting losses elsewhere, and/or additional breeding sites reduce extinction risk posed by catastrophic events. Restoration has been implemented for *Pterodroma* species worldwide (e.g. Gould’s Petrel *Pterodroma leucoptera*, Priddel et al. 2006; Cahow *Pterodroma cahow*, Madeiros et al. 2012, Carlille et al. 2012) but not been employed for the Black-capped Petrel.

Strategy Logic



Strategy Description

Restoration can help to secure and recover the Black-capped Petrel. Exploration of restoration methods starts with undertaking a detailed analysis/feasibility study of translocation and social attraction in respect to the Black-capped Petrel, evaluating efficacy, cost and logistics, and best practice techniques. Methods recommended in the feasibility study must be field tested with the Black-capped Petrel. Although social attraction and translocation have been effective for other imperiled petrel species, these are all novel for the Black-capped Petrel. If the recommended active management methods produce the results anticipated from the pilot studies, we would be successful in improving viability of the species.

The feasibility study should assess:

Long-term Benefit to Species: Explicitly describing the overall project goals and justifications, and specification of principles (e.g., would restoration outside the species indigenous range be considered? are there justifications beyond species conservation?). Importantly, the desired biological outcomes (the seabird response) should be specified along with a plan to assess these outcomes.

Cost and Logistics: Identifying and assessing source and restoration sites, considering compliance and regulatory considerations (e.g., permits needed); logistics relevant for each method (e.g., timing of attraction tactics or relocations, staff and equipment needs); cost/benefits analysis of methods; and needed long-term commitments and financial resources

Best Practices: Ensuring the welfare of individual birds (e.g., techniques of transporting chicks and during a 2-3 week feeding period; design of nest boxes for the fledging chicks) and the highest likelihood of success (e.g., which forms of social attraction are most effective for the species)?

Limitations: Identify challenges of restoration, which may be ecological (e.g. ecological trap in habitat not suitable for optimal embryo development), logistical (e.g. limited availability of land, resources, and manpower; need for predator control) and socio-political (e.g. reluctance from local communities to have petrels “taken away” from them; reluctance from governments to accept international transfers).

Key Information Needs: We anticipate that the translocation feasibility study will call for research on growth and feeding rates, as well as diet composition, quantity, and quality. Also, the suitability of the restoration site as breeding habitat is paramount and much is unknown about microhabitat needs. Since current populations of Black-capped Petrels represent relicts of their former distribution, it is not clear how closely historic populations were tied to current habitats (Simons et al. 2013).

Strategy #3: Explore Restoration Methods	
Objective 1:	By 2025, full feasibility study of restoration methods relevant to Black-capped Petrel is completed with recommendations for pilot projects to test tactics.
Objective 2:	By 2030, restoration methods undertaken, as informed by pilot studies and models of requirements for resilient and increasing petrel population trajectory.
Activity 2.1:	Establish research sub-committee to oversee the progress of the strategy, including 1) the review of the feasibility study, 2) study design of pilot projects, and 3) evaluation of selected tactics.
Activity 2.2:	Identify experts to conduct the feasibility study and act as advisors on pilot projects



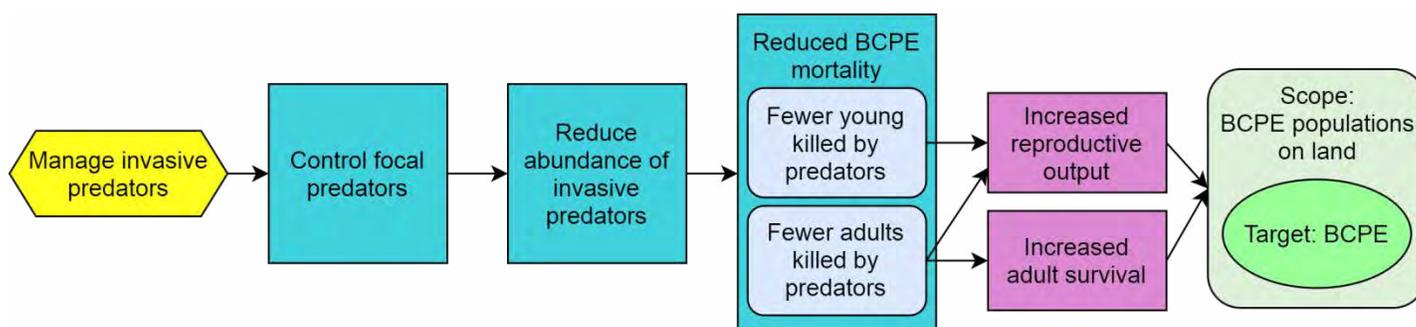
Research on chick development is needed to support any future translocation efforts. EPIC

STRATEGY 4: REDUCE PREDATOR PRESSURE

Background

Introduced mammalian predators are a critical threat to petrels worldwide (Rodríguez et al. 2019). Since locating nests on Hispaniola, petrel field teams have been collecting information about the presence and effects of introduced mammalian predators. Camera traps are used to document predators in or near burrows, and evidence of predation such as broken eggs and body parts are noted, in order to determine predation effects. To address the threat of predators, field teams on Hispaniola have deployed live traps at the start of laying period at confirmed petrel nest sites, especially where cats and mongoose have been noted. However, field teams can only spend limited time in the remote areas where nests are found, which limits the duration that live traps can be set because they must be checked regularly. The ideal approaches to predator control are those that have lasting effects and require only a low level of effort to maintain. The planning team is currently exploring the use of unattended, automatic-resetting lethal traps that are safe for native wildlife (particularly co-occurring Hispaniolan *Solenodon paradoxus* and Hispaniolan Hutia *Plagiodontia aedium*).

Strategy Logic



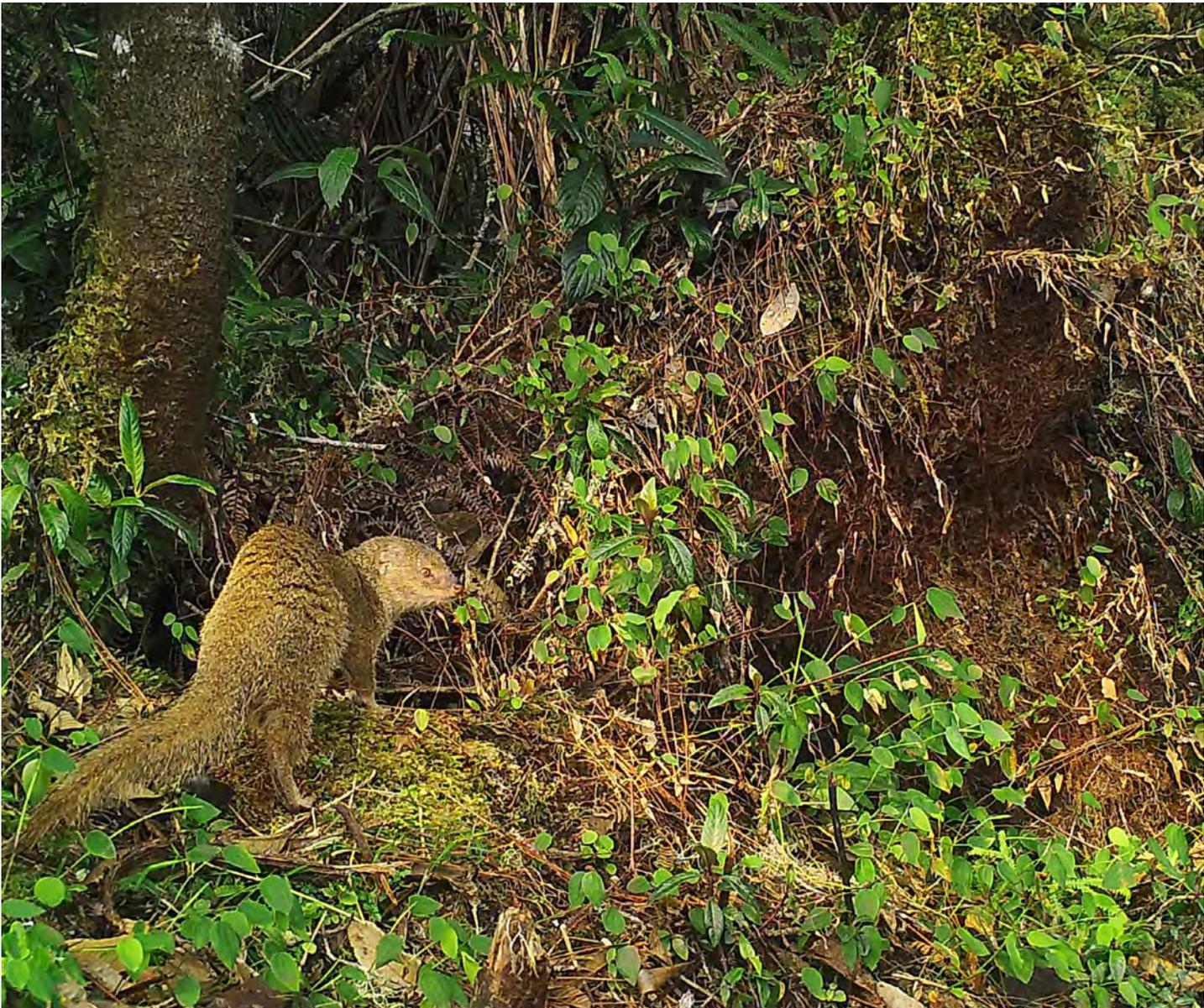
Strategy Description

We believe if the most harmful predators can be controlled such that their abundance is reduced, then mortality of adults, chicks, and eggs at nest sites will also decrease. Conversely, both reproductive output and adult survival will increase at these sites. Predator eradication is preferable to predator control, but mainland Hispaniola and the islands with probable and suspected nest sites are vast and densely populated with humans, making eradication impossible. The most effective methods of control (i.e., trapping, poisoning, hunting) will vary among locations and with predator type, its behavior, non-target risk, the conditions at the site, and the experience of the team. Another option might be sub-island predator-proof fencing (exclosures) – although no such approach has yet been used anywhere in the Caribbean. Data from similar *Pterodroma* species suggest that predator removal and/or long-term control can reverse declines and create long-term stability of nesting populations. For example, after 40 years of predator management in national parks, the Galapagos Petrel (*Pterodroma phaeopygia*) population has stabilized and increased by four-fold (Cruz et al. In prep.) For the closely related Hawaiian Petrel (*Pterodroma sandwichensis*), removing rat predation pressure has resulted in an increase in reproductive rate of 10% for hatching success, and improvement of overall fledgling success (Raine et al. 2020).

Note that predator control activities could be undertaken for some introduced predators even in the absence of confirmed nesting. In Dominica and Guadeloupe, feral pigs are known to occur in the national parks hosting probable or suspected nest sites. Feral pigs damage native vegetation and prey on a number of native species; their reduction or removal would benefit forests regardless of petrel presence.

Key Information Needs: Impacts of predation on Black-capped Petrel, particularly on adult survival, and the techniques that will best control predation (e.g., effective traps, deployment pattern, etc.).

Strategy #4: Reduce Predator Pressure	
Objective 1:	Reduced abundance of introduced predators around nests
Activity 1.1:	Activities to control introduced mammals just before and during Black-capped Petrel nesting season
	Indicators: Less frequent presence of predators as evidenced by camera traps; reduced nest losses due to predation, increased productivity.



Indian mongoose are frequently caught on camera traps, and conservationists are working to develop and implement a mongoose control strategy. Grupo Jaragua

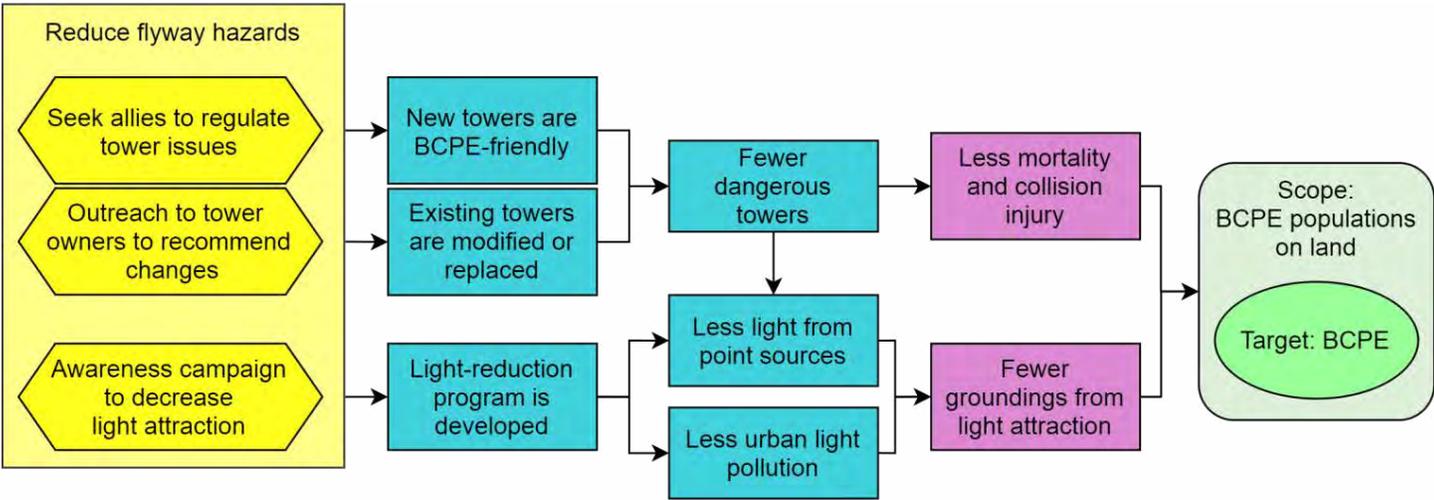
STRATEGY 5: REDUCE COLLISIONS AND GROUNDINGS

Background

The first Black-capped Petrel collision injury documented at a tower was in March 2012 at Loma del Toro (Hardesty Norris and Rupp 2012); a grounded fledgling was recovered the same year at the Haiti’s Central Bank in Port au Prince (SAH 2012). The working group maintains records of injured and grounded birds reported since 2010 to assist in characterizing the threat. Additionally, locations of high-risk towers – based on location, height, lighting, and cabling – have been compiled. Direct action – removal of a spotlight – was undertaken at a high-risk tower at Tet Kay Jak, Haiti where multiple strikes were observed in real-time in February 2013. Letters and briefings have been developed for private tower owners and government agencies with recommendations to reduce collisions and groundings, many of which may also reduce tower operation costs.

In the Dominican Republic, in an effort to reduce mortality, special instruction has been given to park administrators in both Sierra de Bahoruco and Valle Nuevo national parks of the importance of finding, reporting and saving grounded petrels. Flyers with release protocols in Spanish have been distributed to all park guards in these parks, as well as in different institutions in nearby towns of Pedernales, Puerto Escondido and Duvergé. In Haiti, fliers in Kreyol have been distributed in Anse-a-Pitres and Marigot as well as Seguin, Thiotte and Port-au-Prince. Thanks to this outreach, a small number of downed birds have been successfully recovered and released in recent years.

Strategy Logic



Strategies Description

3 Substrategies

- 5a. Seek voluntary solutions with tower industries
- 5b. Seek regulatory solutions with government to tower issues
- 5c. Awareness campaign to decrease light pollution

These substrategies seek to decrease the harm caused by proliferation of lighted structures from infrastructure growth, and light pollution from urbanization through outreach to specific audiences. This is based on the assumption that most owners and communities are currently unaware of the problem, and if given knowledge and recommendations, would be willing to make design and behavior changes if they did not incur significant costs.

The focus of these strategies should be on hazards that pose the highest risk to adult breeders. Special effort should be made at tower hazards near nesting sites, because of proximity and the volume of direct flights to and from nesting areas. Aerial courtship is also known for some *Pterodroma* species and this flight behavior may place pre-breeders as well as breeders at risk.

Unlike with tower hazards, the audiences that need to be reached to reduce the threat of generalized light pollution (e.g., streetlights, home and business lighting, stadium lights) are very broad. We assume that if an awareness campaign is undertaken using effective venues for targeted audiences, then more people will be aware of the phenomenon of light attraction, and open to behavior change. An effective light reduction program is expected to require local leadership and incentives (e.g., demonstrable energy savings, free shielded light bulbs, public recognition) to change behaviors. We can learn from programs around the world.

A light pollution awareness campaign would integrate the current grounded bird outreach effort, which provides information about collection and release of grounded birds. Rescue programs have been set up for 34 other species in 16 locations around the world with thousands of seabirds collected and released by program participants (Rodríguez et al. 2017). It is unlikely that a rescue program for the Black-capped Petrel can replicate the successful release rate achieved for some of these programs that involve rehabilitation of injured birds by trained professionals and dedicated facilities (e.g., Save Our Shearwaters in Kauai). However, rescue programs on Hispaniola and other islands could contribute to conservation knowledge and outcomes by documenting impacts, confirming presence of birds and raising support for other conservation strategies.

Key Information Gap: Occurrence and impact of collisions and groundings, especially on adults. Flyways to and from colonies, and fledging corridors also need to be located. Some recommendations to tower owners may need to be piloted on-site (e.g., efficacy of diverters or other devices deployed to mark guy wires)

Strategy #5: Reduce Collisions and Groundings in Flyways	
Overarching objective: The mortalities from collisions and groundings are reduced, especially of adults.	
SubStrategy 5a: Seek voluntary solutions with tower owners to minimize risk to petrels in flyway	
Objective 1:	Owners of existing and planned towers integrate recommendations and tools to minimize collisions and groundings.
Activity 1.1	Consultations with tower owners
	Indicators: Proximate: Number of consultations. Ultimate: Alterations to tower design.
SubStrategy 5b: Seek regulatory solutions with government to tower issues	
Objective 2:	Government is aware and in favor of regulating towers for the purposes of environmental protection.
Activity 2.1:	Reach out to government bodies with information and recommendations to reduce threat.
	Indicators: Proximate: Allies in government identified. Ultimate: Regulations in place and enforced.
SubStrategy 5c: Awareness campaign to decrease light pollution:	
Objective 3:	Owners (citizens, municipalities, businesses) with high levels of light pollution are aware of wildlife consequences as well as the means and benefits of reducing them.
Activity 3.1:	Identify and work alongside community leaders, business owners, and community groups to address strike and grounding hazards to petrels. Develop local plans to guide efforts to reduce these hazards.
	Indicators: Heightened community awareness, levels of light pollution in targeted areas.
Activity: 3.2	Continue to systemize and expand the rescue program, working alongside community leaders, business owners, and community groups to educate locals about collection, treatment and release of grounded petrels.
	Indicators: grounded bird reports; number of birds released alive compared to total reported

STRATEGY 6: SUPPORT COMMUNITY DEVELOPMENT IN BOUKAN CHAT

Background

The community of Boukan Chat abuts the confirmed Black-capped Petrel nesting site of Morne Vincent in Haiti. Boukan Chat farmers work the land to within a few hundred meters of petrel burrows. Though located in a National Park, loss and degradation of the nesting site due to expanding agriculture is an imminent threat because park protections are not enforced. As shown in the situational analysis for Morne Vincent, expansion of agriculture results from a lack of alternatives: farmers experience degradation of existing farmland, and without adequate social capital, financial capital, and knowledge, are ill-equipped to pursue change. Moreover, farmers are conditioned by a history of political corruption and social unrest, economic crises, and natural disasters to focus on short-term gains, especially since they have no legal claim to the land.

Over the past several years, petrel conservationists working locally – Grupo Jaragua, EPIC and JACSEH – have worked to understand the dynamics of the Boukan Chat community. Early on, teams recognized that community goodwill was necessary to safely and effectively conduct field work, and to explore conservation interventions. By building relationships, undertaking consultations, and supporting humanitarian work (cistern building), conservationists were able to develop a number of strategies to reduce the threat of agricultural expansion. Since forestalling the expansion of agriculture depends on empowering the community to find alternatives to converting and degrading nearby forest, these strategies relate to community development.

These work together:

- 6a Sustainable agriculture and reforestation programs**
- 6b Environmental awareness and education programs**
- 6c Economic empowerment – facilitation of Village Savings and Loans Associations**
- 6d Economic empowerment - livelihood training**
- 6e Engage with government to clarify management of occupied park land forested areas**
- 6f Stove Program**

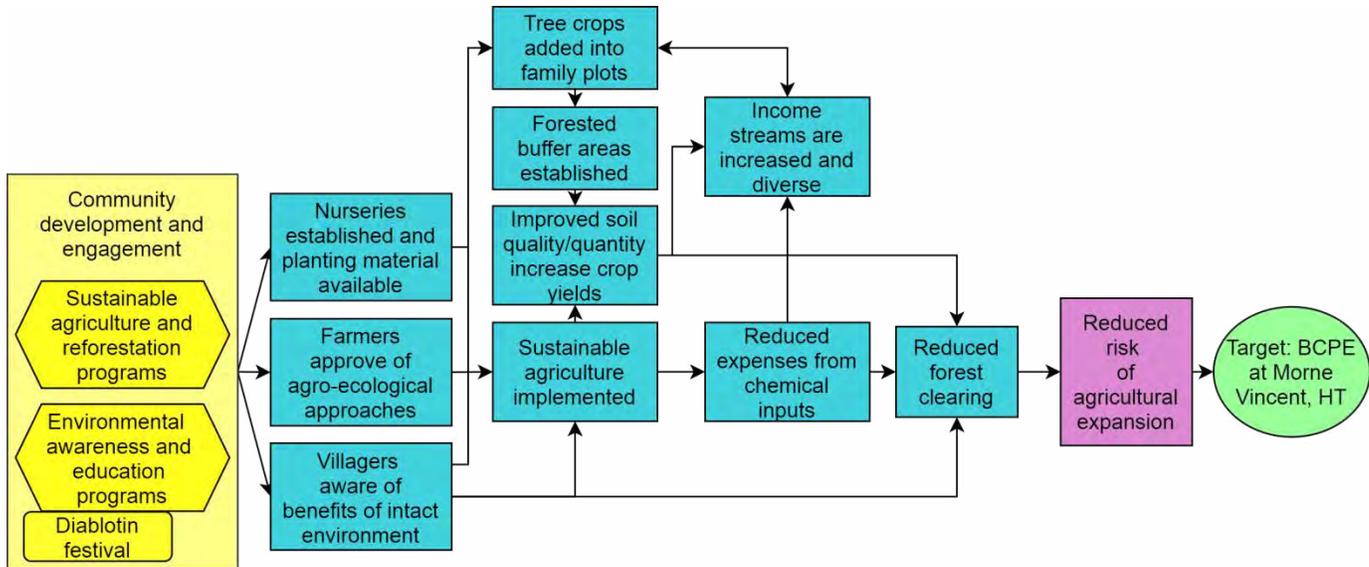
Community development strategies are already ongoing or under development in Boukan Chat. The first two in the above list are most familiar to the organizations represented on the planning team and are described below. All require collaboration with organizations working in the area to improve human health and welfare.

One of the partners in community development is Plant With Purpose (PWP), a private, U.S.-based organization which has operated in nearby Fond Verettes for about a decade and has recently started working in Boukan Chat [See [Breakout: Community Development](#).] Additionally, the IBPCG has engaged with Centro de Estudios y Solidaridad con América Latina (CESAL), an NGO based in Spain, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), a German development agency. Both of these organizations are currently leading projects to reduce poverty and vulnerability of ecosystems in the La Selle-Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve, which includes Boukan Chat. Grupo Jaragua has been engaged to provide forest restoration training and implementation, and monitoring of priority species, to support these projects.



Youth education programs are underway in the Haitian community of Boukan Chat. EPIC

Strategy Logic



Strategy Description

A key assumption of the sustainable agriculture and reforestation programs is that we can reduce pressure on the forests by making the means of livelihood easier to achieve and access outside the forest. Threat of agricultural encroachment into the forested area near Boukan Chat, as well as the harvesting of forest products, is driven by failure of crops on current farming land. By receiving training in sustainable agriculture – methods of soil and water retention, crop rotation, natural fertilizers – farmers will be able to increase yields in existing plots at lower expense. If at the same time, planting material, knowledge of agro-ecology principles, and savings to invest were available, farmers would be more able and willing to explore alternatives to short-term annual crops. Fields tilled for cash-crop such as onions, carrots and potatoes, which provide short-term returns at the expense of forest habitat, could be converted to coffee, avocado, and other perennial tree crops. These farms would act as buffers to existing forest, and encourage engagement in reforestation activities.

We believe that if farmers empowered with the means to change their practices also learn the importance of an intact environment to their own welfare, they are more likely to accept that forest preservation should co-exist with crop production. Environmental awareness and education programs will help local citizens, especially youth, to combine a desire for a better life for themselves with a new-found pride in their natural heritage. If there is the belief that a healthy ecosystem really does benefit a farmer – that livelihood is connected to the health of the ecosystem – then farmers are less likely to pursue or allow further forest clearing. Environmental education is built into the agro-ecology curriculum as well as programs for youth.

Key Information Need: Social research to determine if interventions affect attitudes and behavior over the long term. Also, precise mapping of land use around petrel habitat (extent of cleared areas converted to trees, extent of buffer to habitat/primary forest patch) will indicate if agriculture expansion actually stopped or reversed.

HUMAN BENEFITS IN THE SERVICE OF CONSERVATION COMMUNITY DEVELOPMENT

The conservation of Black-capped Petrels in Haiti – where the largest population is assumed to exist – requires interventions that focus on people. The threats of habitat loss and degradation stem from socio-economic needs of local communities therefore, development of these communities – empowering them socially and economically to make change – is the only feasible way we can hope to protect habitat.

Humanitarian organizations often recognize that improving the natural environment benefits of human welfare; thus, these organizations can be natural partners on a joint goal of habitat conservation. One example for Haiti is Plant With Purpose (PWP) is a US-based nonprofit, non-governmental organization (NGO) whose organizational goal is to improve the quality of the lives of people living in extreme rural poverty, using an approach that brings together environmental restoration and economic empowerment. PWP has worked in the Haitian border for about a decade, orienting their activities around watershed-level socioeconomic and environmental goals. The NGO broadened its program to include Boukan Chat after learning about petrels and petrel habitat needs from EPIC. PWP is seeking to go beyond re-vegetation to address ecosystem function and components, and was open to adding a biodiversity target (petrel) to its work.

PWP already collaborates with the IBPCG on the Boukan Chat community development strategies of Sustainable agriculture and reforestation (Strategy #6a), and Environmental awareness and education (Strategy #6b). In addition, they are implementing or developing community development strategies, including:

- Economic empowerment - Facilitation of Village Savings and Loan Associations (VSLAs): ongoing. If VSLAs are in place to assist farmers with micro-savings, micro-credit and micro-insurance, then farmers are less vulnerable to income fluctuations and have reduced reliance on environmentally unsustainable “desperation” practices. VSLAs are also effective venues for the sustainable agriculture training programs.
- Economic empowerment - Livelihood training: ongoing. If citizens have access to guidance and technical assistance, as well as economic tools, they are better able to pursue new ventures and innovative ideas. The development of nurseries for perennial or tree crops would support reforestation programs; another venture might be the production of efficient cooking stoves.
- Engagement with government to clarify management of occupied park land: in development. The community of Boukan Chat is illegally living and farming on national park land. A return to the past practice of Haitian government-forced evictions is undesirable, but an absence of management is also detrimental to the community. If farmers have confidence in their ability to remain on the land, they are more incentivized to act as stewards of that land. If the government officially embraces the

HUMAN BENEFITS IN THE SERVICE OF CONSERVATION COMMUNITY DEVELOPMENT

model of sustainable agriculture and tree crop buffers that benefit the community, then the community is more likely to be supportive of re-forestation activities.

- Stove Program: in development. If firewood demand is decreased by the availability of more efficient stoves, then there will be less pressure to cut forest. The first step is a scoping study: stove programs require understanding of supply and demand, effective systems of distribution and maintenance, and acceptance in the community.

These strategies focus on human welfare and are measured by social benefits, but they are “in the service of conservation” (CMP 2020) in that they ultimately improve the status of a conservation target, the Black-capped Petrel. These strategies must complement and build upon one other and are likely to take many years to come to fruition. Additionally, development activities need to be conducted in a way that empowers citizens to be partners and leaders in change. The methods of fostering and working through community groups, such as farmer associations, schools or churches are intended to strengthen social cohesion and shared commitment. Building skills and experience in group moderation, decision-making, and mobilization is critically important in Haitian communities where concerted action, transparent and democratic decision-making, and security have been lacking. The interventions are designed to foster a culture of thinking long-term, and to give citizens increased confidence, self-worth, faith, and trust in others.

The complexity and challenge of community development in Boukan Chat cannot be overstated; improvement in social and economic condition requires an evolution in mindsets and culture, which takes many years, and can be swept by a single crisis. Throughout, the value of healthy environment must be made visible to the community: the value of not only increased, sustainable agricultural production, but services associated with the forest, including a more regulated water supply, erosion control, carbon sequestration and biodiversity beneficial to humans. The latter can include the Black-capped Petrels as a symbol of the community, its resilience and pride.



Sustainable farming practices can benefit local people and protect petrel habitat. EPIC

Strategy #6: Strategies of Community Development in Boukan Chat

Overarching objective: No further loss of petrel nesting habitat at Morne Vincent due to expansion, and bordering farms converted to tree crops.

Sub-Strategy 6a: Sustainable agriculture and reforestation programs

Objective 1: Improved productivity and decreasing expense in existing fields reduce pressure to encroach on petrel habitat for needed resources.

Activity 1.1: Farmers closest to the Morne Vincent site are included in agro-ecology programs. Trainings address: water retention and stabilization of soil, alternatives to chemical inputs, fencing of livestock, etc.

Indicators: Number of trainings, number of measures implemented, changes in plots where measures implemented

Objective 2: Farmers plant trees to produce alternative crops and provide ecological services; thus becoming less likely to encroach on petrel habitat for needed resources.

Activity 2.1: Tree planting for alternative crops and reforestation

Indicators: row-crop areas converted to tree crops, number of tree crops planted, number of farmers planting trees

Substrategy 6b: Environmental Awareness and Education Programs

Objective 3: Farmers and community at large are aware of the importance of forest and biodiversity and the ways their activities can contribute to their conservation while also allowing economic improvement.

Activity 3.1: Farmers receive environmental education along with agroforestry techniques.

Indicators: Trainings conducted, farmers reached

Activity 3.2: Classroom outreach to complement lessons to adults including lessons on soil, water, forest and biodiversity.

Indicators: School visits; numbers of students reached.

Objective 4: Community awareness and positive attitudes towards petrels and their habitat foster engagement and support for conservation activities.

Activity 4.1: Continue annual Diablotin Festival – part of a pride campaign that includes a parade, soccer team support, film festival, and celebrates the connection between Boukan Chat and the Black-capped Petrel conservation effort.

Indicators: Festivals conducted, percent of the community reached, familiarity with petrel via soccer team branding

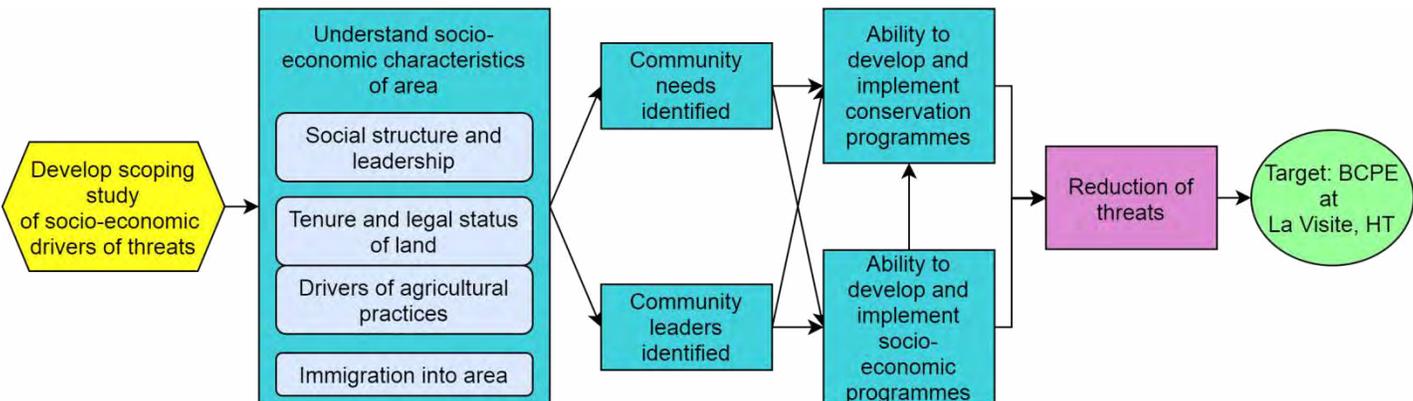
STRATEGY 7: UNDERTAKE SCOPING STUDY OF SOCIO-ECONOMIC DRIVERS OF THREATS AT LA VISITE

Background

In many ways, the situational analysis for the confirmed site at La Visite, Tet Opak, resembles that developed for Morne Vincent. Both depict an overarching situation of unsustainable resource use of petrel habitat, driven by institutional, cultural and socio-economic factors in a national park without control or management (i.e., La Visite National Park stewardship has been weak since its creation in 1983 (Woods et al. 1992, Timyan et al. 2012). It's very likely that the situations at Macaya and any other probable or suspected sites in Haiti are similar.

However, interventions in Boukan Chat, the community adjoining Morne Vincent, were enabled by some fortuitous and positive relationships, opportunities for humanitarian aid in a time of drought, and agro-ecology programs already established with farmer cooperatives in nearby valleys. Importantly, in the Boukan Chat community, it appears there is relative stability in the family structure of the community, and claims on land adjoining Morne Vincent are well-established³. A member of the planning team (James Goetz) has been working in Seguin, in the vicinity of the La Visite ridge for almost two decades. His work in the community managing a Payment for Ecosystem Services project affirms the many social and cultural obstacles to supporting local livelihoods and conserving nearby broadleaf forest. Moreover, despite Goetz's research and experience, and relationship-building in the region, there remain significant unknowns about the communities specifically using the ridge area occupied by petrels.

Strategy Logic



Strategy Description

We know that the habitat on the La Visite Ridge is threatened by expansion of agriculture, expansion of grazing and the collection of forest products (tree ferns, bromeliads, firewood). However, unlike at Boukan Chat community in Morne Vincent, key information about the identity, origin and organization of resource users is lacking. We are not sure exactly who is working or using the petrel habitat: for example, do they reside locally in Seguin or in one of the several surrounding settlements, or do they travel in from several, distant communities? Do these communities have social structures through which conservationists might develop relationships and begin interventions? What community development strategies are in place or have been tried previously? Additionally, we know little about the markets for the extracted forest resources: for example, what are the drivers of demand?

Key Information Need: We need a more in-depth analysis of the situation at La Visite, Haiti, the largest known colony of petrels, in order to move forward on planning and implementing conservation actions to reduce threats to habitat.

³Land occupation and tillage are not legal, but claims are established by working the land and are recognized in the community.

Strategy #7: Scoping Study at La Visite

Objective 1:	With the conservation situation characterized, the planning group can move on to planning and implementing interventions to reduce threats to Black-capped Petrels and petrel habitat in La Visite National Park.
Activity 1.1:	Develop and carry out a socio-economic study of the communities living adjacent to the La Visite escarpment.
	Indicators: Study report with recommendations



Habitat conservation along the LaVisite ridge requires community interventions. EPIC

STRATEGY 8: ENGAGE DOMINICAN REPUBLIC GOVERNMENT TO PLAN AND STRENGTHEN OVERSIGHT OF PARKS

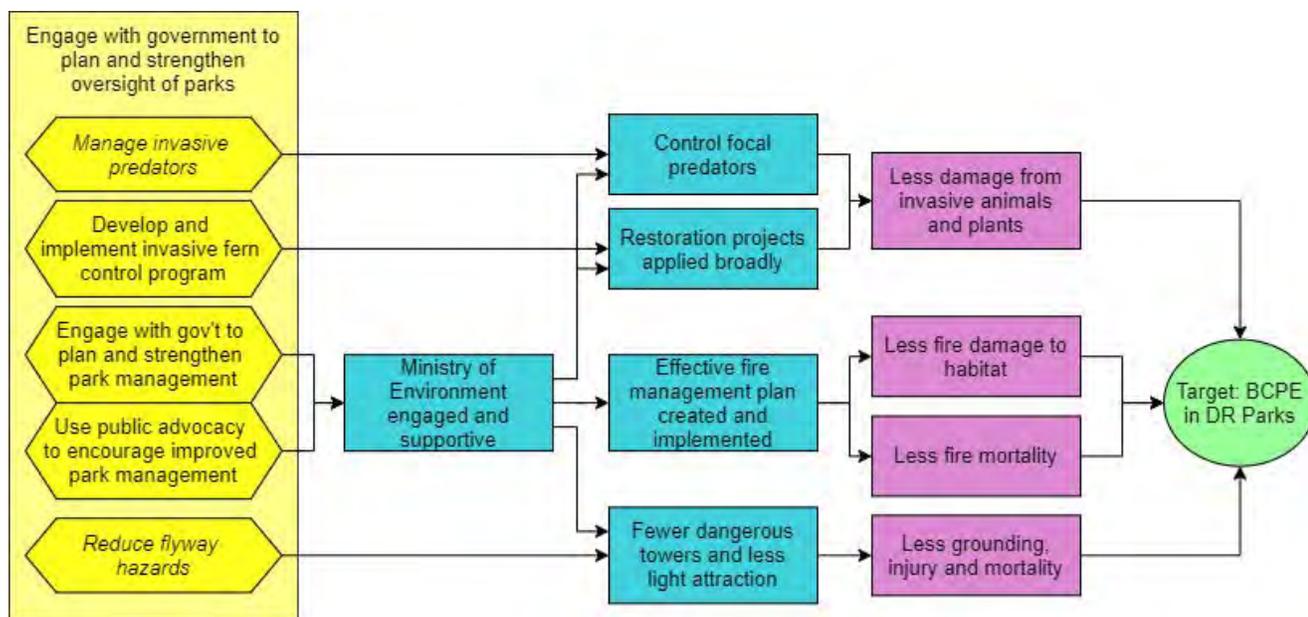
Background

Confirmed and probable nesting sites in the Dominican Republic fall within the National Parks of Sierra de Bahoruco and Valle Nuevo, and suspected sites fall within other National Parks (Sierra de Neiba, Del Carmen Ramirez, Bermudez). Each park has a different history of protection, degradation, restoration and ongoing management, but all are managed under the same system of policies and authorities. It is the Ministry of Environment (Ministerio de Medio Ambiente y Recursos Naturales) that has the responsibility for the condition of Dominican Republic National Parks and the biodiversity they harbor. National Park management varies with the experience and skills of managers, who are typically political appointees. Elections and political turnover often mean a change in park personnel, which is both a challenge and opportunity for developing relationships within the Ministry.

Grupo Jaragua and other field practitioners regularly engage the Ministry to obtain permits and arrange logistics for field work. In ideal times, government involvement and support in conservation projects is significant, with regular dialogue between organization executives, combined planning exercises, and arrangements in which management projects are viewed as partnerships or collaborations. For example, in February 2016, Grupo Jaragua worked the Ministry to arrange a series of strategic planning workshops for Sierra de Bahoruco using the “Conservation Standards” (Rupp and Garrido 2016).

This strategy also calls for collaboration with other organizations: those that seek strong park oversight to achieve other goals such as water and air quality, carbon sequestration, and conservation of other forms of wildlife.

Strategy Logic



Strategy Description

Substrategies

- 8a. Direct engagement
- 8b. Public advocacy
- 8c. Habitat restoration projects

The Black-capped Petrel occurs on just a small part of the Dominican Republic’s very large parks, thus park management to benefit the species must be precisely targeted at the main threats to the petrels and their habitat.

In addition to the threats of predation by introduced mammals and collision and grounding hazards, the greatest threats to Black-capped Petrels in Dominican Parks appear to be damaging fires and, the presence of invasive ferns in Valle Nuevo, with only occasional illegal intrusions causing habitat damage (e.g., charcoal production). Ministry approval and support is a necessary component for the implementation of activities to reduce predation and flyway hazards, and these strategies are discussed in other sections (Strategies 4 and 5).

In coming years, we believe continued engagement by petrel conservationists should focus on convincing or compelling park administrators to commit to wildfire management plans, including vigilance, preventative measures (e.g., litter reduction, fire breaks) and investment in people and infrastructure to combat harmful fires (e.g., paid rangers, supplies). Direct engagement involves activities with Ministry representatives – meetings, site visits, trainings, etc. – whereas public advocacy is indirect: turning to citizens to bring attention to issues. If engagement with or advocacy towards the government is successful, effective management of fire will increase and the threat diminish.

We believe engagement with Ministry on invasive species management in National Parks will also have benefits for the Black-capped Petrel. If officials are made aware of the possibility, means, and benefits of restoration programs – for example, removal of invasive ferns in Valle Nuevo – then they will likely be supportive of these projects in parks. Grupo Jaragua is well positioned to do this: it has organizational experience and capacity for habitat restoration projects; their biologists have first-hand knowledge of habitat conditions that are detrimental to Black-capped Petrels and/or to research and monitoring programs.

Key Information Need: For restoration projects, test feasibility and efficacy of protocols developed to control invasive ferns in the Dominican Republic. Research native species best adapted to recolonize restored habitat.

Strategy #8: Engage with Dominican Republic government to plan and strengthen oversight of parks

Overarching objective: Grupo Jaragua and national/international partners have a proactive relationship with Ministry of Environment and national park administrators and managers that furthers management of parks important to BCPE.

Sub-Strategy 8a: Direct Engagement

Objective 1: Park administrators and managers look to Grupo Jaragua for expertise on Black-capped Petrel and become directly engaged and supportive of petrel conservation activities.

Activity 1.1: Provide information and opportunities to learn more about petrels and the principal threats at confirmed sites (introduced predators, flight hazards, wild fires and invasive species).

Indicators: Number of individual managers and administrators with knowledge of BCPE, the threats to their nesting habitat, and Best Management to reduce impacts to BCPE.

Substrategy 8b: Public Engagement

Objective 2: Grupo Jaragua and partners gain public backing when calling for National Park management of threats to petrels

Activity 2.1: Public outreach and awareness campaigns that bring attention to national park management issues with implications for petrels

Indicators: articles, interviews in the media

Substrategy 8c: Habitat Restoration

Activity 3.1: Restoration projects (e.g., propagation of native broadleaf species, removal of harmful invasive plants) be showcased for national park administrators and managers.

Indicators: Invasive fern removal in Valle Nuevo



Loma Quemada, and other confirmed and probable nesting sites in the Dominican Republic, fall within National Parks. Yvan Satgé

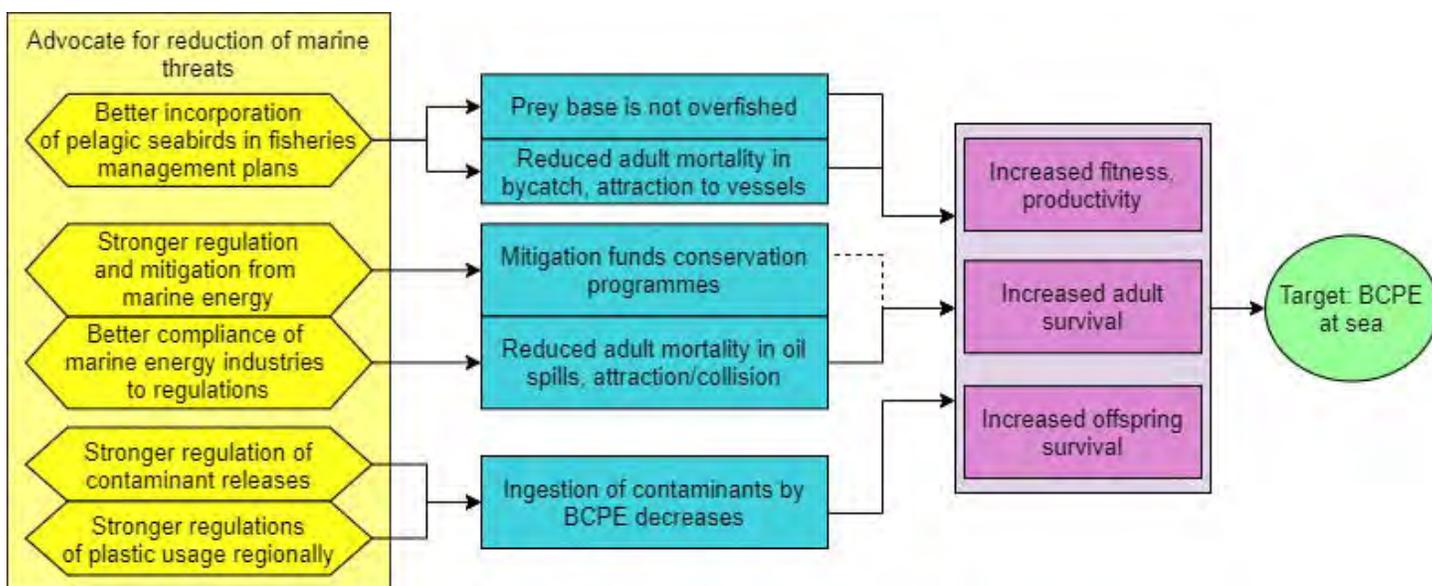
STRATEGY 9: ADDRESS THREATS AT SEA THROUGH ADVOCACY

Background

Although there is significant uncertainty as their population-level effects on Black-capped Petrels, threats at sea are of concern to conservationists. It is likely that marine threats have less direct and short-term impacts than do on-land threats, but cumulative threats affect the viability of the species. Moreover, the sectors and society responsible for marine threats may be able to mitigate or offset impacts that occur on land (e.g., restoration funds from an oil spill).

Petrel conservationists have long worked to keep at-sea threats to Black-capped Petrels in the spotlight. Large-scale changes in the marine environment associated with human activity affect all seabirds to some degree. Thus, individuals and organizations involved in petrel work operate in broader networks that concern themselves with seabird research, monitoring, management and advocacy; for example, the World Seabird Union, Atlantic Marine Bird Cooperative, BirdsCaribbean Seabird Working Group, Gulf of Mexico Avian Monitoring Network. Within these networks, research to understand the movements of petrels at sea and potential exposures is conducted, supported and disseminated. Additionally, through our organizations and networks, we work to ensure that petrel information is included as appropriate to assessments that affect policy: e.g., inform regulating authorities about petrel presence in areas slated for energy exploration; inform enforcement authorities of provenance of birds collected in spills.

Strategy Logic



Strategy Description

Strategies that directly work on the threat (e.g., develop a technology that harvests plastic debris in oceans) or even on a driver of the threat (e.g., plastic waste reduction) are beyond the manageable interest of the planning group. We believe that our most effective and feasible interventions will be to advocate for the Black-capped Petrel in the realm of marine policy. If we continue to engage with networks that disseminate scientific information and concern themselves with marine environmental health, the interests of the Black-capped Petrel can be part of the development of policies that reduce marine threats where petrels occur.

The multi-scale elements of fisheries, marine energy development, ocean contamination and plastic debris involve local, regional, global-scale levels of management. Moreover, the Black-capped Petrels movements at sea make it subject to the jurisdictions of multiple nations as well as into international waters (Jodice and Suryan 2010, Jodice et al. 2015). Addressing the full scope and scale of related marine policies is infeasible, so effort should be focused on highest threats.

Key Information Need: To better assess marine threats, and to give focus to our advocacy, we need to continue to study the at-sea movements and overlap with risk factors using tracking information, in particular in the Eastern Caribbean Sea and tropical Atlantic.

Strategy #9: Address marine threats through advocacy	
Objective 1:	The interests of the BCPE are included in the development of marine policy relevant to the petrel's highest marine threats.
Activity 1.1	Highlight BCPE in appropriate science/conservation forums
	Indicators: Publications, reports, presentations
Activity 1.2	Contribute data to regulatory and policy documents



Petrel threats at sea call for advocacy in the realm of marine policy. Kate Sutherland

CONTINUING THE PROJECT CYCLE



PROJECT CYCLE

As recommended within the Conservation Standards framework, we envision the conservation of the Black-capped Petrel as a cyclical process of assessment, planning, implementation, adapting and sharing. The IBPCG intends to continue its work in an iterative manner, embracing learning, adapting to emerging information and opportunities, and fostering partnership.

[Appendix 1: Planning Process](#) summarizes activities from 2012 to 2020. Going forward from 2021, we take note of some particular intentions:

Assess

We will continue to assess the conservation situation for the petrel, undertaking research to reduce uncertainty and enable strategies. [Appendix 7: Information Needs](#) summarizes the information gaps presented throughout this document.

We welcome all interested parties into the IBPCG, and we will seek out partners for information and participation in working groups as needed. Currently there is a need for partnership in the South American countries whose waters host foraging hotspots for petrels (Colombia and Venezuela). Additionally, we will pursue more determinedly synergies with groups undertaking research or conservation on species sharing Black-capped Petrel habitat (e.g., the Bicknell's Thrush International Working Group). We also recognize the need to engage potential partners with economical, sociological, and/or ethnological backgrounds.

Plan

Additional project- or site-specific planning is required to commence or continue to implement the strategies presented in this Conservation Plan. Many of the strategies are ongoing under the leadership of the organizations represented by the planning team; seem need to be launched, and all would benefit from engaging or re-engaging other stakeholders. This applies particularly for projects on islands where nest sites are yet to be confirmed.

As we plan, we will strive to identify and collaborate with organizations whose mission may focus on other elements (e.g., poverty alleviation or carbon sequestration) but who pursue similar strategies as identified in this plan (e.g. agroecology training or reforestation).

Monitoring is an essential element of planning. We have identified KEAs as the basis of a monitoring plan for the Black-capped Petrel conservation. However, we need to develop defined protocols or established baselines for some.

Implementation

Budgets and timetables are resource-dependent and there is no secured reserve or permanent income-stream established for the project. We will continue to collaborate on fund-raising from agencies, foundations, individuals, seeking growth and diversification of funding streams to support the multi-faceted nature of Black-capped Petrel conservation.

Analyze and Adapt

As data is accrued and assessed, and if and when conditions change, we will revisit our strategies.

Measuring the effectiveness for some strategies is relatively straightforward because of the brevity of the results chain (e.g., reduction of predator pressure decreases petrel mortality). Other strategies involve multiple, inter-connected steps, and take many years to resolve (e.g., public outreach to build a conservation ethic and support for conservation institutions). Ultimately, we should endeavor to find partners who would be able to assist us in conducting a more complete, critical programmatic assessment, to look at the effectiveness of our partnership (in addition to the success of petrel population and habitat assessment).

Share

We will seek to improve the management and accessibility of the emerging datasets held by IBPCG members, such as of images of color forms and downed birds.

We seek to provide input into policy deliberations as appropriate, for example, listing of the species under national and international conventions. Black-capped Petrels have many protections, but there are gaps. [Appendix 8: National and International Instruments](#) details the legal status of the species (updated since the 2012 Plan).

We aspire to have more research shared in peer-reviewed journals and will continue to spread the story of the species in products and publications for lay audiences. We must think broadly and creatively about potential supporters and the means of reaching them. (e.g., birders on pelagic trips or on Hispaniola; soccer fans who could be interested in conservation).



A petrel captured at sea and fitted with a satellite transmitter is ready for release. Kate Sutherland

REFERENCES



- American Bird Conservancy (ABC). 2014. Report September, 2014. Black-capped Petrels. Interim Report to the U.S. Fish and Wildlife Service. Unpublished report from ABC, The Plains, Virginia, USA.
- BirdLife International. 2018. *Pterodroma hasitata*. *The IUCN Red List of Threatened Species 2018*: e.T22698092A132624510. <https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698092A132624510.en>. Downloaded on 12 February 2021.
- BirdLife International, 2020. Important Bird Areas [On-line], BirdLife, Cambridge, UK. Accessed from [<https://www.birdlife.org>] on 2020-11-20.
- BirdLife International, 2021. Species factsheet: *Pterodroma hasitata* [on-line]. Accessed form [<http://www.birdlife.org>] on 2021-02-01.
- Brown, A., 2015. Radar surveys for the Endangered Black-capped Petrel on Dominica, West Indies. Unpublished report from Environmental Protection in the Caribbean to the Dominica Department of Agriculture, Forestry and Parks Division, Dominica. Green Cove Springs, Florida, USA .
- Brown, A., 2016. Radar Surveys for petrels on Jamaica: Results from an expedition during March 2016. Unpublished report from Environmental Protection in the Caribbean. Green Cove Springs, Florida, USA.
- Brown, A., 2017. Radar Surveys, Nest Monitoring and Conservation of the Black-capped Petrel on Hispaniola: February 2017. Unpublished report from Environmental Protection in the Caribbean (March 2017). Green Cove Springs, Florida, USA.
- Brown, A., 2020a. Radar Surveys for Black-capped Petrels on Dominica: Results from an expedition during January and February 2020. Unpublished report from Environmental Protection in the Caribbean. Green Cove Springs, Florida, USA.
- Brown, A., 2020b. Radar Surveys for Black-capped Petrels on Guadeloupe: Results from an expedition during January 2020. Unpublished report from Environmental Protection in the Caribbean. Green Cove Springs, Florida, USA.
- Brown, A., Rupp, E., Jean, A., and Freifeld, H. 2013. Black-capped Petrels and Communication Towers. Poster presented at BirdsCaribbean International Conference in Grenada, July 2013.
- Brown, A., and Jean, A. 2019. Black-capped Petrel Nest Monitoring in Parc National Naturel La Visite, Haiti: 2019 Breeding Season. Unpublished report from Environmental Protection in the Caribbean. Green Cove Springs, Florida, USA.
- Camphuysen, C.J., Fleet, D.M., Reineking, B. and Skov, H., 2005. Oil pollution and seabirds. *Wadden Sea Ecosystem*, 19, pp.115-124.
- Carlile, N., Priddel, D. and Madeiros, J., 2012. Establishment of a new, secure colony of Endangered Bermuda Petrel *Pterodroma cahow* by translocation of near-fledged nestlings. *Bird Conservation International*, 22(1), pp.46-58.
- Chabrolle A., 2017. A la redécouverte du Pétrel diablotin (*Pterodroma hasitata*) nicheur en Guadeloupe. Juin 2016 à juillet 2017. Rapport AEVA n° 43, rapport AMAZONA n° 48, septembre 2017. Le Gosier, Guadeloupe.
- Chrastansky, A., Callies, U. and Fleet, D.M., 2009. Estimation of the impact of prevailing weather conditions on the occurrence of oil-contaminated dead birds on the German North Sea coast. *Environmental Pollution*, 157(1), pp.194-198.
- Churches, C.E., Wampler, P.J., Sun, W. and Smith, A.J., 2014. Evaluation of forest cover estimates for Haiti using supervised classification of Landsat data. *International Journal of Applied Earth Observation and Geoinformation*, 30, pp.203-216.
- Conservation Measures Partnership (CMP), 2020. Open standards for the practice of conservation. Version 4.0 2020. 81pp.
- Conservation Measures Partnership (CMP) and Sitka Technology Group, 2020. Miradi Adaptive Management Software for Conservation Projects. Conservation Measures Partnership and Sitka Technology Group 2013–2016. Accessed from

[<https://www.miradi.org>] on 2020-02-01.

- Croll, D., Tershy, B., Tinker, T., Zilliacus, K. 2019. Seabird meta-Population Viability Model (mPVA) Methods, University of California Santa Cruz Conservation Action Lab. February 6, 2019.
- Farnsworth, A., 2020. Black-capped Petrel (*Pterodroma hasitata*), version 1.0. In Birds of the World (T. S. Schulenberg, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. Accessed from [<https://birdsoftheworld.org/bow/species/bkcpet>] on 2020-02-01.
- Faulquier, L., Fontaine, R., Vidal, E., Salamolard, M. and Le Corre, M., 2009. Feral cats *Felis catus* threaten the endangered endemic Barau's petrel *Pterodroma barau* at Reunion Island (Western Indian Ocean). *Waterbirds*, 32(2), pp.330-336.
- Food and Agriculture Organization of the United Nations (FAO), 2010. Global forest resources assessment 2010: Main report. Rome, Italy.
- Foundations of Success (FOS), 2009. Conceptualizing and planning conservation projects and programs: A training manual. Foundations of Success, Bethesda, Maryland, USA.
- Global Fishing Watch, 2020. Global Fishing Watch map [On-line]. Accessed from [<https://globalfishingwatch.org/map/workspace/udw-v2-f8ee94e1-1290-4e96-8d3f-734e8bd10853>] on 2020-11-20.
- Goetz, J.E., Norris, J.H. and Wheeler, J.A., 2012. Conservation action plan for the black-capped petrel (*Pterodroma hasitata*). International black-capped petrel conservation group.
- Hardesty Norris, J. and Rupp, E., 2012. Interim Report April 2012, USFWS Agreement F11AC00825, Black-Capped Petrel Conservation 2011-2012. April 2012. Unpublished report from American Bird Conservancy, The Plains, Virginia, USA AND Grupo Jaragua, Santo Domingo, Dominican Republic.
- Hass, T., Hyman, J. and Semmens, B.X., 2012. Climate change, heightened hurricane activity, and extinction risk for an endangered tropical seabird, the black-capped petrel *Pterodroma hasitata*. *Marine Ecology Progress Series*, 454, pp.251-261.
- Howell, S.N.G. and Patteson, J.B., 2008. Variation in the Black-capped Petrel: one species or more. *Alula*, 14(2), pp.70-83.
- IBPCG, 2014. Mid-Year Update on Current Activities. June 2014. Accessed from [<https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg>] on 2020-02-01.
- IBPCG, 2020. Annual Update on Activities, May 2020. Accessed from [<https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg>] on 2020-02-01.
- IBPCG, 2021. Annual Update on Activities, June 2021. Accessed from [<https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg>] on 2021-06-08.
- Jacobs, J., Deguchi, T., Perriman, L., Flint, E., Gummer, H., and Uhart, M., 2020. Guidelines for translocations of albatrosses and petrels. Agreement on the Conservation of Albatrosses and Petrels. Accessed from [<https://acap.aq/en/resources/acap-conservation-guidelines/2640-translocation-guidelines/file>] on 2021-01-01.
- Jean, A., Louis, T., Jeune, R., Raymond, L., and Brown, A., 2018. Black-capped Petrel Nest Monitoring in Parc National La Visite, Haiti: 2018 Breeding Season. Unpublished report from Environmental Protection in the Caribbean. Green Cove Springs, Florida, USA.
- Jodice, P.G. and Suryan, R.M., 2010. The transboundary nature of seabird ecology. In *Landscape-scale conservation planning* (pp. 139-165). Springer, Dordrecht.
- Jodice, P.G., Ronconi, R.A., Rupp, E., Wallace, G.E. and Satgé, Y., 2015. First satellite tracks of the endangered black-capped petrel. *Endangered Species Research*, 29(1), pp.23-33.
- Jodice, P. G. R., E. M. Adams, J. Lamb, Y. Satgé, J. S. Gleason. 2019. GoMAMN Strategic Bird Monitoring Guidelines: Seabirds. Pages 129-170 in R. R. Wilson, A. M. V. Fournier, J. S. Gleason, J. E. Lyons, and M. S. Woodrey (Editors), *Strategic Bird Monitoring Guidelines for the Northern Gulf of Mexico*. Mississippi Agricultural and Forestry Experiment Station Research Bulletin 1228, Mississippi State University. 324 pp.

- Jodice P.G.R., Michael P.E., Gleason J.S., Haney J.C., Satgé Y.G. 2021. Revising the marine range of the endangered black capped petrel *Pterodroma hasitata*: occurrence in the northern Gulf of Mexico and exposure to conservation threats. *Endang Species Res* 46:49-65. <https://doi.org/10.3354/esr01143>
- Jones, H.P. and Kress, S.W., 2012. A review of the world's active seabird restoration projects. *The Journal of Wildlife Management*, 76(1), pp.2-9.
- Key Biodiversity Areas Partnership, 2020. World Database of Key Biodiversity Areas [On-line], Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Accessed from [<https://www.keybiodiversityareas.org>] on 2020-11-20.
- Lee, D.S., 1999. Pelagic seabirds and the proposed exploration for fossil fuels off North Carolina: a test for conservation efforts of a vulnerable international resource. *Journal of the Elisha Mitchell Scientific Society*, pp.294-315.
- Leopold, M.F., Geelhoed, S.C., Scheidat, M., Cremer, J., Debrot, A.O. and Van Halewijn, R., 2019. A review of records of the Black-capped Petrel *Pterodroma hasitata* in the Caribbean Sea. *Marine Ornithology*, 47, pp.235-241.
- Madeiros, J., Carlile, N. and Priddel, D., 2012. Breeding biology and population increase of the Endangered Bermuda Petrel *Pterodroma cahow*. *Bird Conservation International*, 22(1), pp.35-45.
- Manly, B., Arbogast, B.S., Lee, D.S. and Van Tuinen, M., 2013. Mitochondrial DNA analysis reveals substantial population structure within the endangered Black-capped Petrel (*Pterodroma hasitata*). *Waterbirds*, 36(2), pp.228-233.
- Montevecchi, W.A., 2006. Influences of artificial light on marine birds. *Ecological consequences of artificial night lighting*, pp.94-113.
- Moser, M.L. and Lee, D.S., 1992. A fourteen-year survey of plastic ingestion by western North Atlantic seabirds. *Colonial Waterbirds*, pp.83-94
- Pauleus, O. and Aide, T.M., 2020. Haiti has more forest than previously reported: land change 2000–2015. *PeerJ*, 8, p.e9919.
- Plasencia León, C., Segovia Vega, Y., Viña Dávila, N., and Rodríguez Santana, F., 2020. Informe sobre expedición para comprobar la presencia del Pájaro de la Bruja (*Pterodroma hasitata*) en la localidad de la Bruja, Santiago de Cuba. Unpublished report from Centro Oriental de Ecosistemas y Biodiversidad (BIOECO), Santiago de Cuba, Cuba.
- Priddel, D., Carlile, N. and Wheeler, R., 2006. Establishment of a new breeding colony of Gould's petrel (*Pterodroma leucoptera leucoptera*) through the creation of artificial nesting habitat and the translocation of nestlings. *Biological Conservation*, 128(4), pp.553-563.
- Raine, A.F., Holmes, N.D., Travers, M., Cooper, B.A. and Day, R.H., 2017. Declining population trends of Hawaiian Petrel and Newell's Shearwater on the island of Kaua 'i, Hawaii, USA. *The Condor: Ornithological Applications*, 119(3), pp.405-415.
- Raine, A.F., Driskill, S., Vynne, M., Harvey, D. and Pias, K., 2020. Managing the effects of introduced predators on Hawaiian endangered seabirds. *The Journal of Wildlife Management*, 84(3), pp.425-435.
- Rodríguez, A., Holmes, N.D., Ryan, P.G., Wilson, K.J., Faulquier, L., Murillo, Y., Raine, A.F., Penniman, J.F., Neves, V., Rodríguez, B. and Negro, J.J., 2017. Seabird mortality induced by land-based artificial lights. *Conservation Biology*, 31(5), pp.986-1001.
- Rodríguez, A., Arcos, J.M., Bretagnolle, V., Dias, M.P., Holmes, N.D., Louzao, M., Provencher, J., Raine, A.F., Ramirez, F., Rodriguez, B. and Ronconi, R.A., 2019. Future directions in conservation research on petrels and shearwaters. *Frontiers in Marine Science*, 6, p.94.
- Rupp, E. and Garrido, E., 2013. Report May 2013. Interim Report on Black-capped Petrel Activities. Unpublished report from Grupo Jaragua. Santo Domingo, Dominican Republic.

- Rupp, E. and Garrido, E., 2016. Report July 2016, #709M, Black-capped Petrel Conservation 2015-2016. Unpublished report from Grupo Jaragua. Santo Domingo, Dominican Republic.
- Rupp, E., Garrido, E. and Wallace, G. 2012. Summary of Black-capped Petrel (*Pterodroma hasitata*) Nesting Activity during the 2011/2012 Nesting Season at Loma del Toro and Morne Vincent, Hispaniola
- Rupp, E., 2017. Interim Report August 2017, #1715 C, Black-capped Petrel Conservation 2017. Unpublished report from Grupo Jaragua. Santo Domingo, Dominican Republic.
- Rupp, E., 2018. Report August 2018, #709 P, Black-capped Petrel Conservation. Unpublished report from Grupo Jaragua. Santo Domingo, Dominican Republic.
- Satgé, Y.G., E. Rupp, and P.G.R. Jodice. 2019. A preliminary report of ongoing research of the ecology of Black-capped Petrel (*Pterodroma hasitata*) in Sierra de Bahoruco, Dominican Republic – I: GPS tracking of breeding adults. Unpublished Report, South Carolina Cooperative Research Unit, Clemson University, Clemson, South Carolina, USA. DOI: 10.5066/P9UHASY4
- Satgé, Y.G., Rupp, E., Brown, A. and Jodice, P.G., 2020. Habitat modeling locates nesting areas of the Endangered Black-capped Petrel *Pterodroma hasitata* on Hispaniola and identifies habitat loss. *Bird Conservation International*, pp.1-18. DOI:10.1017/S0959270920000490
- Satgé, Y.G., Brown, A., Wheeler, J. and Sutherland, K. [In prep.]. Black-capped Petrel (*Pterodroma hasitata*), version 2.0. In *Birds of the World* (T. S. Schulenberg, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA.
- Satgé, Y.G., Keitt, B., and Jodice, P.G.R., [In prep.]. Temporal and spatial segregations between color morphs of the Diablotin Black-capped Petrel *Pterodroma hasitata* during the breeding and non-breeding periods.
- Seabird mPVA. 2020. Seabird mPVA Online Tool developed by the UC Santa Cruz Conservation Action Lab. Accessed from [<https://nhydra.shinyapps.io/mPVA1>] on 2020-02-01.
- Seabird Restoration Database. 2020. Online compendium of seabird restoration effort. Accessed from [<https://www.seabirddatabase.org/>] on 2020-02-01.
- Simons, T.R., Lee, D.S. and Haney, J.C., 2013. Diablotin *Pterodroma hasitata*: a biography of the endangered Black-capped Petrel. *Marine Ornithology*, 41, pp.1-43.
- Société Audubon Haiti (SAH), 2012. A Black-capped Petrel at Haiti's Central Bank. Unpublished newsletter from Société Audubon Haiti, Port-Au-Prince, Haiti.
- Taylor, G.T., Muller-Karger, F.E., Thunell, R.C., Scranton, M.I., Astor, Y., Varela, R., Ghinaglia, L.T., Lorenzoni, L., Fanning, K.A., Hameed, S. and Doherty, O., 2012. Ecosystem responses in the southern Caribbean Sea to global climate change. *Proceedings of the National Academy of Sciences*, 109(47), pp.19315-19320.
- The Nature Conservancy (TNC) 2007. Conservation Action Planning Handbook: Developing Strategies, Taking Action and Measuring Success at Any Scale. The Nature Conservancy, Arlington, VA.
- The Seabird Restoration Database, 2021. Seabird Restoration Database Glossary. Pacific Rim Conservation. Honolulu, Hawaii, USA. Accessed from [<https://www.seabirddatabase.org/>] on 2021-01-01.
- Timyan, J.C., Goetz, J.E., Martínez-Sánchez, J.C. 2012. Toward an Improved Conservation Strategy for Bicknell's Thrush (*Catharus bicknelli*) in La Visite National Park, Haiti. Unpublished report for Canadian Wildlife Service and BirdLife International.
- Threatened Island Biodiversity Database Partners, 2018. The Threatened Island Biodiversity Database: developed by Island Conservation, University of California Santa Cruz Coastal Conservation Action Lab, BirdLife International and IUCN Invasive Species Specialist Group. Version 2018. Accessed from [<https://tib.islandconservation.org>] on 2020-02-01.

- U.S. Fish and Wildlife Service (USFWS), 2018a. Endangered and threatened wildlife and plants; Threatened species status for Black-Capped Petrel with a Section 4(d) rule. 50 CFR Part 17. RIN 1018-BD13. Proposed rule. Federal Register: 83(195): 50560 – 50574
- U.S. Fish and Wildlife Service (USFWS), 2018b. Species status assessment report for the Black-capped petrel (*Pterodroma hasitata*). Version 1.1. June 2018. Atlanta, GA.
- UNEP, 2019. Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (SPAW Protocol to Cartagena Convention) – Annex II. Update following the 10th meeting of the Contracting Parties to the SPAW Protocol, Roatan, Honduras 2019-06-03. Accessed from [https://www.car-spaw-rac.org/IMG/pdf/annexes_i_ii_iii_of_spaw_protocol_revised_cop10_honduras_2019.pdf] on 2020-02-01.
- UNEP-WCMC and IUCN, 2020. Protected Planet: The World Database on Protected Areas (WDPA) [On-line], UNEP-WCMC and IUCN, Cambridge, UK. Accessed from [www.protectedplanet.net] on 2020-11-20.
- UNESCO, 2019. UNESCO Man and Biosphere Programme: Transboundary Biosphere Reserves. Accessed from [<http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/transboundary-biosphere-reserves>] on 2021-02-01.
- Veil, J, Puder MG, Elcock D, Redweik Jr RJ (2004) A white paper describing produced water from production of crude oil, natural gas, and coal bed methane, Argonne Natl. Lab., Argonne, IL
- Welch RA, Rychel DF (2004) Produced water from oil and gas operations in the onshore lower 48 states. Northrop Grumman Mission Systems, Information & Technical Services Division, Tulsa OK p 100
- Whitney, M.C. and Cristol, D.A., 2017. Impacts of sublethal mercury exposure on birds: a detailed review. *Reviews of Environmental Contamination and Toxicology* Volume 244, pp.113-163.
- Wilcox, C., Van Sebille, E. and Hardesty, B.D., 2015. Threat of plastic pollution to seabirds is global, pervasive, and increasing. *Proceedings of the National Academy of Sciences*, 112(38), pp.11899-11904.
- Winship, A.J., Kinlan, B.P., White, T.P., Leirness, J.B., and Christensen, J., 2018. Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, Virginia, USA. OCS Study BOEM 2018-010. x+66 pp.
- Woods, C.A., Sergile, F.E. and Ottenwalder, J.A., 1992. Stewardship plan for the national parks and natural areas of Haiti. US Department of State, Agency for International Development.
- Yang, H., Lohmann, G., Wei, W., Dima, M., Ionita, M. and Liu, J., 2016. Intensification and poleward shift of subtropical western boundary currents in a warming climate. *Journal of Geophysical Research: Oceans*, 121(7), pp.4928-4945.
- Zhou, C., Jiao, Y. and Browder, J., 2019. Seabird bycatch vulnerability to pelagic longline fisheries: ecological traits matter. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 29(8), pp.1324-1335.

APPENDICES



APPENDIX 1: REPORT ON WORKING GROUP ACTIVITIES 2012 – 2020 AND PLANNING PROCESS FOR 2021 CONSERVATION PLAN

The practice of conservation is a cyclical process of overlapping activities. The following sections summarize activities of the IBPCG from 2012-2020, relating them to the Conservation Standards elements. The summary picks up at Implementation (following the release of the 2012 Conservation Plan).

Implement

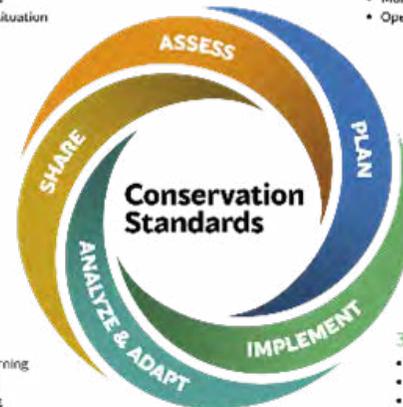
- Implemented several of the actions in the 2012 Conservation Action Plan (see Table A1-1 **Review of Actions from 2012 Conservation Action Plan for the Black-capped Petrel**, undertaking field investigations and conservation interventions each year.
- Developed workplans, timetables and budgets for research, monitoring and for conservation interventions 2012- present.
- Used internal funding from our organizations and obtained financial assistance from multiple supporters.
- Coordinated fund-raising efforts in order to maximize synergies and minimize direct competition.

1. ASSESS

- Purpose & team
- Scope, vision, & targets
- Critical threats
- Conservation situation

2. PLAN

- Goals, strategies, assumptions, & objectives
- Monitoring plan
- Operational plan



5. SHARE

- Document learning
- Share learning
- Foster learning

3. IMPLEMENT

- Work plan & timecable
- Budget
- Implement plan

4. ANALYZE & ADAPT

- Prepare data
- Analyze results
- Adapt plans

Analyze And Adapt

- Members of the International Black-capped Petrel Conservation Group active in research, monitoring and conservation interventions in the field, have modified or expanded their activities based on findings each year.
- Thanks to the improved techniques for finding petrels in new places, seized opportunities to implement various forms of management, which were only hypothetical in 2012.
- To create a full revision of the international scale 2012 Conservation Plan, a subset committed to a course of weekly conferences from February to September 2020 to revisit and refine the plan.
- Realized that some of the desired conservation actions have pre-requisite activities that need to be explored well in advance of any implementation.

Share

- Published some field studies in peer-reviewed journals with open access
- Posted unpublished field reports in an archive online: (<https://www.birdscaribbean.org/our-work/working-groups/black-capped-petrel-wg/>)
- Shared annual or more frequent summaries of activities with the wider IBPCG and seabird conservation community via listservs
- Convened biannual meetings at BirdsCaribbean International Conferences
- The core planning team signed a Memorandum of Understanding in which they agreed to share data openly and freely to the benefit of greater understanding and priority conservation actions for the species.
- Created multiple information summaries and shared spaces (see appendices 2 - 8).
- Incorporated results of petrel experts from other areas Réunion, Kauai, Cape Verde, Galapagos (acknowledgements)
- Shared results. The Miradi-related elements of this Plan are publicly available at www.miradishare.org

Assess

- Reaffirmed scope, vision and specified site-specific targets for petrel conservation
- Brought in new information on nesting habitat, habitat modeling and threats, and incorporated results from new seabird multi-population viability model.
- Undertook situational analyses for each site and populations of petrels at sea. Consulted active NGOs (Grupo Jaragua, EPIC), and biologists working with local communities in confirmed nesting areas (J. Goetz, A. Brown, E. Rupp) and at sea (Y. Stage, P. Jodice, G. Wallace).
- Drew on representatives at the IBPCG meeting held in 2019 (at the BirdsCaribbean International Conference in Guadeloupe) to gather additional input into the situations across the species range, especially probable and suspected areas in the Lesser Antilles.
- Consulted with external petrel experts we gained additional insights on various threats (for which few data were available) and to strategies as determined by other *Pterodroma* experts: Jérôme Dubos (Université de La Réunion), Martin Riethmuller (Société d'Études Ornithologiques de La Réunion), Teresa Militao (Universitat de Barcelona), Jacob Gonzalez-Solis (Universitat de Barcelona) and Herculano Dinis (Associação Projecto Vitó), Andre Raine (Kauai Endangered Seabird Recovery Program), Carolina Proaño (Galapagos Science Center), and Leo Zurita Arthos (Universidad San Francisco de Quito).
- Developed goals in the form of the status of Key Ecological Attributes (KEAs) relating to the petrel targets.

Plan

- Developed strategies, documenting our assumptions about drivers of change, and drafting objectives, activities, and indicators.
- Rated Strategies, examined possible negative outcomes
- Compiled information needs (monitoring and research recommendations.)
- Brought in external resources, including new publications and guest lectures from *Pterodroma* petrel experts from other areas (Réunion, Kauai, Cape Verde, Galapagos) to create an atmosphere of learning and cross-collaboration.
- Looked for examples from beyond taxa-specific conservation plans to other plans where human communities are central themes (e.g., Masai Mara Conservation Action Plan).



The conservation of the petrel has benefited from the close collaboration of many partners. Jennifer Wheeler

Table A1-1: Review of Actions from 2012 Conservation Action Plan for the Black-capped Petrel

Table 2 from 2012 Conservation Action Plan is replicated below, annotated with notes on progress and current relevancy. Almost all actions are still relevant and carried forward into the 2021 Conservation Action Plan: these are marked “In 2021 Plan.”

Many actions are “ONGOING;” a few are essentially “COMPLETED;” only a few actions are noted as “DROPPED.” In 2012 we lacked information needed to assess nesting sites separately or to rate threats and strategies. With advances in knowledge, we are better able to characterize sites specifically, rate threats, and identify and describe top strategies at particular sites.

ACTIONS (from 2012 Conservation Action Plan, Table 2)	Progress Report
<p>OUTPUT 1.A. Reduce Existing Threats: Known threats of habitat loss, predation and tower kills quantified, prioritized and reduced</p> <p>1.A.i. Maintain existing forest cover at known sites; incorporate petrel conservation into existing reforestation projects</p> <p>In 2021 Plan, interventions commenced at one site in Haiti, Morne Vincent</p> <p>1.A.ii. Assess which towers pose mortality threat; prioritize actions in accordance with assessment; develop mitigation measures such as reduced lighting, re-locating, and co-locating on existing towers to reduce number of structures</p> <p>In 2021 Plan, some interventions commenced</p> <p>1.A.iii. Identify key predators and predation levels; prioritize sites and predators; reduce predator impact on BCPE with traps or other predator control methods</p> <p>In 2021 Plan, some interventions commenced</p> <p>1.A.iv. Increase fire-control measures, and increase vigilance and enforcement</p> <p>In 2021 Plan, priority particularly for La Visite</p>	<p>As nest sites are discovered, threats are characterized by field observations and camera traps. Threats have been rated for each individual nesting site, although impacts of threats are not yet quantified. Determining impact of highest threats is a research priority.</p> <p>Some preliminary interventions have been made (modified lighting at one particularly dangerous tower, some pre-breeding predator trapping; some reforestation), but need to be expanded and effectiveness determined.</p> <p>(1.A.i.) Reforestation at forest buffer areas as well as farming practices that reduce needs to clear forest have offset the rate of deforestation in the border areas near Morne Vincent</p>
<p>OUTPUT I.B. Community Involvement: Communities adjacent to the known breeding sites are integrated in a participatory conservation process</p> <p>1.B.i. Conduct social research to understand human dependency and impact on BCPE forest habitat as well as potential direct impacts on BCPE populations</p> <p>In 2021 Plan</p> <p>1. B.ii. Create participatory management plans for sites with human impacts</p> <p>In 2021 Plan</p> <p>1.B.iii. Work with communities to manage hunting pressures and/or predation</p> <p>Abandoned - Harvest by humans not considered an important threat, and community control of predators not discussed</p>	<p>These actions are most relevant to the sites in Haiti, where communities are located within the Parks hosting petrels. At Morne Vincent, community engagement relating to sustainable agriculture and public education is ongoing. These and strategies of community development seek to provide citizens with concern for the petrel, and to provide them with skills and resources to improve environmental conditions in their fields and nearby forest.</p> <p>Direct interventions at La Visite ridge have not commenced, but James Goetz’s Payment for Ecosystem Services Program near Seguin illustrates complexity of drivers of resource use. A socio-economic study specifically for the ridge area is recommended.</p>

<p>1.C. Breeding Distribution: Nesting sites are known, mapped and characterized across the breeding range</p> <p>1.C.i. Develop habitat model that accurately characterizes known nesting sites (e.g. with satellite images and spatially explicit modeling that accounts for slope and vegetation cover)</p> <p>Completed</p> <p>1.C.i. Identify potential nesting and restoration sites based on characterization (above)</p> <p>Completed</p> <p>1.C.ii. Compare historical and potential BCPE nesting sites on Cuba, Dominica, Guadeloupe, Hispaniola, Jamaica, Navassa, etc. to known BCPE nesting characteristics, and survey sites with most potential</p> <p>In 2021 Plan; surveys commenced on all except Navassa (ruled out).</p> <p>1.C.iii. Develop and refine search methodologies for individual nests and nesting sites, e.g. radar, search dogs, transmitters on birds caught at sea</p> <p>In 2021 Plan</p>	<p>Habitat model developed for Hispaniola and Caribbean, and shared with partners.</p> <p>100 nests now located in 5 sites on Hispaniola. Autonomous recording units and ground searches continue in promising areas.</p> <p>Radar surveys conducted for most promising areas of Hispaniola, Dominica, Guadeloupe, and Jamaica.</p> <p>ARUs deployed in Dominica and Guadeloupe. Some coastal surveys conducted in Cuba.</p> <p>Petrels captured at Loma del Toro nesting sites and at sea off Hatteras, NC, and tracked by satellite shed light on nesting grounds and foraging areas.</p>
<p>1.D. Knowledge: Additional factors that affect population size, structure and vulnerability are identified</p> <p>1.D.i. Understand limiting factors and mortality drivers: quantify population vital rates and create a demographic model, conduct Population Viability Analysis</p> <p>In 2021 Plan, ongoing</p> <p>1.D.ii. Determine whether BCPE is nest-site limited through investigation of intra-specific and inter-specific competition at nest sites</p> <p>Abandoned - Not a research priority</p> <p>1.D.iii. Investigate current and historical population structure using genetic studies, esp. to determine unique populations</p> <p>In 2021 Plan</p> <p>1.D.iv. Assess prevalence and impact of parasites and/or disease</p> <p>Abandoned – Not a research priority</p>	<p>Seabird mPVA indicates negative trajectory; determining key species-specific vital rates is a key priority.</p> <p>Genetic work on specimens captured in the 1980s indicates genetic distinction between dark, and light and intermediate morphs.</p>
<p>1.E. Management and Policy: Appropriate legal and policy protection</p> <p>1.E.i. Protected area boundaries defined legally and marked on the ground</p> <p>Not pursued in 2021 Plan</p> <p>1.E.ii. Where they do not exist, develop and circulate area management plans in appropriate languages</p> <p>Not pursued in 2021 Plan</p> <p>1.E.iii. Implement long-term protection measures for expanded breeding areas by elevating protected status or securing conservation concessions</p> <p>To date, no nests outside parks</p> <p>1.E.iv. Explore national legal protections for the species, e.g. address the possibility of U.S. Endangered Species Act listing; provide international technical support for the process</p> <p>Advised on the US ESA listing</p> <p>1.E.v. Explore international legal protections for the species, e.g. inclusion in CMS (see Appendix A of Plan)</p> <p>In 2021 Plan</p>	<p>KBAs in Haiti were redefined/refined with the process inextricably linked to the development of the National System of Protected Areas. Specifically, Massif de la Selle formally proposed as a Biosphere Reserve.</p> <p>The USFWS has undertaken a formal Status Assessment and released a Proposed Rule for the listing of the species as Threatened.</p> <p>Species added to Annex 2 of the SPAW Protocol (2014)</p>

2.A. At-Sea Surveys and Seasonal Movements: Seasonal movements and at-sea range of BCPE understood

2.A.i. Place transmitters on birds at nesting sites to understand at-sea movements; investigate differences in at-sea range in the breeding and non-breeding season

In 2021 Plan, ongoing

2.A.ii. Continue compilation of at-sea sightings by U.S. Geological Survey and update other databases such as eBird; identify data gaps, e.g. winter surveys off Cape Hatteras

In 2021 Plan

2.A.iii. Collect information on at-sea sightings between Cuba and Jamaica

In 2021 Plan

2.A.iv. Recruit fishermen, sailors, etc. to report sightings

Not pursued

2.B. At-Sea Threats: At-sea threats and factors that affect population size identified and reduced

2.B.i. Identify prey and dynamics of prey base

In 2021 Plan, ongoing

2.B.ii. Investigate and if warranted, reduce fishery impacts on mortality

In 2021 Plan, ongoing

2.B.iii. Investigate marine lighting as a source of mortality, e.g. map locations of relevant platforms; develop mitigation for identified threats

In 2021 Plan, ongoing

2.B.iv. Assess risk posed by wind development in Caribbean areas

In 2021 Plan

3.A. Expanded Breeding Locations: Available nesting habitat at known sites increased by doubling the area of suitable threat-free habitat and/or increasing density using artificial nests or other measures. Suitable threat-free habitat at the existing three sites doubled in area

3.A.i. Assess potential for habitat restoration to expand suitable habitat at Macaya, La Visite, and Loma del Toro

In Haiti: Restoration preceded by development of tree crop buffers is envisioned as a long-term outcome for Morne Vincent. In DR, restoration at Loma del Toro not currently a priority; Valle Nuevo restoration discussed in 2021 Plan.

3.A.iii. Monitor the regeneration and restoration of forest areas

In 2021 Plan

3.A.iv. Use artificial nest burrows, playback attraction and/or translocation to expand current BCPE breeding sites

In 2021 Plan

Tracking studies conducted on birds caught at nesting sites and at sea.

Spatial overlap developed using tracking data, and shared with partners.

Field projects conducted by partners in Massif de la Hotte were planning steps for habitat protection/restoration, but restoration not actually underway.

Yet to be in a position to form a strategic approach to forest protection in and around the La Visite nesting colony.

<p>3.B. New Locations: New breeding locations established in a minimum of three new areas through translocation, artificial nests, attraction</p> <p>3.B.i. Identify new locations suitable for BCPE breeding (near existing breeding sites, or in completely new areas) based on habitat model from item 1.C.i.</p> <p>3.B.ii. Assess the feasibility of securing suitable habitat and establishing breeding sites in new locations</p> <p>3.B.iii. Secure suitable habitat (managing and mitigating for threats) and implement long-term protection measures</p> <p>3.B.iv. Install artificial nest burrows in the new areas and attract birds to nest (through spotlight attraction of adults and introduction to artificial nests, and also through translocation of pre-fledging young)</p> <p>3.B.v. Carry out late-provisioning studies at known nests to acquire data necessary for translocation applications</p> <p>All in 2021 Plan</p>	<p>These steps in the creation of new breeding locations form a top strategy in the 2021 Plan.</p>
<p>3C. Management of New Locations: Newly discovered or created sites protected and expanded</p> <p>3.C.i. Set in place long-term protection measures for the newly discovered populations; develop area management plans if needed</p> <p>3.C.ii. Manage land cover appropriately at each new colony, e.g. assess feasibility of tree planting or restoration to consolidate and expand habitat</p> <p>3.C.iii. Manage for habitat and invasive predator threats at new and expanded breeding locations</p> <p>All of above in 2021 Plan</p>	<p>Site-specific strategies must be developed for any newly discovered or created sites</p>

APPENDIX 2: SITE PROFILES

Table of Contents

Notes on terrestrial site profiles	72
CONFIRMED BREEDING AREAS ON HISPANIOLA	
LA VISITE (TET OPAK) - Haiti	73
MORNE VINCENT - Haiti	75
LOMA DEL TORO – Dominican Republic	77
LOMA QUEMADA – Dominican Republic	79
VALLE NUEVO – Dominican Republic	82
PROBABLE AND SUSPECTED BREEDING AREAS ON HISPANIOLA	
MACAYA - Haiti	83
LA VISITE - REMAINDER OF ESCARPMENT - Haiti	85
PIC DE LA SELLE - Haiti	87
ZAPOTEN - Dominican Republic	89
SIERRA DE NEIBA - Dominican Republic	91
NORTHWEST and CENTRAL CORDILLERA CENTRAL - Dominican Republic	93
PROBABLE AND SUSPECTED BREEDING AREAS ON OTHER ISLANDS	
DOMINICA	95
PICO TURQUINO and PICO LA BAYAMESA - Cuba	97
BLUE MOUNTAINS - Jamaica	99
GUADELOUPE	101
MAIN USE AREAS AT SEA	
Notes on marine profiles	102
NORTHWEST ATLANTIC	103
CARIBBEAN SEA	105
GULF OF MEXICO	107
REFERENCES	108

NOTES ON TERRESTRIAL SITE PROFILES

(Terrestrial site profiles are presented from west to east)

Terrestrial profiles contain the following sections:

Map: Maps provided show the general locations of sites described within these profiles. In addition, maps of confirmed sites also show nesting areas (blue minimum convex polygons, calculated from all extant burrows ever evidenced of being active). When available, maps include additional information such as searched areas (dashed white polygons), radar locations within site flyways (pink circles), and location of acoustic autonomous recording units (ARU; pink squares). Filled circles and squares locate surveys that recorded petrel activity; outlined circles and squares locate surveys that did not record petrel activity. For information, national parks in petrel habitat are also mapped (green overlay). Insets show 3D views of confirmed sites.

Vitals:

Search effort: Focuses on fieldwork since the 2012 Plan and Simons et al. (2013) monograph. All radar expeditions to date led by Adam Brown, with Environmental Protection in the Caribbean. All habitat modeling noted is that of Satgé et al. (2020). Audio/visual refers to night-time human listening/looking and/or placement of ARUs.

Dimensions:

- Nesting area based on 95% minimum convex polygon around all extant burrows ever evidenced of being active.
- Dimensions of protected areas based on UNEP-WCMC and IUCN (2020).
- Suitable Area in Protected Area: Computed as the suitable ($s > 0.90$; Satgé et al. 2020) surface areas inside nominal Protected Area.

Number of known nests: Includes all extant burrows ever evidenced of being active.

IBA: Site present in Important Bird Area, as designated by Birdlife International (2020).

KBA: Site present in Key Biodiversity Area, as designated by Key Biodiversity Areas Partnership (2020).

Other: Other area designations reflecting conservation priority, e.g. UNESCO Biosphere Reserves (2020)

Description: Short descriptions of the area, the type of habitat available, and human impact.

Highest threats: Only includes those rated as High or Very High for the particular site (for more details on threats and threat rating, see Threats Rating in the main text and Appendix 3: Threats Rating. For the threat of predation by introduced mammals: many potential harmful introduced species are present in the Caribbean; only the most damaging to petrel populations are noted.

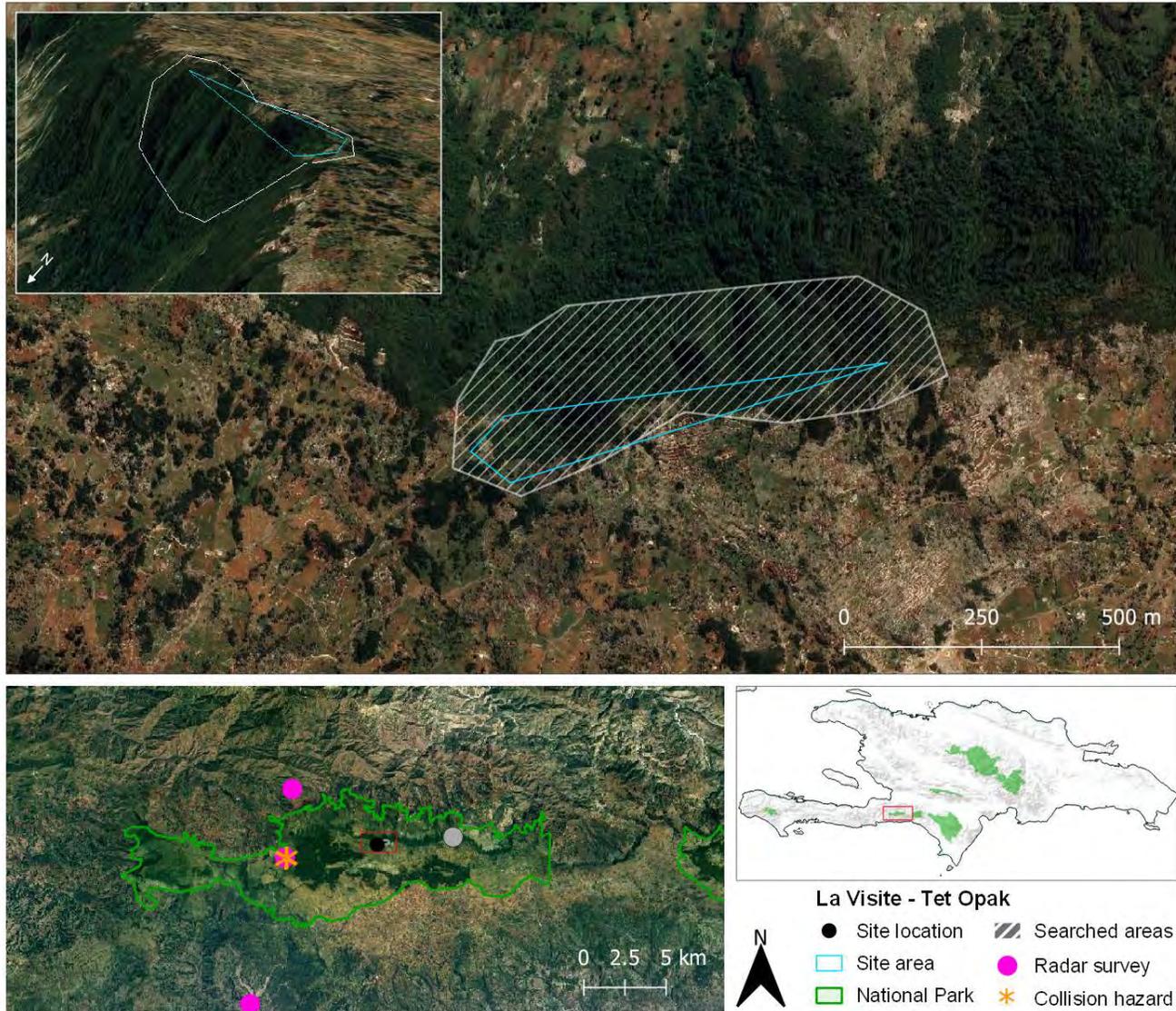
Other information include:

- Existing/Recent Research and Monitoring
- Existing/Recent Conservation Interventions
- Planned Strategies
- Critical Information Needs

LA VISITE (TET OPAK) - Haiti

Confirmed nesting

Site map (see map notes on page 72):



Vitals:

- Located at the western end of Massif de la Selle, in the La Visite escarpment, southcentral Haiti. Altitude: 2200m above sea level.
- Area thoroughly surveyed with radar (2013, 2014, 2017), and ground searches in 2013 and 2017 onwards.
- 42 nests (October 2020). Additional nests are suspected in adjacent areas.
- Nests spread over 0.01 km².
- Protected Area: La Visite National Park, 114.3 km², lacks effective protection enforcement.
- 25.6 km² of suitable nesting habitat available in Protected Area, based on modeling.
- Nearest confirmed nesting area: Morne Vincent, Haiti; 50 km to the east.
- IBA: yes; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- La Visite National Park is characterized by a dry, karstic environment with large swaths of remaining broadleaf and Hispaniola Pine forests surrounded by numerous farming communities.
- The La Visite escarpment is an area of steep north-facing slopes, with a remnant broadleaf forest that is 7 km

long and ranges from 40-500 m wide.

- Tet Opak refers to a specific area within a large drainage. A low descending ridge creates a natural barrier, effectively splitting the drainage into two shallow valleys.
- Nests are located in both valleys, on slopes with thick vegetation and on the ridgeline in areas actively being cleared for agriculture.
- The presence of farming communities, which have been using the area before the creation of the park, is tolerated within park boundaries though illegal.

Highest Threats:

- **Expansion of agriculture is a Very High ongoing threat** fueled by non-sustainable, low-yield farming practices in communities above and below the escarpment.
- **Livestock grazing is a High ongoing threat** as conversion to pasture increases exposure of burrows and is a step towards full vegetation clearing for row crop farming.
- **Fires** started in pine forests to expand nearby farming land have caused fatal attraction of breeding petrels and also **pose a High ongoing threat.**
- **Predation by introduced mammals**, fostered by the nearby presence of human settlements, **is a High ongoing threat.**
 - Cats are abundant.
 - Dogs are common
 - Mongoose are present
 - Rats are extremely abundant.
- **Collision with lighted telecommunication towers** was formerly a High threat but alteration of its lighting system has decreased its impact to Low.
- **Other threats** include: Extraction of wood and non-timber forest products (e.g. tree ferns): Medium; Groundings from Light Pollution: Medium; Harvest by humans: Low.

Existing Research and Monitoring:

- Visited annually since 2018, with all known nests visually inspected throughout the breeding season.
- Camera traps are placed at the site and most nests are being monitored.

Existing Conservation Interventions:

- None yet in place
- Conservation work by IBPCG has been challenged by the remoteness of the area and the lack of an established presence there.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S4: Reduce predator pressure
- S5: Reduce flight hazards
- S7: Scoping study of socio-economic drivers of the threats at La Visite National Park

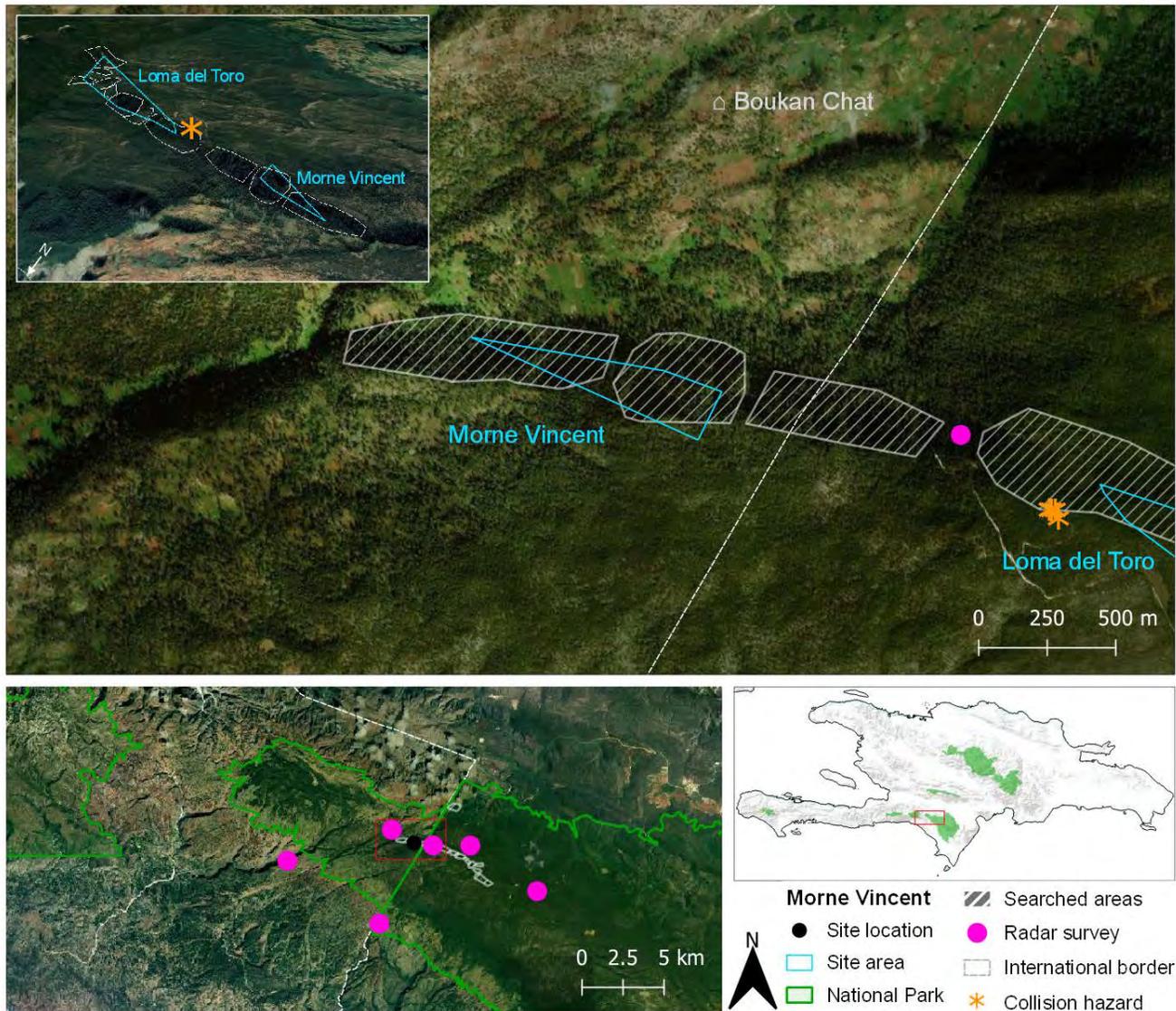
Critical Information Needs:

- Continued monitoring of the site for indicators of Key Ecological Attributes
- Continued search for nesting sites along remainder of the escarpment.
- Impact of predators.
- A better understanding of the socioeconomics of communities living in the La Visite National Park is needed to propose relevant strategies.

MORNE VINCENT - Haiti

Confirmed nesting

Site map (see map notes on page 72):



Vitals:

- Located at the east end of Massif de la Selle, on Haiti's eastern border with the Dominican Republic. Altitude: 2000m above sea level.
- Area thoroughly surveyed with radar (2012-2014, 2017), ARUs and ground searches since 2010.
- 17 nests (October 2020). No or few additional nests suspected.
- Nests spread over 0.13 km²
- Protected Area: Forêt de Pins I National Park (Parc National Naturel), 65 km², lacks effective protection enforcement.
- Very little suitable nesting habitat remaining in Protected Area: 2.3 km², based on modeling and observation.
- Nearest confirmed nesting area: Loma del Toro, Dominican Republic, abuts Morne Vincent and can be considered the same nesting area (1 km). La Visite - Tet Opak is located 50km to the west.
- IBA: no; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- In a high elevation region characterized by heavily forested patches in a dry, karstic environment, intermixed with small impoverished farming communities.
- Morne Vincent site consists of dispersed mature Hispaniola Pine, mostly cleared of undergrowth, although small, scattered patches of remaining broadleaf undergrowth are still present.
- Abutted by community of Boukan Chat (very roughly estimated as a population of 5,000), other smaller communities nearby

Highest Threats:

- **Predation by introduced mammals is a High ongoing threat.**
 - Cats are present but not abundant.
 - No mongoose have yet been observed
 - Rats are extremely abundant.
- **Collision with lighted structures** on the nearby Loma del Toro peak (<1km) **poses a High ongoing threat** to petrels at Morne Vincent.
- **Expansion of agriculture** by citizens of Boukan Chat, driven by poor agroecological practices, was **formerly a Very High threat**; however, conservation interventions of the last decade appear to have brought the threat to **Low**.
- **Other threats** include: Fire mortality: Medium; Groundings from Light Pollution: Medium; Fire damage to habitat: Low; Extraction of wood and non-timber forest products: Low; Harvest by humans: Low.

Existing Research and Monitoring:

- Visited annually since 2010, with all known nests visually inspected throughout the breeding season.
- A handful of camera traps are placed at the site.

Existing Conservation Interventions:

- Positive relationships built within the Boukan Chat community and community-development and environmental education initiatives launched with partners Plant with Purpose and GIZ (the German government's international aid organization).
- Farmer education on sustainable practices on existing farmland and in forest conservation values to reduce pressure to convert forest.
- Continued program of education and outreach to the public (e.g., Diablotin Festival, support to soccer team) and in schools.
- Success of conservation interventions is evidenced by the continued existence of the site and because the number of occupied nests seems stable.

Planned Strategies

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S4: Reduce predator pressure
- S5: Reduce flight hazards
- S6: Strategies of community development in Boukan Chat

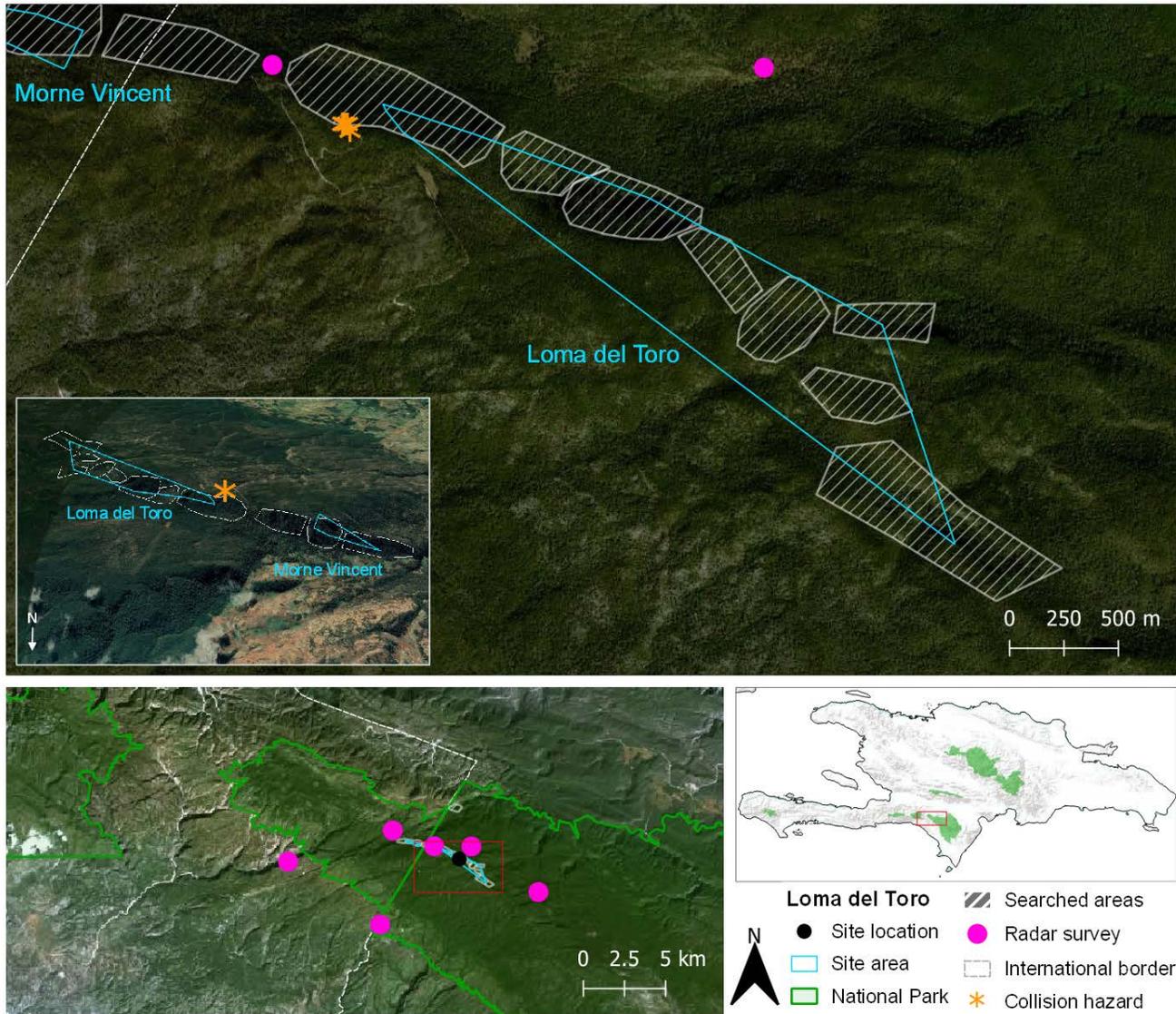
Critical Information Needs:

- Continued monitoring of the site for indicators of Key Ecological Attributes.
- Impact of nearby lighted telecommunication towers.
- Locating nesting areas and assessing habitat quality and encroachment

LOMA DEL TORO – Dominican Republic

Confirmed nesting

Site map (see map notes on page 72):



Vitals:

- Located at the west end of Sierra de Bahoruco, on the Dominican Republic's western border with Haiti. Altitude: 2300 m above sea level.
- Area thoroughly surveyed with radar (2012-2014, 2017), ARUs and ground searches since 2010.
- 28 nests (October 2020). Few additional nests suspected.
- Nests spread over 1.5 km²
- Protected Area: Sierra de Bahoruco National Park, 1092 km².
- Protected Area hosts large swaths of suitable nesting habitat: 57 km², based on modeling.
- Nearest confirmed nesting area: Morne Vincent, Haiti, abuts Loma del Toro and can be considered the same nesting area (1 km). Also in the Sierra de Bahoruco mountain range, Loma Quemada, Dominican Republic, is located 20 km to the east.
- IBA: yes; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- In a high elevation area characterized by broad expanses of forests of Hispaniola Pine in a dry, karstic environment.
- Nesting areas in Loma del Toro consist of dense broadleaf undergrowth in dispersed Hispaniola Pine forest, on medium to steep slopes.
- Nesting sites are grouped into three main independent clusters of 15, 8, and 2 monitored burrows.
- No reported human encroachment.

Highest Threats:

- **Predation by introduced mammals is a High ongoing threat:**
 - Cats are present but not abundant.
 - No mongoose have yet been observed
 - Rats are extremely abundant.
- **Collision with lighted structures** on the Loma del Toro peak (<100 m from main cluster) **pose a High ongoing threat** to the petrels at Loma del Toro.
- **Other threats** include: Fire mortality: Medium; Groundings from Light Pollution: Medium; Fire damage to habitat: Low.

Existing Research and Monitoring:

- Visited annually since 2010, with most known nests visually inspected (25 out of 28) throughout the breeding season.
- Camera traps are placed at the site and most nests are being monitored.
- Predator control has been trialled and is planned for future years (cats and rats).

Existing Conservation Interventions:

- Positive relationships built within the nearby Boukan Chat community, Haiti, and community-development and environmental education initiatives launched with partners Plant with Purpose and GIZ (the German government's international aid organization).
- Continued program of education and outreach to the public (e.g., Diablotin Festival) and in schools.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S4: Reduce predator pressure
- S5: Reduce flight hazards
- S6: Strategies of community development in Boukan Chat
- S8: Engage with DR government to plan and strengthen oversight of parks

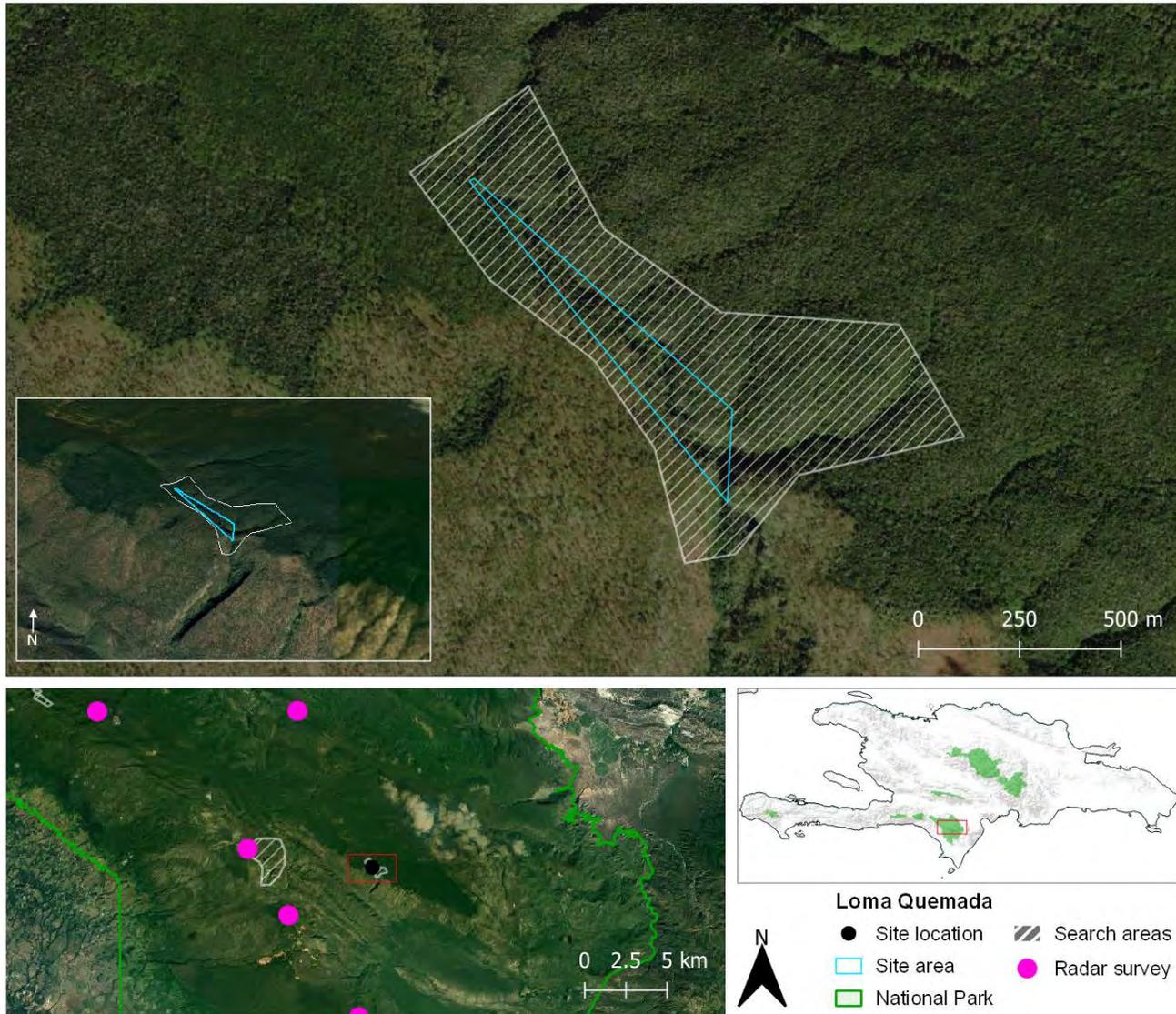
Critical Information Needs:

- Continued monitoring of the site for indicators of Key Ecological Attributes.
- Impact of predators.
- Impact of lighted telecommunication towers.

LOMA QUEMADA – Dominican Republic

Confirmed nesting

Site map (see map notes on page 72):



Vitals:

- Located in the eastern Sierra de Bahoruco, in the southwestern Dominican Republic. Altitude: 1700 m above sea level.
- Area covered by radar (2013, 2017); moderately surveyed with ARUs and ground searches since 2015.
- 7 nests (October 2020). Additional nests suspected in adjacent areas.
- Nests spread over 0.11 km²
- Protected Area: Sierra de Bahoruco National Park, 1092 km².
- Protected Area hosts large swaths of suitable nesting habitat: 57 km².
- Nearest confirmed nesting area: Also in the Sierra de Bahoruco mountain range, Loma del Toro, Dominican Republic, is located 20 km to the west.
- IBA: yes; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve?

Description:

- Nesting site with the lowest elevation, characterized by broad expanses of forests of Hispaniola Pine in a dry, karstic environment.
- Nesting sites located along the bottom of a dry canyon vegetated with broadleaf trees and shrubs. The area has generally undisturbed broadleaf vegetation, despite pig damage.
- All nests in deep caves, crevices with narrow entrances (likely due to pig pressure).
- No reported human encroachment.

Highest Threats:

- **Predation by introduced mammals is a High ongoing threat:**
 - Cats are not abundant but regularly observed.
 - No mongoose have yet been observed
 - Rats are extremely abundant.
- **The presence of feral pigs is a High ongoing threat**, with pigs destroying burrows and occasionally depredating nest occupants.
- **Other threats** include: Fire mortality: Medium; Groundings from Light Pollution: Medium; Fire damage to habitat: Low.

Existing Research and Monitoring:

- Visited annually since 2016, with all known nests visually inspected throughout the breeding season.
- Camera traps are placed at the site and most nests are being monitored.

Existing Conservation Interventions:

No conservation interventions are ongoing but solutions to control the feral pig population are sought with local hunters.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S4: Reduce predator pressure
- S8: Engage with DR government to plan and strengthen oversight of parks

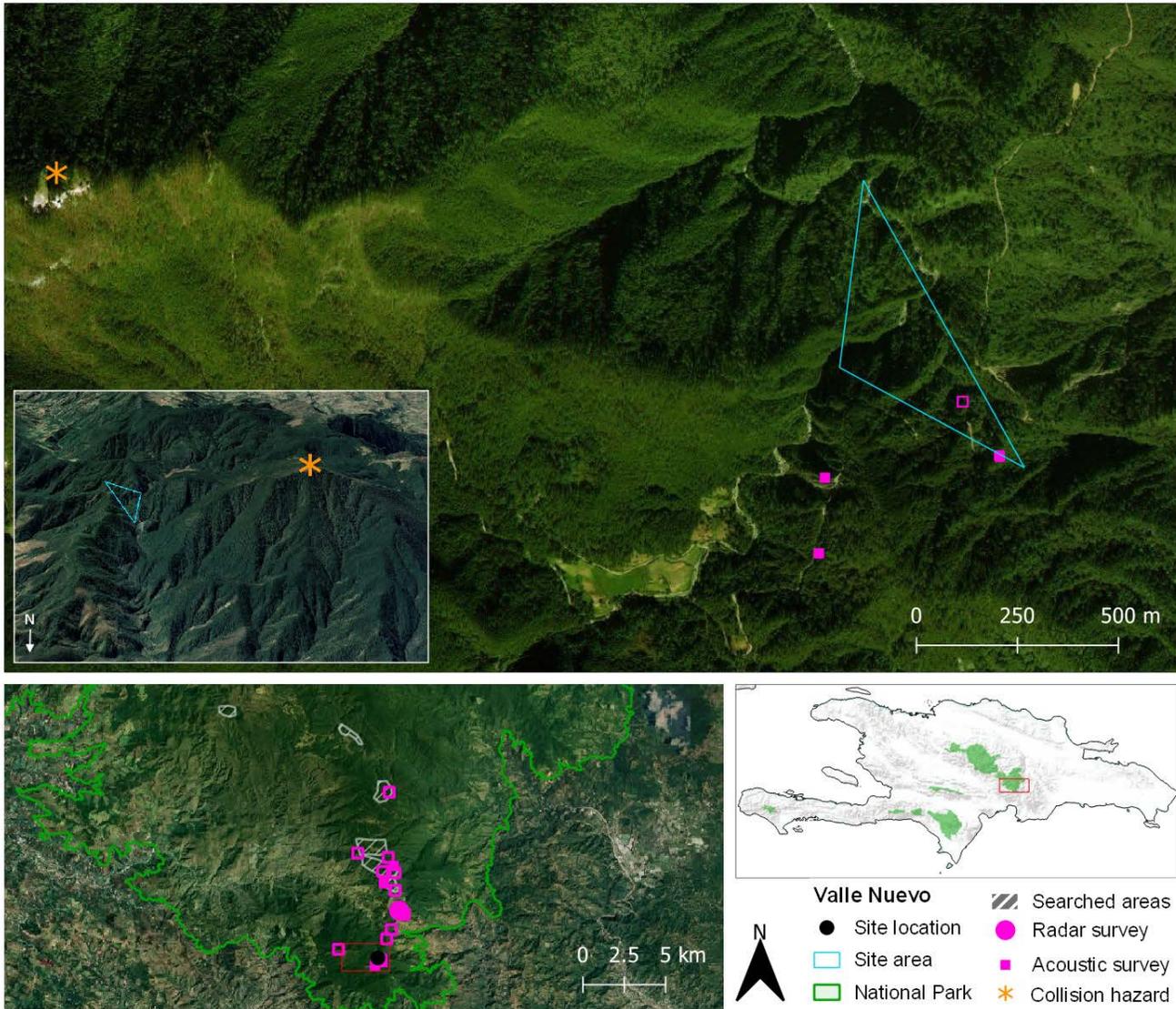
Critical Information Needs:

- Continued monitoring of the site for indicators of Key Ecological Attributes.
- Impact of introduced mammals.

VALLE NUEVO – Dominican Republic

Confirmed nesting

Site map (see map notes on page 72):



Vitals:

- Located in the southeastern Cordillera Central, in the central Dominican Republic. Altitude: 2000 m above sea level.
- Area covered by radar (2013, 2017); moderately surveyed with ARUs and ground searches.
- 11 nests (October 2020). Additional nests suspected in adjacent areas.
- Nests spread over 0.14 km²
- Protected Area: Valle Nuevo National Park, 906 km².
- Protected Area hosts large swaths of suitable nesting habitat: 54 km² based on modeling.
- Nearest confirmed nesting area: Loma Quemada, Dominican Republic, is located 100 km to the southwest.
- IBA: yes; KBA: yes.

Description:

- Area characterized by steep valleys and ravines with flowing streams, vegetated by mixed forests of broadleaf tree species, with very dispersed Hispaniola pines.
- Areas of invasive fern thickets in forest patches damaged by fires.
- Few farming communities are present in the area, with currently a low level of encroachment. Encroachment occurred in the past, with intensive cash-crop farming near nesting areas.

Highest Threats:

- **Predation by introduced mammals is a High ongoing threat:**
 - Cats have not been recorded at this site, but likely occur.
 - Mongoose are not abundant but regularly observed. Predation by mongoose was observed.
 - Rats are extremely abundant.
- **Grounding due to light attraction is rated as a Medium ongoing threat** because of villages and lighted roads on flyway; however, data gaps on its impacts may temper this assessment.
- **Other threats** include: Degradation of habitat by invasive ferns: Medium; Fire mortality: Medium; Groundings from Light Pollution: Medium; Fire damage to habitat: Medium; Agricultural expansion: Low in current nesting habitat (based on past incursions in the area).

Existing Research and Monitoring:

- Visited annually since 2017, with all known nests visually inspected throughout the breeding season.
- Camera traps are placed at the site and most nests are being monitored.
- Predator control has been trialed and is planned for future years (mongoose and rats).

Existing Conservation Interventions:

No conservation interventions are ongoing but solutions to control invasive ferns from affecting petrel habitat are being discussed.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S4: Reduce predator pressure
- S5: Reduce flight hazards
- S8: Engage with DR government to plan and strengthen oversight of parks
- S8c: Habitat restoration

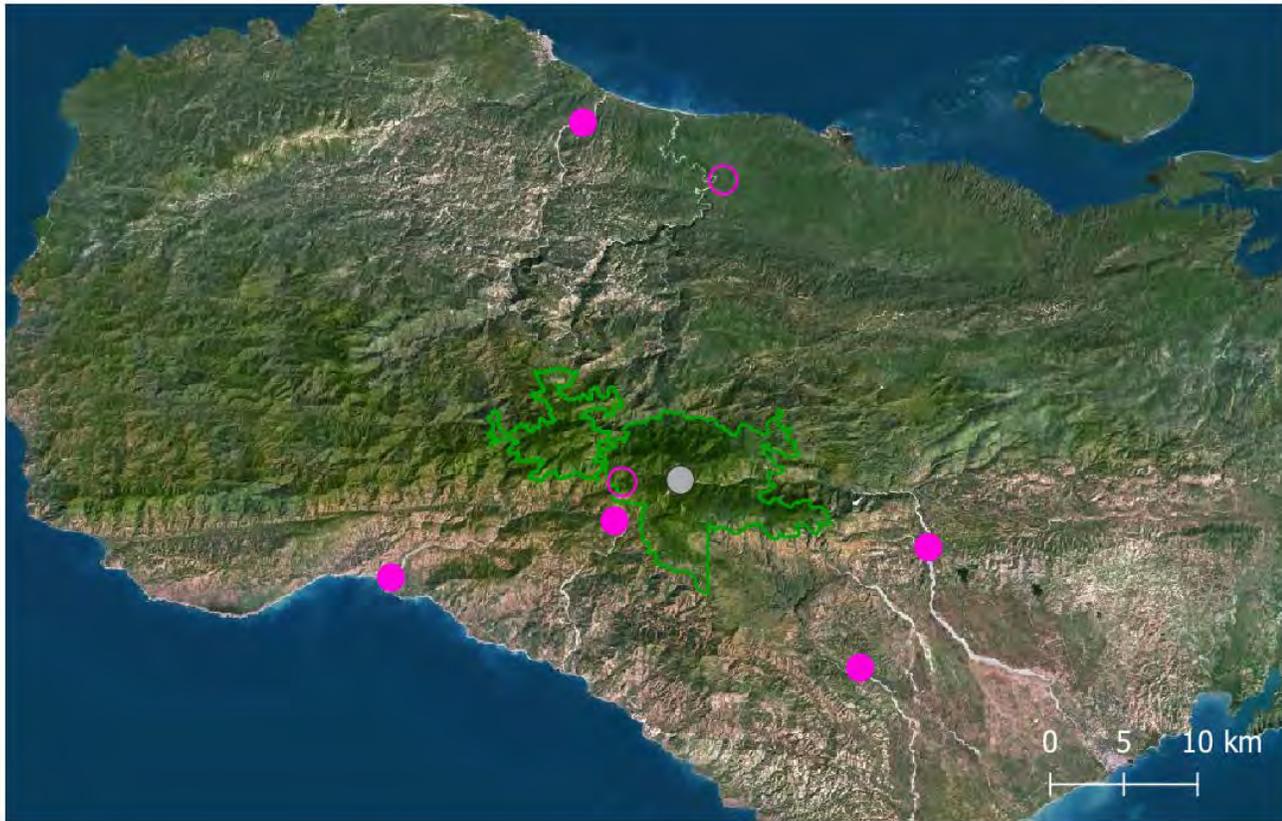
Critical Information Needs:

- Continued monitoring of the site for indicators of Key Ecological Attributes.
- Impact of introduced mammals.
- Impact of strandings due to light attraction to populated areas along flyways.
- Impact of invasive ferns.

MACAYA - Haiti

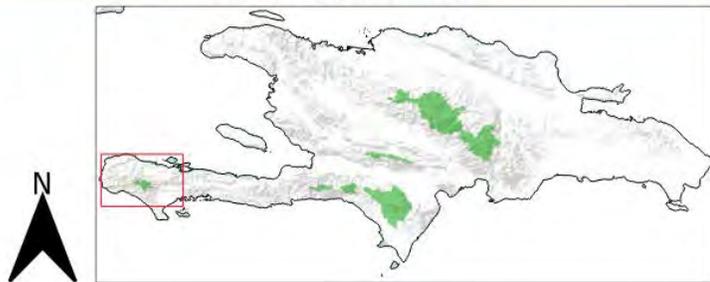
Probable nesting

Site map (see map notes on page 72):



Macaya

-  General site location
-  Radar survey
-  National Park



Vitals:

- Located in the Massif de la Hotte, at the tip of the southwestern peninsula of Haiti. Altitude: 1600-2300 m above sea level.
- Area partially covered by radar in 2014; scarce audio, visual surveys and ground searches (Goetz 2009).
- Nesting is probable based on recent evidence from radar surveys in flyways leading to Pic Macaya (2014), from observations of petrels flying and vocalizing (Goetz 2009), and from habitat modeling.
- Protected Area: Macaya National Park, 99 km².
- Protected Area hosts large swaths of suitable nesting habitat: 31.4 km², based on modeling.
- Nearest confirmed nesting area: La Visite - Tet Opak, Haiti, is located 190 km to the east.
- IBA: no; KBA: yes. Within UNESCO's La Hotte Biosphere Reserve.

Description:

- This area is composed of the parallel east-west ridgelines of twin peaks Pic Macaya (to the north) and Pic Formont (to the south).
- The terrain is characterized by steep valleys and ravines in a dry, karstic environment. A relatively well preserved forest of Hispaniola pines covers the summit and adjacent slopes.

Highest Threats:

- **Expansion of agriculture is a Very High ongoing threat**, with farming occurring at the bottom of the peaks and encroaching upwards. Fires used to clear land have also damaged nesting habitat.
- **Predation by introduced mammals is a High ongoing threat**, with a confirmed presence of:
 - Cats are abundant and regularly observed.
 - Rats are extremely abundant.
 - Feral pigs reported, but not abundant.
 - Mongoose have not been recorded, but likely occur.

Research and Monitoring:

No research or monitoring currently occurring.

Conservation Interventions:

No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites

Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

LA VISITE - REMAINDER OF ESCARPMENT - Haiti

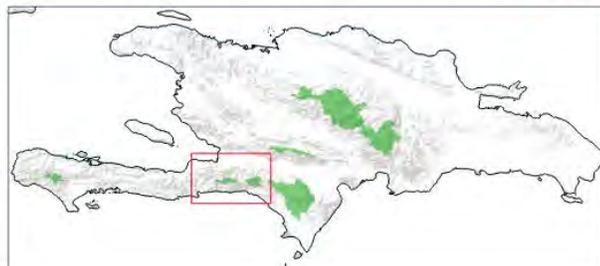
Probable nesting

Site map (see map notes on page 72):



La Visite escarpment (remainder)

-  General site location
-  Suspected site
-  Confirmed site
-  Collision hazard
-  National Park
-  International border
-  Radar survey



Vitals:

- Located at the western end of Massif de la Selle, in southcentral Haiti. Altitude: 1600-2200m above sea level.
- Area thoroughly surveyed with radar (2013, 2014, 2017). Occasional audio and visual surveys (2008, 2009, 2011 reported by Goetz); no ground searches.
- Nesting is probable based on recent evidence from radar surveys in flyways leading to the escarpment, from observations of petrels flying and vocalizing, and from habitat modeling.
- Protected Area: La Visite National Park, 114.3 km², lacks effective protection enforcement.
- 25.6 km² of suitable nesting habitat available in Protected Area, based on modeling.
- Nearest confirmed nesting area: La Visite - Tet Opak, on the western end of the escarpment.
- IBA: no; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- La Visite National Park is characterized by a dry, karstic environment with large swaths of remaining broadleaf

and Hispaniola Pine forests surrounded by numerous farming communities.

- The La Visite escarpment is an area of steep north-facing slopes, with a remnant broadleaf forest that is 7 km long and ranges from 40-500 m wide.
- The presence of farming communities, which have been using the area before the creation of the park, is tolerated within park boundaries though illegal.

Highest threats:

- **Expansion of agriculture is a Very High ongoing threat** fueled by non-sustainable, low-yield farming practices in communities above and below the escarpment.
- **Livestock grazing is a High ongoing threat** as it is a step towards full vegetation clearing for row crop farming.
- **Fires** started in pine forests to expand nearby farming land have caused fatal attraction of breeding petrels and also **pose a High ongoing threat**.
- **Predation by introduced mammals**, fostered by the nearby presence of human settlements, **is a High ongoing threat**.
 - Cats are abundant.
 - Mongoose have not been reported, but likely occur.
 - Rats are extremely abundant.
- Collision with lighted telecommunication towers was formerly a High threat but alteration of its lighting system has decreased its impact to Low.

Research and Monitoring: No research or monitoring currently occurring in the remainder of the escarpment.

Existing Conservation Interventions: No conservation interventions currently ongoing. Conservation work by IBPCG has been challenged by the remoteness of the area and the lack of an established presence there.

Planned Strategies

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S5: Reduce flight hazards
- S7: Scoping study of socio-economic drivers of the threats at La Visite

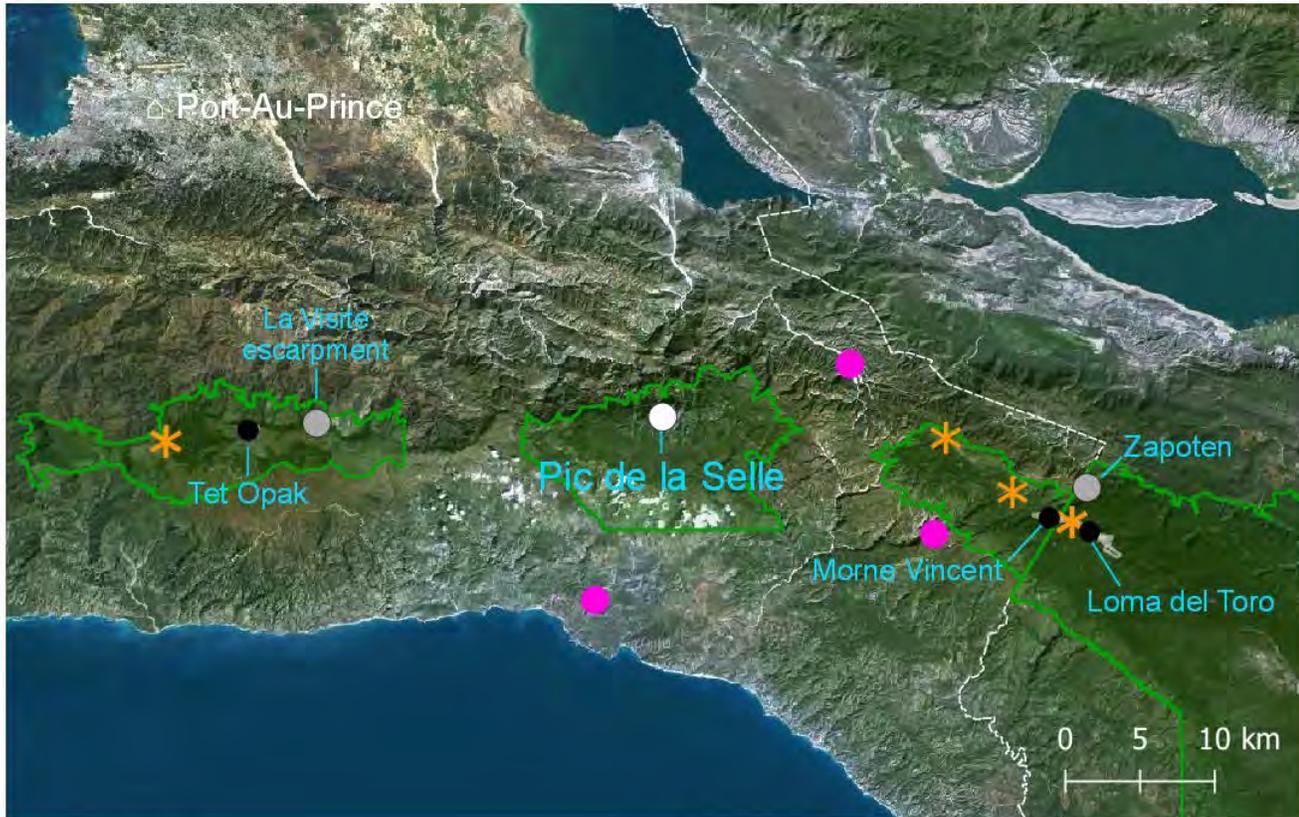
Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.
- A better understanding of the socioeconomics of communities living in the La Visite National Park is needed to propose relevant strategies.

PIC DE LA SELLE - Haiti

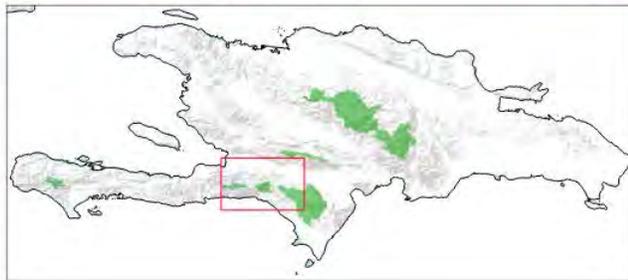
Probable nesting

Site map (see map notes on page 72):



Pic de la Selle

-  General site location
-  Probable site
-  Confirmed site
-  Collision hazard
-  National Park
-  International border
-  Radar survey



Vitals:

- Located at the eastern end of Massif de la Selle, in southeast Haiti. Altitude: 2000-2600m above sea level. Pic de la Selle is the highest peak in Haiti (2680m)
- Area partially surveyed with radar (2013, 2017). No audio and visual surveys; occasional ground searches (limited scope).
- Nesting is probable based on recent evidence from radar surveys in flyways leading to the escarpment, from observations of petrels vocalizing (Jean et al. 2011), and from habitat modeling.
- Protected Area: Forêt de Pins II National Park, 140.0 km², lacks effective protection enforcement.
- 21.4 km² of suitable nesting habitat available in Protected Area, based on modeling.
- Nearest confirmed nesting area: La Visite - Tet Opak (to the west) and Morne Vincent (to the east) are both located 25 km away from Pic de la Selle.
- IBA: no; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- Pic de la Selle is characterized by a dry, karstic environment. Western slopes host high altitude forests of Hispaniola pine, while the highest areas and the eastern slopes are characterized by shrub-like, scattered vegetation.
- Habitat modeling locates suitable nesting habitat in the forests west and southwest of the peak.
- The area is surrounded by numerous farming communities but the arid environment prevents much further ingress.

Highest Threats:

Threats are similar to those in the remainder of the La Visite escarpment:

- **Expansion of agriculture** (including livestock grazing) into the remaining pine forest.
- **Predation by introduced mammals**, including cats and rats.
- **Fires** started to expand nearby farming land.

Research and Monitoring:

Occasional ground searches but no research or monitoring currently occurring.

Conservation Interventions:

No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S5: Reduce flight hazards

Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

ZAPOTEN - Dominican Republic

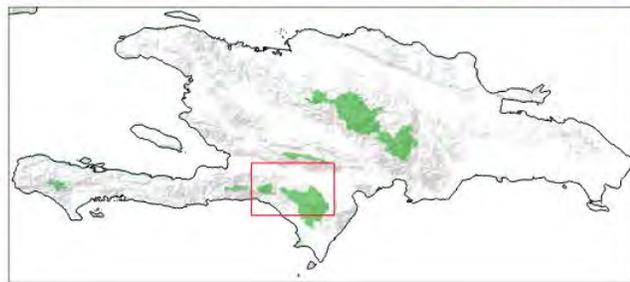
Probable nesting

Site map (see map notes on page 72):



Zapoten

-  General site location
-  Suspected site
-  Confirmed site
-  Collision hazard
-  National Park
-  International border
-  Radar survey



Vitals:

- Located at the western end of Sierra de Bahoruco, on the Dominican Republic's western border with Haiti. North and below Loma del Toro. Altitude: 1300-1500 m above sea level.
- Area surveyed with radar as part of surveys at Loma del Toro (2012-2014, 2017). Some audio and visual surveys, ground searches (2019).
- Nesting is probable based on recent evidence from radar surveys near the area (2012-2014, 2017), on hearing vocalizing petrels in the distance (2019), on the discovery of a lost petrel chick (2020), and from habitat modeling.
- Protected Area: Sierra de Bahoruco National Park, 1092 km².
- Protected Area hosts large swaths of suitable nesting habitat: 57 km², based on modeling.
- Nearest confirmed nesting area: Also in the Sierra de Bahoruco mountain range, Loma del Toro, Dominican Republic, is located 2 km to the south.
- IBA: yes; KBA: yes. Within UNESCO's La Selle - Jaragua-Bahoruco-Enriquillo Transboundary Biosphere Reserve.

Description:

- Zapoten is located at medium altitude on the north-facing slope of the Sierra de Bahoruco range. The vegetation is characterized by broadleaved evergreen trees (cloudforest) with close canopy.
- The area is abutted to the north and west by farming communities in Haiti.

Highest Threats: Threats have not been rated for this site but suspected threats include:

- **Expansion of agriculture** (including livestock grazing) from the Haitian side of the border.
- **Predation by introduced mammals**, including cats and rats.
- **Collision with lighted structures** on the Loma del Toro peak and nearby Foret de Pins.

Research and Monitoring:

No research or monitoring currently occurring but plans exist to deploy acoustic recording units.

Conservation Interventions:

No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites
- ES3: Restore or create nest sites
- S5: Reduce flight hazards
- S6: Strategies of community development in Boukan Chat
- S8: Engage with DR government to plan and strengthen oversight of parks

Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

SIERRA DE NEIBA - Dominican Republic

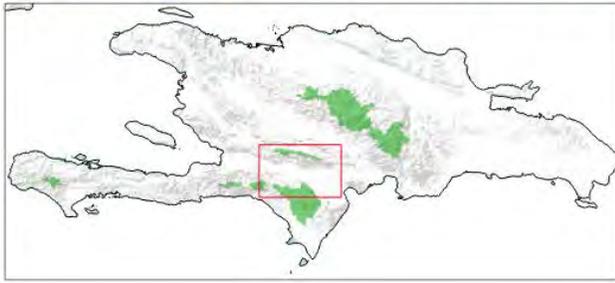
Suspected nesting

Site map (see map notes on page 72):



Sierra de Neiba

- | | |
|---|--|
|  General site location |  National Park |
|  Probable site |  International border |
|  Confirmed site |  Radar survey |
- 



Vitals:

- High mountain range located in western Dominican Republic, shared with Haiti (¼ of the area). Altitude: 1700-2300 m above sea level.
- Area surveyed with radar once in 2013. No audio and visual surveys; no ground searches.
- Nesting is suspected based on recent evidence from radar surveys near the area (14 petrel-like targets; Brown 2014) but habitat modeling does not highlight this area as suitable for nesting.
- Protected Area: Sierra de Neiba National Park, 183 km².
- Protected Area does not appear to host suitable nesting habitat based on modeling.
- Nearest confirmed nesting area: Loma del Toro, Dominican Republic, is located 40 km to the south.
- IBA: yes; KBA: yes.

Description:

- Sierra de Neiba forms a long (ca 80 km) elevated east-west ridge. It is separated from the Sierra de Bahoruco range by the drainage basin of Lago Enriquillo. The vegetation is characterized by broadleaved evergreen trees (cloudforest) with close canopy.
- Lower elevations have been deforested for farming (up to 1300 - 1700 m above sea level).

Highest Threats: Threats have not been rated for this site but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose and rats.
- **Expansion of agriculture** (including livestock grazing) into the lower extents of forests.

Research and Monitoring:

No research or monitoring currently occurring.

Conservation Interventions:

No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

No other strategies are planned for this site.

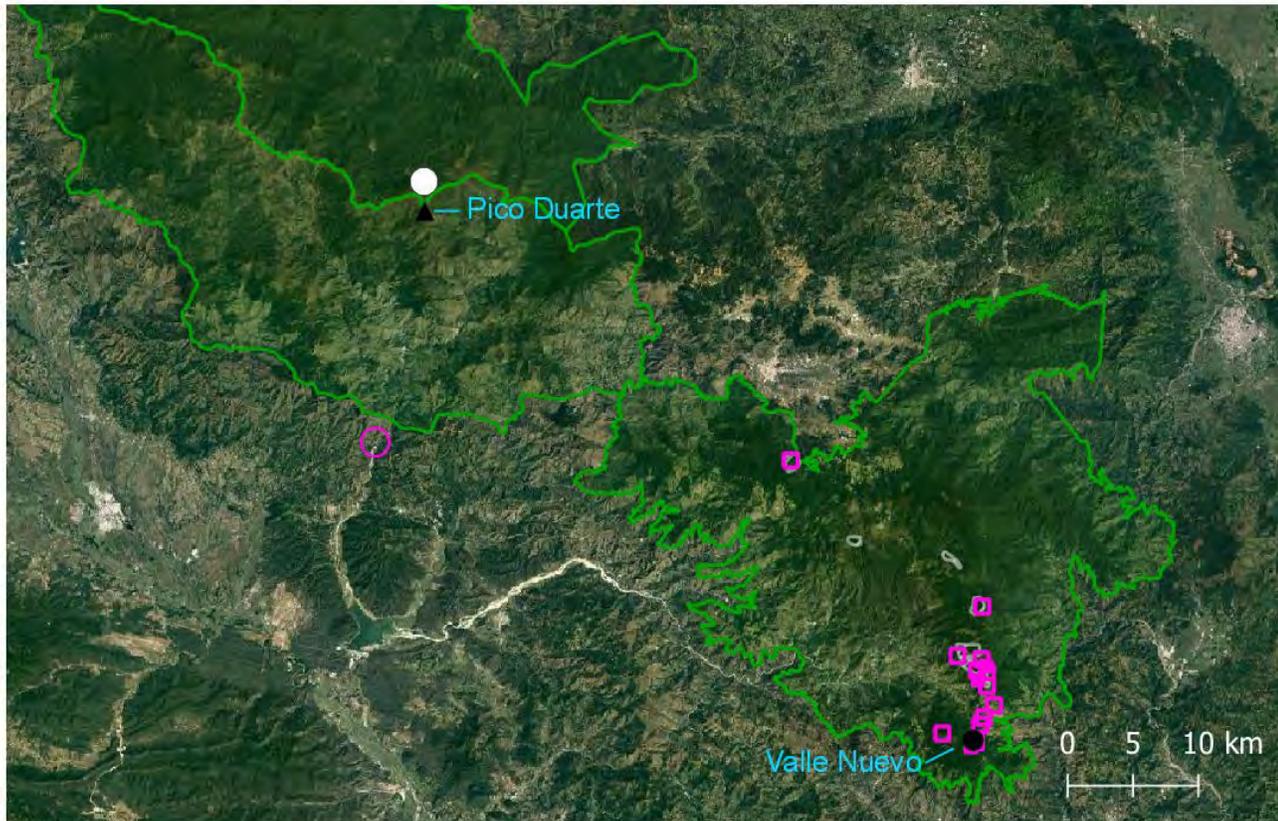
Critical Information Needs:

- Assess and characterize threats.

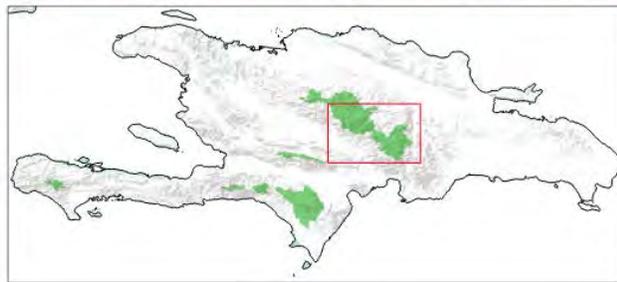
NORTHWEST and CENTRAL CORDILLERA CENTRAL - Dominican Republic

Suspected nesting

Site map (see map notes on page 72):



Northwest and Central Cordillera Central



Vitals:

- High mountain range located in central Dominican Republic. Altitude: 1400-3000 m above sea level. Pico Duarte, 3098 m is the highest point in the country.
- Surveyed once by radar (no petrel targets recorded; 2014). No audio and visual surveys; no ground searches.
- Nesting is possible based on proximity to confirmed nesting sites in eastern Cordillera Central and Sierra de Bahoruco - but habitat modeling does not highlight this area as suitable for nesting.
- Protected Areas: Armando Bermúdez National Park, 803 km²; José del Carmen Ramírez, 750 km².
- Protected Area does not appear to host suitable nesting habitat based on modeling.
- Nearest confirmed nesting area: Valle Nuevo, Dominican Republic, is located 50 km to the southeast.
- IBA: yes; KBA: yes.

Description:

- The Cordillera central has a crescent-shape ridgeline from the northwest to the southeast, ca 100km in length. The vegetation is characterized by broadleaved evergreen trees mixed with various levels of Hispaniola pines. Higher altitudes around Pico Duarte are characterized by shrub-like open vegetation.
- The southeastern part of the mountain range is home to Valle Nuevo National Park, where petrel nesting has been confirmed.

Highest Threats: Threats have not been rated for this site but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose and rats.
- **Expansion of agriculture** (including livestock grazing) into the lower extents of forests.

Research and Monitoring:

No research or monitoring currently occurring.

Conservation Interventions:

No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

No other strategies are planned for this site.

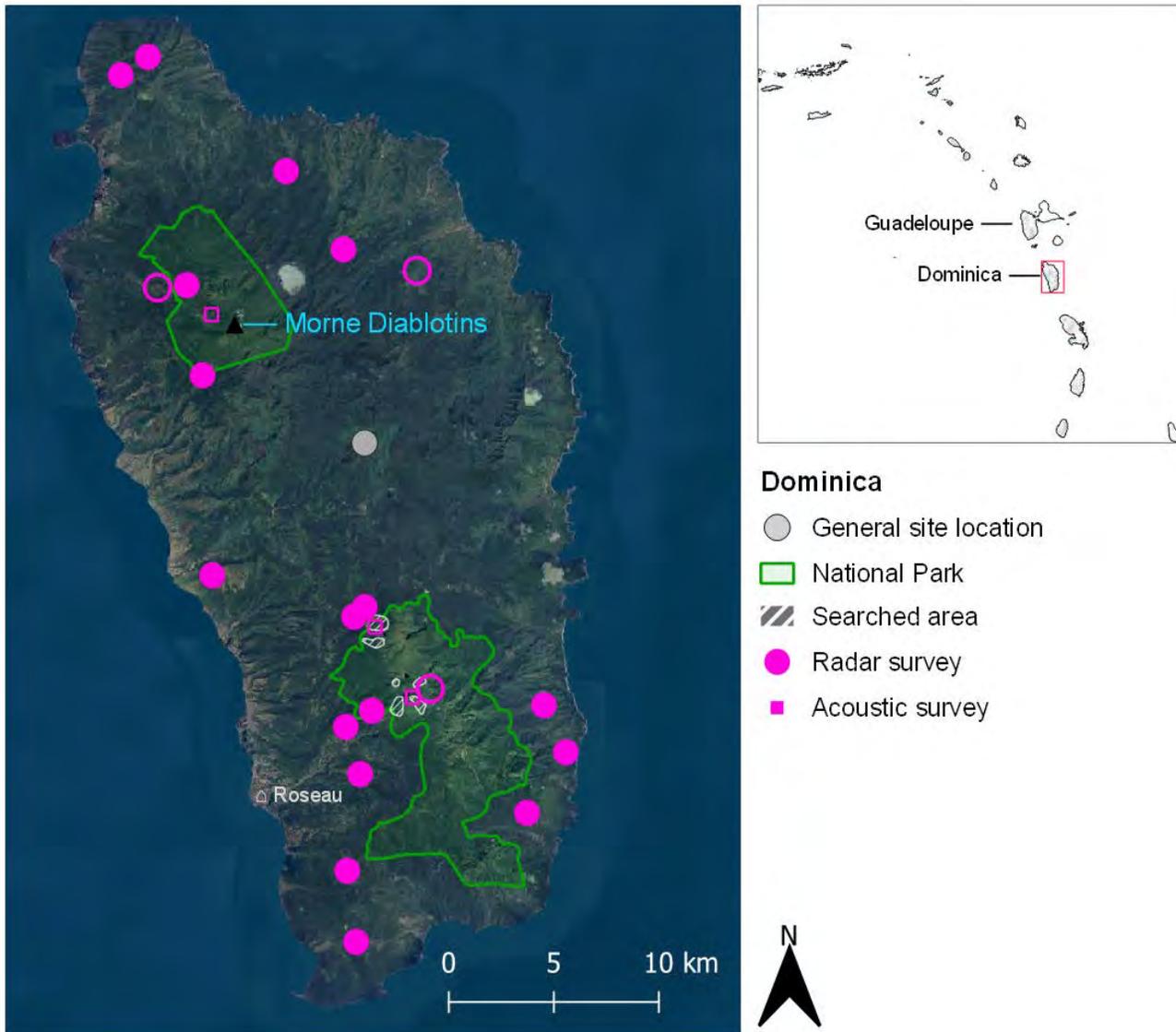
Critical Information Needs:

- Assess and characterize threats.

DOMINICA

Probable nesting

Site map (see map notes on page 72):



Vitals:

- Various peaks on Dominica, including Morne Diablotins (to the north) and Morne Trois Pitons (to the south). Altitude: 1000-1500 m above sea level. Morne Diablotins (1447 m) is the highest point on Dominica.
- Area thoroughly surveyed with radar in 2015 and 2020. Localized audio surveys and ground searches during technical exchange (Morne Trois Pitons, 2016).
- Nesting is probable based on recent evidence from radar surveys in the area, direct observation of flying petrels, recovery of grounded birds in urban areas, and from habitat modeling. **Morne Diablotins**: up to 204 petrel-like targets observed in adjacent flyways (Brown 2015, Brown 2020); **Morne Trois Pitons**: up to 168 petrel-like targets observed in adjacent flyways (Brown 2015, Brown 2020), and up to 3 flying petrels observed. Areas were searched but nests have yet to be located (Rupp et al. 2016).
- Protected Areas: Morne Diablotins National Park, 36 km²; Northern Forest Reserve: 59 km²; Morne Trois Pitons National Park, 69 km².
- Suitable nesting habitat available in Protected Areas but not quantified.
- IBA: yes; KBA: yes.

Description: Dominica is a mountainous volcanic island characterized by steep slopes covered by broadleaf vegetation in relatively closed canopy. The area is well preserved, with 22% of the land area in protected areas. Recent hurricanes have damaged large portions of suitable nesting habitat.

Highest Threats: Threats have not been rated for this area but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose, rats, and pigs.
- **Light attraction and grounding** into urban areas located on flyways, and Morne Micotrin.

Research and Monitoring: Recent monitoring includes radar surveys (2015 and 2020), and deployment of automated acoustic recording units. Thorough ground searches in localized areas of Morne Microtin and Morne Trois Pitons.

Conservation Interventions: No conservation interventions currently ongoing. Technical exchange between Dominican Republic (Grupo Jaragua) and Dominica (Forestry, Wildlife and National Parks Division).

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

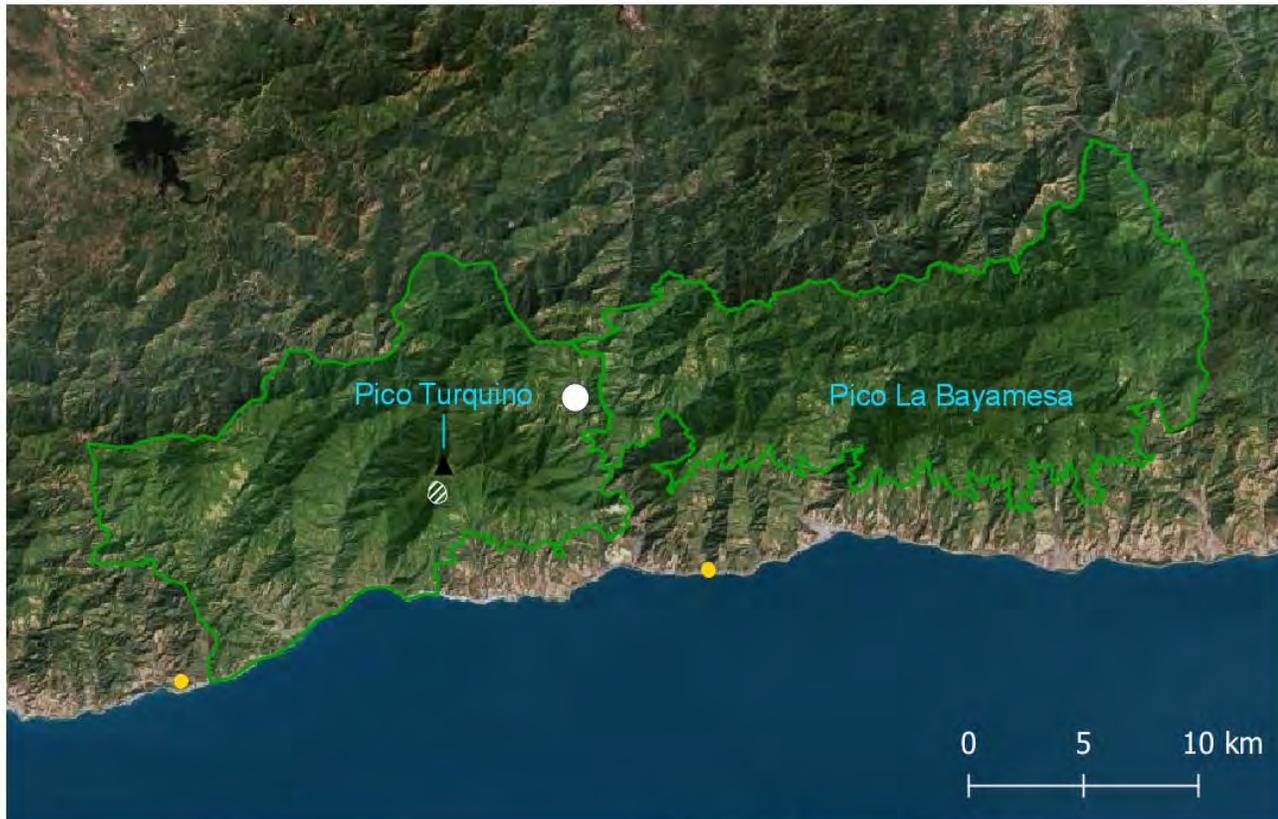
Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

PICO TURQUINO and PICO LA BAYAMESA - Cuba

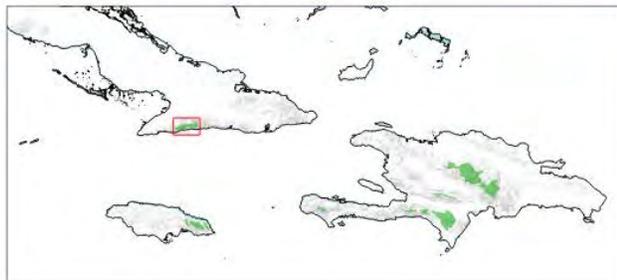
Suspected nesting

Site map (see map notes on page 72):



Pico Turquino - Pico La Bayamesa

-  General site location
-  Searched area
-  National Park
-  Petrel observations at dusk



Vitals:

- Two distinct mountainous areas (within 25 km of each other) located in the western Sierra Maestra, in southeastern Cuba. Altitude: 1600-2000 m above sea level. Pico Turquino (1974m) is the highest point in Cuba.
- No radar survey; some audio and visual surveys (2006); some ground searches (2006).
- Pico Turquino: Nesting is suspected based on recent observations of petrels from the coast at dusk (Pointon et al. in March 2019, and Plasencia Leon et al. in February 2020), and from habitat modeling. Pico la Bayamesa: Nesting is suspected based on habitat modeling.
- Protected Areas: Pico Turquino National Park, 232 km². Pico La Bayamesa National Park, 242 km².
- Suitable nesting habitat available in Protected Areas but not quantified.
- IBA: yes; KBA: yes.

Description: Both areas are characterized by steep mountainous slopes covered by broadleaf deciduous vegetation, with shrub-like broadleaf vegetation at the highest altitudes. The areas are well preserved and forest loss is only occurring in a few localized areas at lower elevations.

Highest Threats: Threats have not been rated for this area but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose and rats.

Research and Monitoring: No research or monitoring currently occurring.

Conservation Interventions: No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

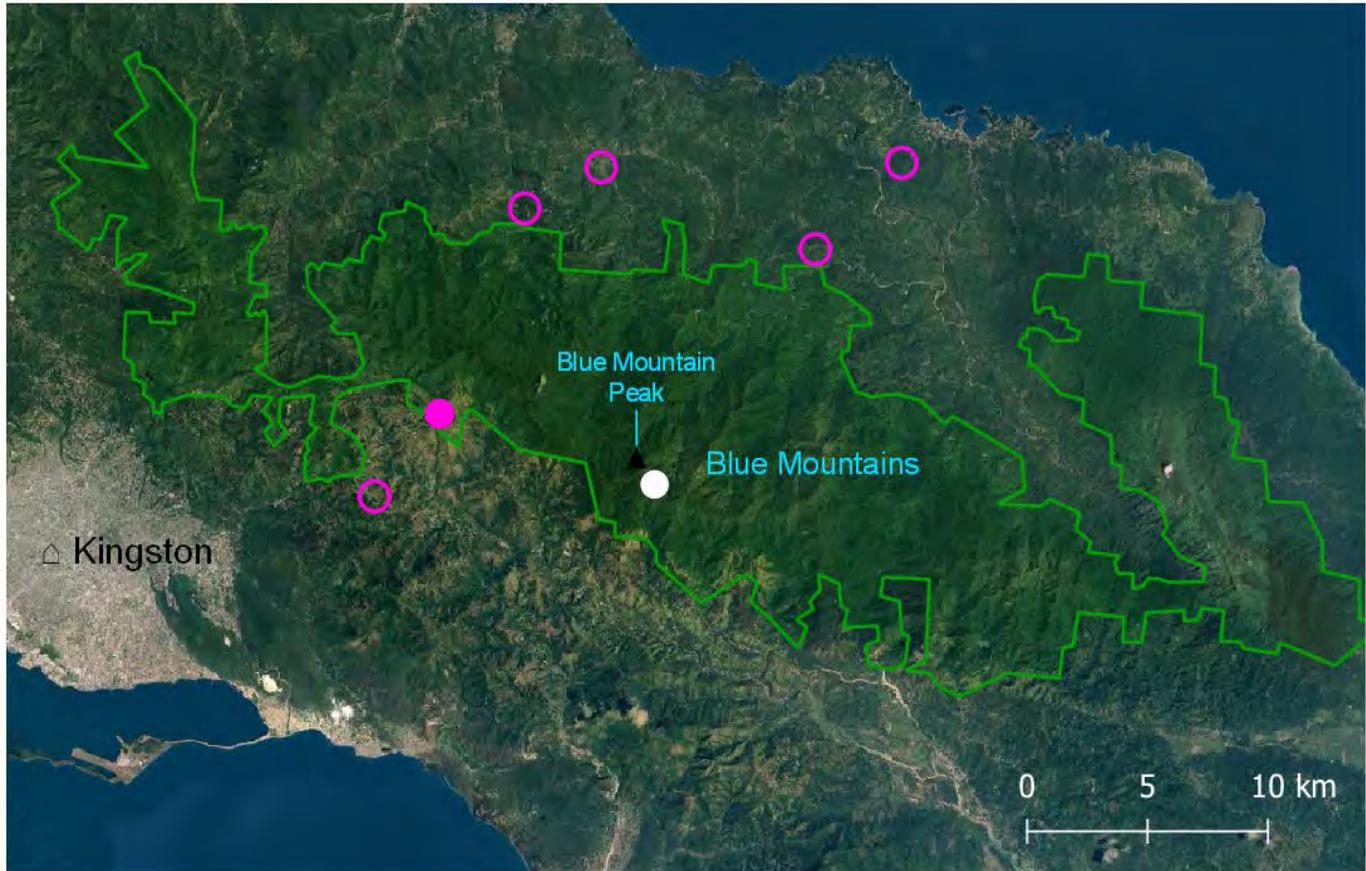
Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

BLUE MOUNTAINS - Jamaica

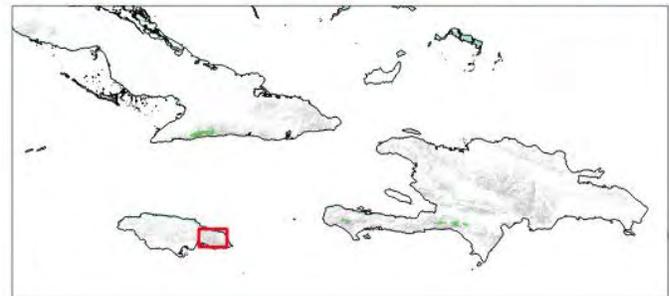
Suspected nesting

Site map (see map notes on page 72):



Blue Mountains

- General site location
- Radar survey
- National Park



Vitals:

- Highest mountain range in the country, the Blue Mountains form an east-west ridge located in eastern Jamaica. Altitude: 1500-2250 m above sea level. The Blue Mountain peak (2256 m) is the highest point in Jamaica.
- Area surveyed with radar in 2016. No audio and visual surveys; no ground searches.
- Nesting is suspected based on recent evidence from radar surveys near the area (6 petrel-like targets; Brown 2016), and from habitat modeling (higher elevations of Blue Mountains).
- Protected Areas: Blue and John Crow Mountains National Park, 1224 km².
- Suitable nesting habitat available in Protected Areas but not quantified.
- IBA: yes; KBA: yes.

Description: Characterized by steep mountainous slopes covered by broadleaf vegetation in relatively closed canopy. The area is relatively well preserved but forest loss is occurring at lower elevations on the southwestern slopes.

Highest Threats: Threats have not been rated for this area but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose and rats.
- **Expansion of agriculture** into the lower extents of forests on the south-facing slopes in the northwest of the range
- **Light attraction and grounding** into the nearby major urban area of Jamaica's capital, Kingston.

Research and Monitoring: No research or monitoring currently occurring.

Conservation Interventions: No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

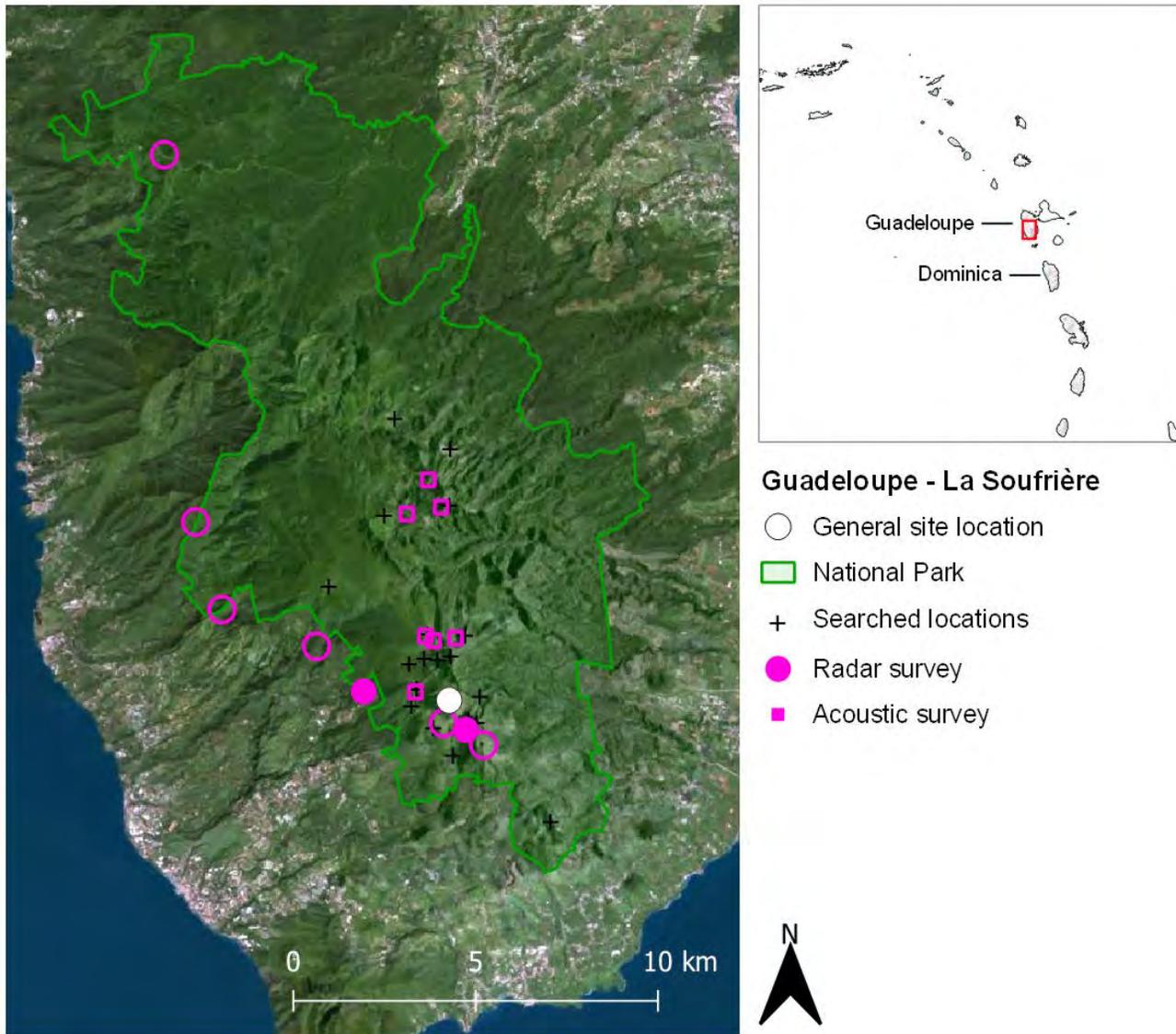
Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

GADELOUPE

Suspected nesting

Site map (see map notes on page 72):



Vitals:

- Slopes of Pic de la Soufrière (1467 m, highest point in Guadeloupe). Altitude: 900-1500 m above sea level.
- Area surveyed with radar (Brown and Chabrolle in 2020). One audio survey (Chabrolle 2016-2017); localized ground searches (Chabrolle in 2017).
- Nesting is suspected based on recent evidence from radar surveys in the area (13 petrel-like targets, 2020), and from habitat modeling. An audio and visual observation between December 1991 and January 1992 (Lorvelec) is promising (20-30 individual procellariiformes flying and vocalizing at dusk on a ridge below Pic de la Soufrière) but did not confirm the species to be Black-capped Petrel (cited in Chabrolle et al. 2020).
- Protected Areas: La Guadeloupe National Park, 218 km².
- Suitable nesting habitat available in Protected Areas but not quantified.
- IBA: yes; KBA: yes.

Description: The mountains of La Soufrière are characterized by steep mountainous slopes covered by broadleaf evergreen trees, with shrub-like broadleaf vegetation at the highest altitudes. The area is well preserved.

Highest Threats: Threats have not been rated for this area but are suspected to include:

- **Predation by introduced mammals**, including cats, mongoose, rats and raccoons.

Research and Monitoring: Recent monitoring was supported by Parc National de la Guadeloupe and included the deployment of automated acoustic recording units (2016-2017) and a radar survey (2020). Visual surveys are planned for the end of 2021.

Conservation Interventions: No conservation interventions currently ongoing.

Planned Strategies:

- ES1: Build in-country capacity
- ES2: Locate & characterize nesting sites

Critical Information Needs:

- Locate and characterize nest sites.
- Assess and characterize threats.

MAIN USE AREAS AT SEA

Notes on marine profiles

Vitals:

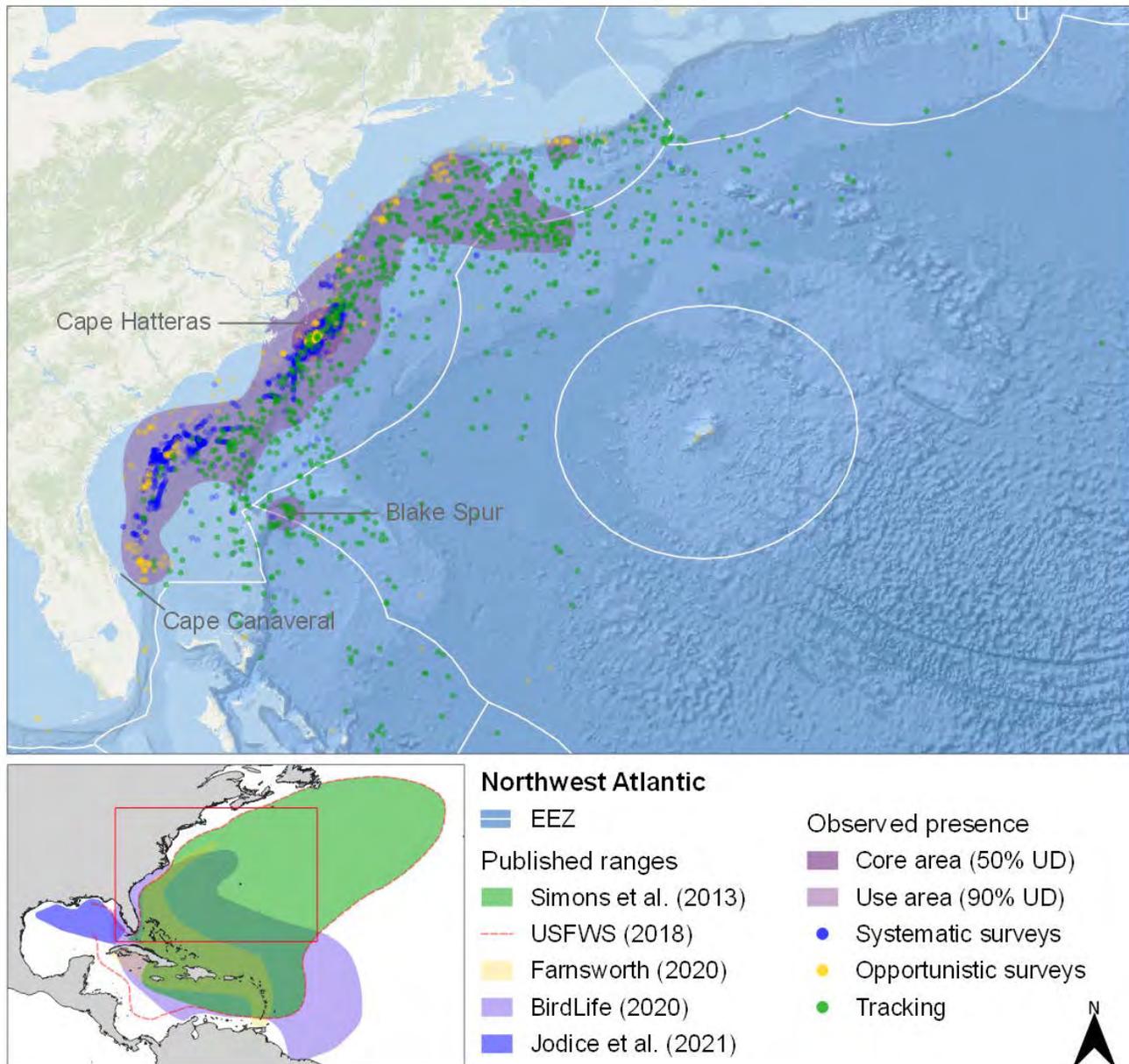
- **Use assessment:** To estimate use areas, we calculated utilization distributions (UD) using the kernel density methodology on the basis of the following sources:
 - Ship-based observations:
 - Systematic surveys: Atlantic Offshore Seabird Dataset Catalog (Sussman and USGS 2014; Atlantic); Gulf of Mexico Marine Assessment Program for Protected Species (Jodice et al. 2021; Gulf of Mexico).
 - Opportunistic observations: Leopold et al. (2019; Caribbean Sea); eBird (2020; Atlantic, Caribbean Sea, Gulf of Mexico; with records already used in Leopold et al. 2019 removed); Texas pelagics data (cited in Jodice et al. 2021).
 - Individual-based tracking data: Jodice et al. (2015; Atlantic and Caribbean); Satgé et al. (2019; Atlantic and Caribbean); Satgé et al. (in prep.; Atlantic and Caribbean).

To compensate for the effects of a larger number of locations in the tracking dataset despite few individuals tracked ($n = 16$), we limited the tracking data to one location per individual per day, calculated as the centroid of all locations for that individual for that day. When mentioned, core areas refer to the 50% UD.

- **Marine ecoregions:** We estimated overlap between UD and marine ecoregions (Spalding et al. 2007). We report the proportion of the overall range (90% UD) in each of the overlapping ecoregions, including Pelagic Waters.
- **Exclusive Economic Zones:** We estimated overlap between UD and exclusive economic zones (EEZ). Unless mentioned otherwise, we report the proportion of the overall range (90% UD) in each of the overlapping EEZ, including High Seas. Particularly in the Caribbean Sea, these values are subject to change as our understanding of the use of marine areas by Black-capped Petrels improves.

NORTHWEST ATLANTIC

Site map (see map notes on page 102):



Vitals:

- **Primary range:** South Atlantic Bight, Gulf Stream, and mixed pelagic waters between the latitudes of Cape Canaveral, Florida, USA to the south (ca 28.5°N), and New Jersey, USA to the north (ca. 38°N). Extends eastward from the outer continental shelf to ca. 74°W.
- **Core area:** limited in size along the outer continental shelf offshore Cape Hatteras, North Carolina, USA. From Cape Lookout to the south (ca. 34.2°N) and Nags Head to the north (ca. 35.8°N).
- Area assessed via systematic ship-based surveys, opportunistic ship-based observations, and individual-based tracking.
- **Marine ecoregions:** Carolinian (52.5%), Virginian (36.5%), Pelagic Waters (8.5%), Bahamian (1.5%), Floridian (0.5%), Gulf of Maine/Bay of Fundy (0.5%).
- **EEZ:** U.S.A. (92.0%), High Seas (7.0%), Bahamas (1.0%). The core use area is entirely in the U.S. EEZ.
- **Period of use:** Estimated as mostly during non-breeding (adults class: inter-nuptial period; fledging to subadult classes: all year) with forays into area by breeding birds.

Description:

- Numerous observations have been recorded at sea in the area, starting in the late 1970's. To date, > 5,500 records have been confirmed.
- Petrels are present in highest concentrations around the latitude of Cape Hatteras, a boundary area between warmer waters of the Gulf Stream and colder, denser waters from the northerly Labrador Current. Tracked individuals have forayed into Canadian waters (Satgé et al. in prep).
- In the South Atlantic Bight from North Carolina to Florida, Black-capped Petrels are more abundant along the strongly defined western edge of the Gulf Stream, which is bound to the outer continental shelf. To the east, as the southerly current diffuses into the Sargasso Sea, petrels make use of the upwelling induced by the Blake Spur, a prominent underwater feature.
- Vagrants have been recorded in Macaronesia, and as far as coastal Morocco (13 records). Two historical records in England (likely from birds blown off course by storms).
- Density modeling predicts a limited use during March-May, with a higher use post-breeding (June-August) and into the winter (Winship et al. 2018).
- Preliminary results from satellite tracking suggest that color morphs use distinct areas in the Atlantic, with light-morph petrels using more northern waters than dark-morph birds (Satgé et al. in prep).

Highest Threats: Suspected threats include:

- **Exposure to Plastics**, rated as High, and **Mercury and Other Contaminants**, rated as Medium.
- **Reduced Prey Availability** because of climate change, rated as Medium.
- **Exposure to Oil Spills** from shipping and oil and gas exploration, rated as Medium.
- **Attraction/Collision with Marine Infrastructure**, rated as Medium.

Research and Monitoring: Recent research in the area includes:

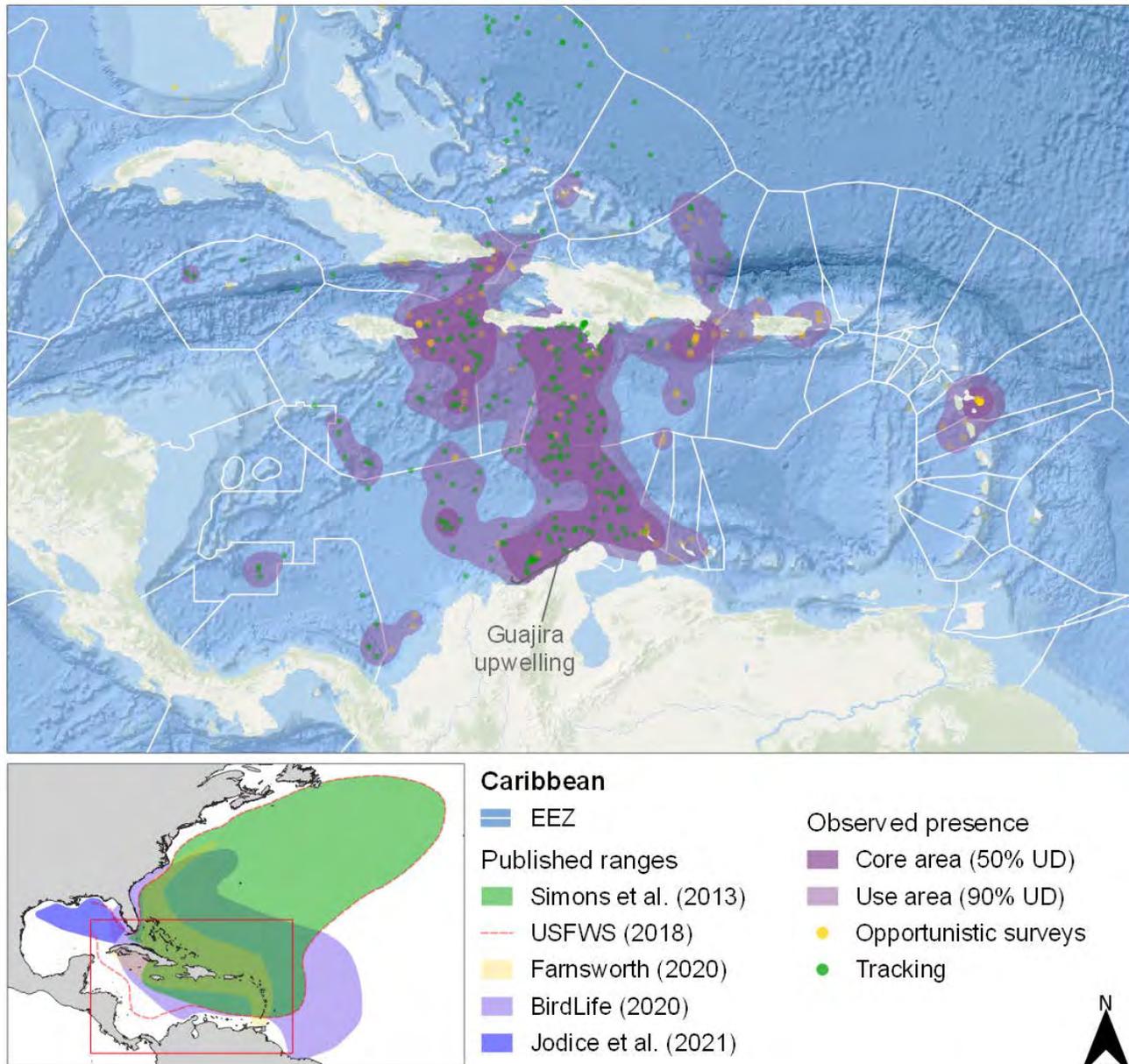
- Satellite tracking 3 post-breeding adults captured at nest sites in Loma del Toro, Dominican Republic (Jodice et al. 2015), and 10 non-breeding adults captured in Gulf Stream waters off Cape Hatteras (Satgé et al. in prep).
- Modeling of petrel density in the Northwest Atlantic using observations from systematic surveys (Winship et al. 2018).

Studies of diet and mercury levels of petrels captured at sea are ongoing.

Critical Information Needs: Include degree of impact of climate change on prey availability, in particular as related to changes in Gulf Stream regime; degree and impact of exposure to mercury, plastic and other contaminants; exposure to mortality in trawling fishery.

CARIBBEAN SEA

Site map (see map notes on page 102):



Use areas include areas used during active prey search and foraging, but also those used during migration and commuting to and from nesting sites. In this map, we have also included coastal observations made from land (e.g. in Guadeloupe and Cuba). Use areas are subject to change as our understanding of the marine ecology of Black-capped Petrels continues to improve.

Vitals:

- **Primary range:** Central Caribbean Sea, between 67°W and 77°W. Regularly observed in the eastern Caribbean Sea, and present in western Caribbean Sea.
- **Core area:** Guajira upwelling, off Colombia and Gulf of Venezuela; mixed waters between Cuba, Jamaica and Hispaniola.
- Area assessed via individual-based tracking and opportunistic ship-based observations.
- **Marine ecoregions:** Greater Antilles (51.0%), Southern Caribbean (22.5%), Southwestern Caribbean (16.0%), Bahamian (6.0%), Eastern Caribbean (4.5%).
- **EEZ¹:** Colombia (23.5%), Dominican Republic (23.0%), Haiti (14.5%), Jamaica (12.0%), Venezuela (5.5%), Cuba

¹These values are subject to change as our understanding of the use of marine areas by Black-capped Petrels improves.

(5.0%), Puerto Rico (4.0%), Guadeloupe (3%); Aruba, Bonaire, Curaçao, Nicaragua, Dominica, Panama, Turks and Caicos Islands, Bahamas, Cayman Islands: each \leq 2%.

- **Period of use:** Estimated as mostly during and around breeding season (breeding adults, prospecting subadults).

Description:

- Despite suspected use of the Caribbean basin, information is limited to < 100 observation records since 1953 (summarized in Leopold et al. 2019), and 6 individuals tracked.
- During the breeding season, petrels appear to consistently commute to upwelling waters off the Guajira peninsula, in the southern Caribbean Sea. They also use the area between Jamaica, Cuba and Haiti, an area of seamounts where waters from the Caribbean and Atlantic basins converge.
- Our understanding for the rest of the Caribbean basin is incomplete. Records are scattered in the western Caribbean Sea, in particular in the Darien Gulf off Panama and Colombia. In the eastern Caribbean Sea, repeated observations off Guadeloupe and other at-sea observations in the area suggest a regular presence (consistent with probable nesting on Dominica, and with suspected nesting in Guadeloupe).

Highest Threats: Suspected threats include:

- **Exposure to Plastics**, rated as High, and **Exposure to Mercury** and **Other Contaminants**, rated as Medium.
- **Reduced Prey Availability** because of climate change, rated as Medium.
- **Exposure to Oil Spills** from shipping and oil and gas exploration, rated as Medium, though oil and gas exploration and extraction off Colombia and Venezuela may elevate that threat.
- **Attraction/Collision with Marine Infrastructure**, rated as Medium

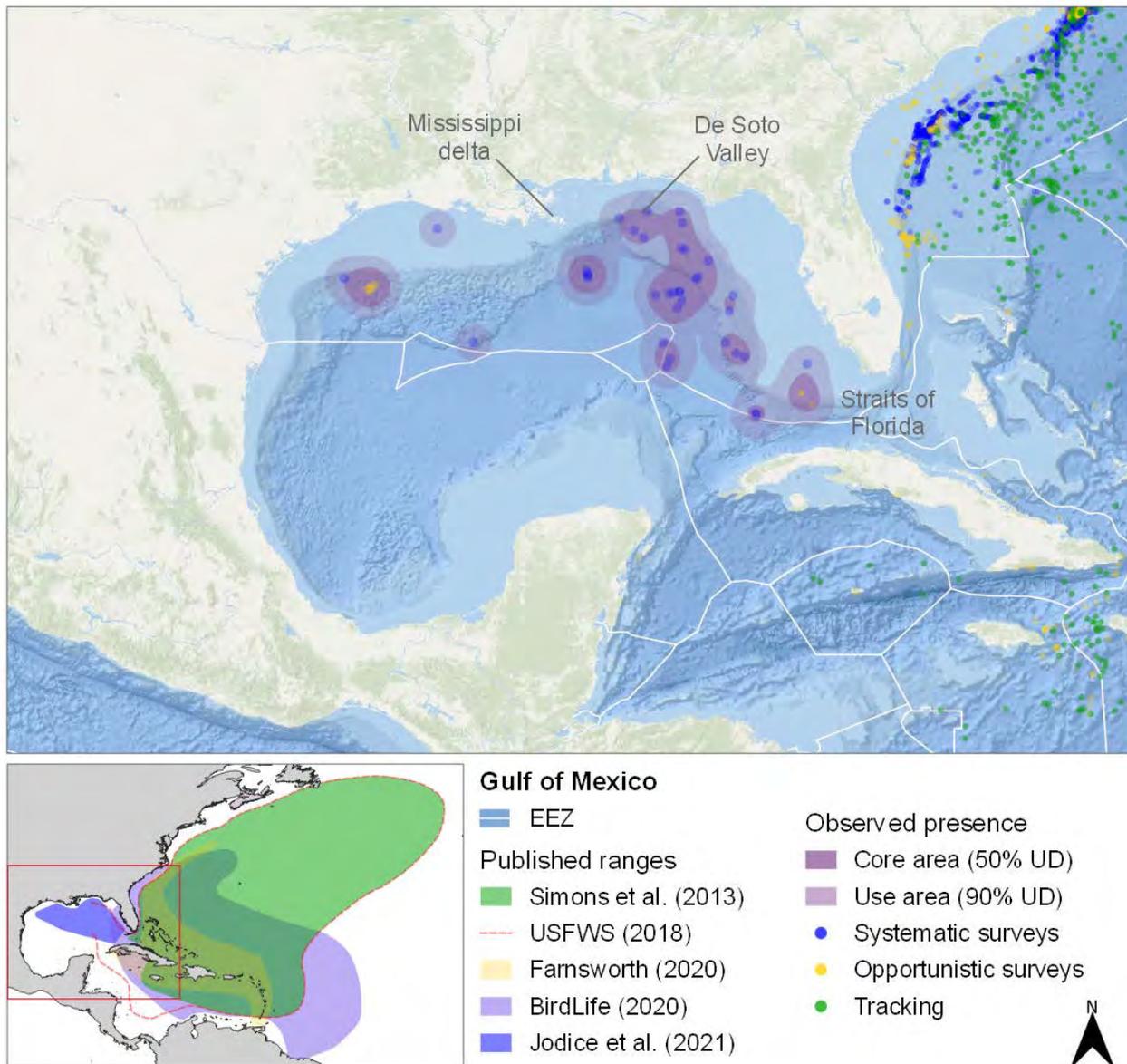
Research and Monitoring: Recent research in the area includes:

- Satellite tracking 6 breeding adults captured at nest sites in Loma del Toro, Dominican Republic (Jodice et al. 2015, Satgé et al. 2019).
- Studies of diet and mercury levels of breeding petrels are ongoing.

Critical Information Needs: Include degree of impact of climate change on prey availability, in particular as related to changes in upwelling regimes; degree and impact of exposure to oil and gas activity; degree and impact of exposure to mercury, plastic and other contaminants; exposure to mortality in trawling fishery, and bycatch in squid longline fishery (in particular lighted fishery).

GULF OF MEXICO

Site map (see map notes on page 102):



Vitals:

- Primary range: Eastern Gulf of Mexico, from Straits of Florida to the east, to Mississippi delta to the west (ca. 89°W). Present in central and western parts of the northern Gulf.
- Core area: Waters along the continental shelf and slope, from Florida Keys to the southeast, to De Soto Valley to the northwest.
- Area assessed via systematic ship-based surveys, and opportunistic ship-based observations.
- Marine ecoregions: Northern Gulf of Mexico (53.5%), Floridian (28.5%), Southern Gulf of Mexico (10.5%), Greater Antilles (7.5%).
- EEZ^{2*}: U.S.A. (92%), High Seas (4%), Cuba (4%), Mexico (<0.5%).
- Period of use: Estimated as mostly during post-breeding (July-September), with forays into area during spring (Jodice et al. 2021). Age-class unknown.

^{2*} These values are subject to change as our understanding of the use of marine areas by Black-capped Petrels improves.

Description:

- Rarely recorded in the area (9 records between 1900-1990) until systematic seabird surveys were organized in 2010-2011 and 2017-2019. Since, ca. 40 additional observations have been recorded.
- Highest numbers of petrels have been located along the West Florida escarpment, in areas associated with dynamic waters of the Loop Current. Like petrels using the Gulf Stream in the Atlantic Ocean, petrels in the Gulf of Mexico make use of edges along current systems.
- Habitat modeling predicts the occurrence of the species in the western Gulf but with a patchy distribution (Jodice et al. 2021).

Highest Threats:

Suspected threats include:

- **Exposure to Plastics**, rated as High, and **Mercury** and **Other Contaminants**, rated as Medium.
- **Reduced Prey Availability** because of climate change, rated as Medium.
- **Exposure to Oil Spills** from shipping and oil and gas exploration, rated as Medium for the overall population, but likely elevated in the Gulf of Mexico.
- **Attraction/Collision with Marine Infrastructure**, rated as Medium overall, though the number of oil and gas platforms in the Gulf of Mexico likely elevates this threat.

Research and Monitoring:

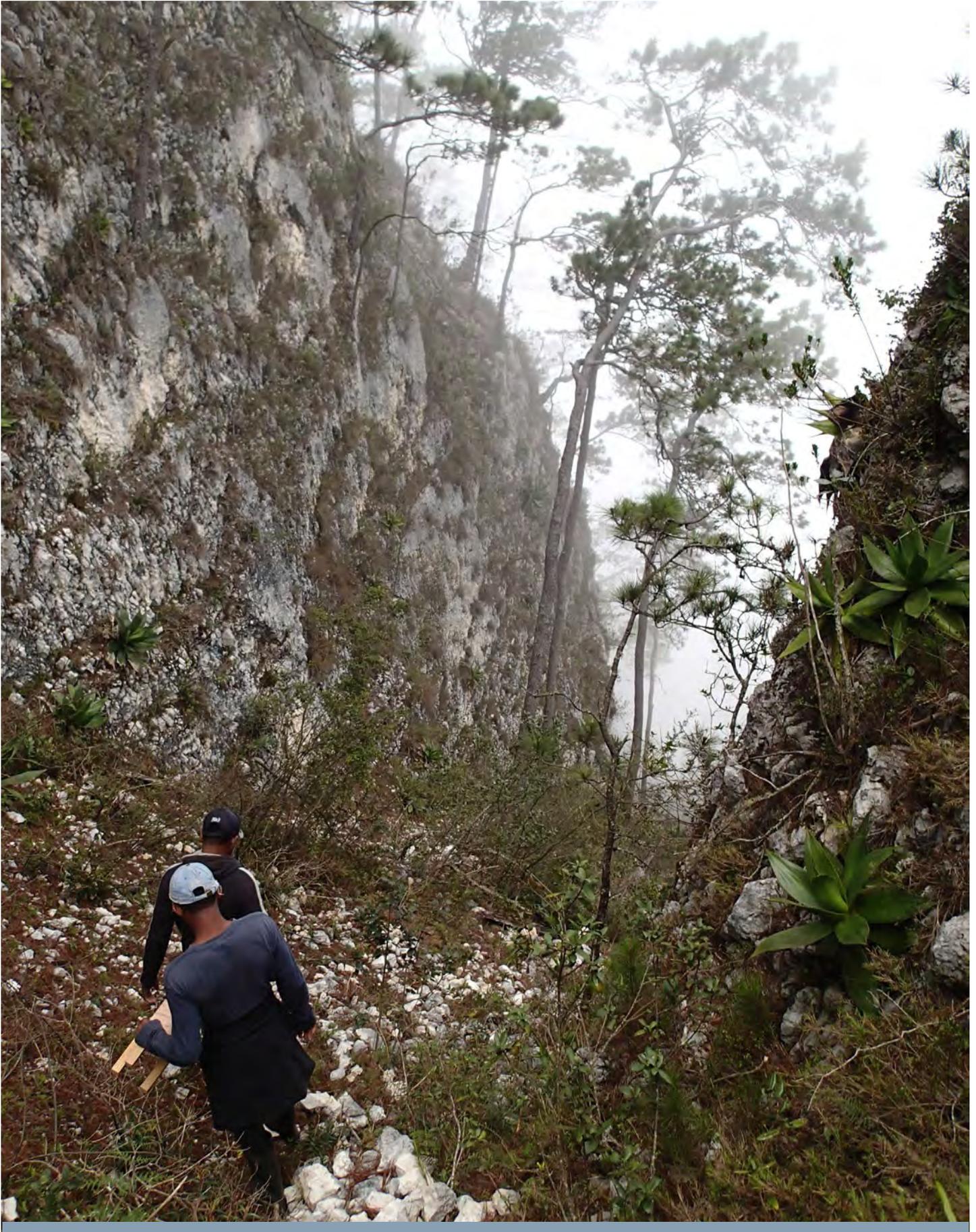
No dedicated research or monitoring currently occurring.

Critical Information Needs: Origin and age class of individuals using the area; degree of impact of climate change on prey availability, in particular as related to changes in the Loop current; degree and impact of exposure to oil and gas activity; degree and impact of exposure to mercury, plastic and other contaminants.

REFERENCES

- BirdLife International. 2020. Important Bird Areas [On-line], BirdLife, Cambridge, UK. Available at <https://www.birdlife.org>. (Accessed: 2020-11-20).
- BirdLife International. 2020. Species factsheet: *Pterodroma hasitata*. Downloaded from <http://www.birdlife.org> on October 6, 2020. Recommended citation for factsheets for more than one species: BirdLife International (2020) IUCN Red List for birds. Available at <https://www.birdlife.org>. (Accessed: 2020-11-20).
- Brown, A. 2015. Radar surveys for the Endangered Black-capped Petrel on Dominica, West Indies. Report to the Dominica Department of Agriculture, Forestry and Parks Division, Dominica. Green Cove Spring, Florida, USA: Environmental Protection In the Caribbean.
- Brown, A. 2016. Radar surveys for petrels in Jamaica: Results from an expedition during March 2016. Report to the National Environment and Planning Agency, Jamaica. Green Cove Spring, Florida, USA: Environmental Protection In the Caribbean.
- Brown, A. 2017. Radar Surveys, Nest Monitoring and Conservation of the Black-capped Petrel on Hispaniola: February 2017. Green Cove Spring, Florida, USA: Environmental Protection In the Caribbean.
- Brown, A. 2020. Radar Surveys for Black-capped Petrels on Dominica: Results from an expedition during January and February 2020. Green Cove Spring, Florida, USA: Environmental Protection In the Caribbean.
- Chabrolle A. 2017. A la redécouverte du Pétrel diablotin (*Pterodroma hasitata*) nicheur en Guadeloupe. Juin 2016 à juillet 2017. Rapport AEVA n° 43, rapport AMAZONA n° 48, septembre 2017. 29 p + annexes.
- Chabrolle A., Brown A. & Pavis C. 2020. A la recherche du Pétrel Diablotin (*Pterodroma hasitata*) en Guadeloupe en 2020, à l'aide de la technologie radar. Association des Mateurs Amicaux des Z'Oiseaux et de la Nature aux Antilles (AMAZONA) - Association pour l'Etude et la protection des Vertébrés et végétaux des petites Antilles (AEVA), Petit-Bourg, Guadeloupe. Rapport AMAZONA n°67, Rapport AEVA n°46, septembre 2020 : 26 pp.
- eBird: An online database of bird distribution and abundance. 2020. eBird [On-line], Cornell Lab of Ornithology, Ithaca, New York. Available: <https://www.ebird.org>. (Accessed: 2020-11-20).
- Farnsworth, A. 2020. Black-capped Petrel (*Pterodroma hasitata*), version 1.0. In *Birds of the World* (T. S. Schulenberg, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.bkcpet.01> (Accessed: 2020-11-20).
- Jean A., J. Timyan, and E. Louis-Jean. 2011. New discoveries of the Endangered Black-capped Petrel (*Pterodroma hasitata*) in Massif de la Selle, Haiti: January 2012. Société Audubon Haïti. 2pp.

- Jodice P.G.R., R.A. Ronconi, E. Rupp, G.E. Wallace, and Y. Satgé. 2015. First satellite tracks of the Endangered black-capped petrel. *Endangered Species Research*. 26:23-33. doi:10.3354/esr00697
- Jodice P.G.R., P.E. Michael, J.S. Gleason, J.C. Haney, and Y.G. Satgé. 2021. Expanding the marine range of the endangered black-capped petrel *Pterodroma hasitata*: Occurrence in the northern Gulf of Mexico and conservation implications. *bioRxiv* 2021.01.19.427288; doi: <https://doi.org/10.1101/2021.01.19.427288>
- Key Biodiversity Areas Partnership. 2020. World Database of Key Biodiversity Areas [On-line], Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Available at <https://www.keybiodiversityareas.org>. (Accessed: 2020-11-20).
- Leopold, M.F., Geelhoed, S.C., Scheidat, M., Cremer, J., Debrot, A.O. and Van Halewijn, R., 2019. A review of records of the Black-capped Petrel *Pterodroma hasitata* in the Caribbean Sea. *Marine Ornithology*, 47, pp.235-241.
- Rupp, E., S. Durand, G. Wallace. 2016. Report on Diablotin Nest Search Activities in Dominica April 13th to 26th, 2016. Grupo Jaragua. 31pp.
- Satgé, Y. G., Rupp, E., and Jodice, P. G. R. 2019. A preliminary report of ongoing research of the ecology of Black-capped Petrel (*Pterodroma hasitata*) in Sierra de Bahoruco, Dominican Republic – I: GPS tracking of breeding adults. Clemson, South Carolina, USA: South Carolina Cooperative Research Unit, Clemson University
- Satgé, Y. G., Rupp, E., Brown, A., and Jodice, P. G. R. 2020. Habitat modeling locates nesting areas of the Endangered Black-capped Petrel *Pterodroma hasitata* on Hispaniola and identifies habitat loss. *Bird Conservation International*, 1-18. doi:10.1017/S0959270920000490
- Satgé, Y. G., B. Keitt, C. Gaskin, and P.G.R. Jodice. [In Prep]. Temporal and spatial segregations between color morphs of the Diablotin Black-capped Petrel *Pterodroma hasitata* during the breeding and non-breeding periods.
- Simons, TR, Lee DS, Haney JC. 2013. Diablotin *Pterodroma hasitata*: A biography of the endangered Black-capped Petrel. *Mar Ornithol*:S3–S43
- Spalding MD, Fox HE, Allen GR, Davidson N, Ferdana ZA, Finlayson M, Halpern BS, Jorge MA, Lombana A, Lourie SA, Martin KD, McManus E, Molnar J, Recchia CA, Robertson J. 2007. Marine ecoregions of the world: A bioregionalization of coastal and shelf areas. *Bioscience* 57:573
- Sussman, Allison and US Geological Survey. 2014. Atlantic Offshore Seabird Dataset Catalog, Atlantic Coast and Outer Continental Shelf, from 1938-01-01 to 2013-12-31 (NCEI Accession 0115356). NOAA National Centers for Environmental Information. Dataset. <https://accession.nodc.noaa.gov/0115356>. Accessed [2020-11-01].
- Tims, J., O’Shea, B., McCrary, J., and Meshach, P. 2019. Gaining an understanding of seabird communities offshore Guyana: results from two years of seasonal surveys. Annual Meeting of the Waterbirds Society. Princess Anne, Maryland, USA.
- UNEP-WCMC and IUCN. 2020. Protected Planet: The World Database on Protected Areas (WDPA) [On-line], UNEP-WCMC and IUCN, Cambridge, UK. Available at: www.protectedplanet.net. (Accessed: 2020-11-20).
- UNESCO Biosphere Reserves (2020). [On-line]. The World Network of Biosphere Reserves. United Nations Educational, Scientific and Cultural Organization. Paris, France. Available at <https://en.unesco.org/biosphere/wnbr>. (Accessed: 2021-2-11).
- U.S. Fish and Wildlife Service. 2018. Species status assessment report for the Black-capped Petrel (*Pterodroma hasitata*). Version 1.1. Atlanta, Georgia, USA: U.S. Fish and Wildlife Service.
- Winship, A.J., Kinlan, B.P., White, T.P., Leirness, J.B., and Christensen, J., 2018. Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2018-010. x+66 pp.



Members of the field team navigate the steep cliffs of Morne Vincent. Rob Ronconi

APPENDIX 3: THREATS ASSESSMENT

Threat rating is a method for making an implicit assessment of threats more explicit and more objective. It involves determining and defining a set of criteria and then applying those criteria systematically to the direct threats to conservation targets so that conservation actions can be directed where they are most needed (FOS 2009). It is desirable to have a systematic and repeatable threat assessment, which may be updated as new information becomes available. Many tools for threats rating assess the extent of the threat and the level of its impacts on the conservation targets (CMP 2020). We used the **Simple Threat Rating** system build into the Miradi (Version 4.5). This system involves assigning a category of the relative magnitude and impact of each direct threat to a target with a four-point qualitative scale (very high, high, medium, or low) using three criteria: scope, severity and irreversibility.

We applied the three criteria to threat-to-target threat combinations for all confirmed nesting sites and birds at sea. We relied on local or on-the-ground knowledge based on field observations or camera trap photographs, reports of grounded birds, or notes regarding towers or other hazards in the area. In the case of probable or suspected sites (no confirmation of nesting), threats rating is complicated because exact nesting sites are not characterized. However, scope and severity can be estimated in a general sense based on conditions of the island, the particular mountain ranges or even peaks where sites would most likely occur.

CRITERIA

Scope

Most commonly defined spatially as the proportion of the target population that can reasonably be expected to be affected by the threat **within ten years** given the continuation of current circumstances and trends. The criteria for rating scope are as follows:

- Very High, affecting most or all of the target (e.g., 71-100%);
- High, affecting much of the target (e.g., 31-70%);
- Medium, affecting some of the target (e.g., 11-30%); or
- Low, affecting just a small percent of the target (e.g., 1-10%).

Severity

Within the scope, the level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances and trends. For ecosystems and ecological communities, typically measured as the degree of destruction or degradation of the target within the scope. For species, usually measured as the degree of reduction of the target population within the scope. Seabirds based on general life parameters (long-lived, slow to reproduce) we know that threats affecting adult and subadult survival have greater impact than those affecting egg and small chick success and first year survival.

- Very High: Within the scope, the threat is likely to destroy or eliminate the target, or reduce its population by 71-100% within ten years or three generations.
- High: Within the scope, the threat is likely to seriously degrade/reduce the target or reduce its population by 31-70% within ten years or three generations.
- Medium: Within the scope, the threat is likely to moderately degrade/reduce the target or reduce its population by 11-30% within ten years or three generations.
- Low: Within the scope, the threat is likely to only slightly degrade/reduce the target or reduce its population by 1-10% within ten years or three generations.

Irreversibility

The degree to which the effects of a threat can be reversed and the target affected by the threat restored, if the threat no longer existed.

- Very High: The effects of the threat cannot be reversed and it is very unlikely the target can be restored, and/ or it would take more than 100 years to achieve this.

- High: The effects of the threat can technically be reversed and the target restored, but it is not practically affordable and/or it would take 21-100 years to achieve this.
- Medium: The effects of the threat can be reversed and the target restored with a reasonable commitment of resources and/or within 6-20 years.
- Low: The effects of the threat are easily reversible and the target can be easily restored at a relatively low cost and/or within 0-5 years.

COMBINING CRITERIA AND SUMMARIZING ACROSS THREATS

Once assigned, the ratings for scope, severity and irreversibility were combined using established rule sets (an automated process in Miradi) to give an overall rating for each threat-target combination, which are then summarized across all threats and across all targets.

The rule sets for combining criteria involve first combining the Scope and Severity variables to assess magnitude, then combining that with Irreversibility to derive the threat-target rating:

		Scope			
		Very High	High	Medium	Low
Severity	Very High	Very High	High	Medium	Low
	High	High	High	Medium	Low
	Medium	Medium	Medium	Medium	Low
	Low	Low	Low	Low	Low

		Irreversibility			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	Very High	High
	High	Very High	High	High	Low
	Medium	High	Medium	Medium	Low
	Low	Medium	Low	Low	Low

Miradi also provides a combination of rules for rolling up ratings across targets and threats, and for the project as a whole. We chose not to present roll-ups because of the varying level of uncertainty in threats at sites.

Tables A3-1 and A3-2 present the ratings and justifications for threats by target.

Table A3-1 On-Land Threat Ratings and Justifications

Threat	Overall Miradi	Scope	Severity	Irreversibility
Site: Loma del Toro				
Justifications based on interviews with Ernst Rupp and Adam Brown, April 21 and 22, 2020 with supplemental comments inserted June 24, 2020.				
Agriculture (meaning planted crops farming)		Not Occurring (N/O) and unlikely to occur. Currently, agriculture into this part of park is very hypothetical as are other incursions.	N/O	N/O
Fire (damaging habitat, but also some mortality in nests or adults)	Low	MEDIUM: Fires have been sweeping through, but only every few years. Conceivably up to a third of nests affected in an event.	MEDIUM: Damage depends on timing (birds in burrows) and severity of fire. "On average," effects could be moderate degradation of target.	LOW: Habitat typically heals pretty quickly e.g., big pines survive, if seed bank present, vegetation back within a few years. Fire may actually be part of ecosystem/germination.
Livestock grazing		N/O. Not occurring and unlikely to occur.	N/O	N/O
Non-timber Forest Product collection		N/O. Not occurring and unlikely to occur.	N/O	N/O
Harvest by humans		N/O. Not occurring and unlikely to occur.	N/O	N/O
Predation by introduced mammals - cats	High	HIGH: Cats are present but not abundant (usually one cat at a time). No mongoose yet seen; no pigs probably because of human presence.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: <i>Rattus rattus</i> is everywhere, potentially visiting every nest.	HIGH: Observations so far indicate that the effects are low, but collecting data now with camera traps. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	All transiting birds are exposed to lights on the coasts; how much depends on exact route (e.g., Pedernales, DR (well lit up) or Belle Anse (not producing much light).	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	High	HIGH: Site has a lighted tower that majority of the birds must navigate.	HIGH: In fogs and winds, 1 - 3 downed birds each year.	MEDIUM: Adult losses might be rarer (occurring mostly during foul weather) than for fledglings. Fledglings have a lower survival rate generally (losses are likely compensatory).
Wood harvest		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Site: Morne Vincent				
Justifications based on interviews with Ernst Rupp and Adam Brown, April 21 and 22, 2020 with supplemental comments inserted June 24, 2020.				
Agriculture - Current	Low	LOW: Activities and conditions of the last 10 years have stopped agricultural movement in monitored area. With intervention, threat greatly reduced and the number of occupied nests seems stable.	MEDIUM: Farming practices generally very destructive, if it occurred, would affect excavated nests (in soil, not stone) particularly.	MEDIUM: The decreased quality of nesting habitat could be reversed, but with soil quality damaged and vegetation removed, restoration would take 6-20 years.

Agriculture with no intervention 10 years ago	Very high	HIGH: Without intervention, likely agriculture would have spread and been very destructive in the monitored area. In a nearby area: looking back the last 9 years, Rupp estimates the loss of 20 to 50 nests on what was likely former petrel habitat. (Basically, the amount lost equal to the amount remaining).	VERY HIGH: Nests can hold on in grazed areas (just grassy cover) but eventually these burrows won't persist in areas overrun by agricultural effort (row crops).	VERY HIGH: Once the area is severely degraded, it would take a lot of effort to restore it to any kind of ecological function. The nesting site is "lost." Adults could attempt to find new locations, but unknown amount of energy to re-nest.
Fire (damaging habitat, mortality in nests)	Low	MEDIUM: Fires have been sweeping through, but only every few years. Conceivably up to a third of nests affected in an event.	MEDIUM: Damage depends on timing (birds in burrows) and severity of fire. "On average," effects could be moderate degradation of target.	LOW: Habitat typically heals pretty quickly e.g., big pines survive, if seed bank present, vegetation back within a few years. Fire may actually be part of ecosystem/germination.
Livestock grazing	Low	LOW: Some grazing, but livestock don't seem to be going in the steepest part where nests are.	LOW: Grazing not on itself damaging but could be a step towards full clearing.	MEDIUM: The decreased quality of nesting habitat could be reversed, but with soil quality damaged and vegetation removed, restoration would take 6-20 years.
Non-timber Forest Product collection	Low	HIGH: Wild tubers gathered.	LOW: No direct effects on petrels' needs, unless actual burrow damaged.	MEDIUM: Damaged burrow may be unused for years.
Harvest by humans		Not occurring (N/O). In the past, people went looking for petrels, but this stopped some time ago. Haven't really seen it happening 10 years.	N/O	N/O
Predation by introduced mammals - cats	High	HIGH: Cats are present but not abundant (usually one cat at a time). No mongoose yet seen; no pigs probably because of human presence.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: <i>Rattus rattus</i> is everywhere, potentially visiting every nest.	HIGH: Observations so far indicate that the effects are low, but collecting data now with camera traps. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	HIGH: All transiting birds are exposed to lights on the coasts; how much depends on exact route (e.g., Pedernales, DR (well lit up) or Belle Anse (not producing much light).	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	High	HIGH: Site has a lighted tower that majority of the birds must navigate.	HIGH: In fog and wind, 1 - 3 downed birds each year.	MEDIUM: Adult losses might be rarer (occurring mostly during foul weather) than for fledglings. Fledglings have a lower survival rate generally (losses are likely compensatory).
Wood harvest	Low	HIGH: Wood harvest here is primarily women and children collecting deadwood, axing down some bushes, chipping on the pine trees for fire starting. It's widespread.	LOW: Will ultimately kill trees, but does not directly harm the petrel habitat requirements. (Danger is if people are accompanied by dog.)	MEDIUM: Damaged woody growth takes a while to recover and collectors aren't likely to ease up. Growth of new trees is slow.
Site: Loma Quemada		Justifications based on interviews with Ernst Rupp and Adam Brown, April 21 and 22, 2020 with supplemental comments inserted June 24, 2020.		
Agriculture		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Livestock grazing (in this case, feral pigs).	High	VERY HIGH: Wild pigs -- rooting up large areas the soil looking for yams, insects, etc. Human presence in park is mostly pig hunters	HIGH: May have limited petrel populations in the past. Lack of data about severity of pig rooting damage; defaulted to "high" in Miradi.	MEDIUM: The decreased quality of nesting habitat could be reversed, but with soil quality damaged and vegetation removed, restoration would take 6-20 years. Legal pig hunting is feasible and would prob. be effective.
Harvest by humans		Not Occurring (N/O) and unlikely to occur.	N/O	N/O

Fire (damaging habitat, mortality in nests)	Medium	MEDIUM: Fires popping up - fire risk similar to Loma del Toro, maybe less.	MEDIUM: Damage depends on nature of fire.	MEDIUM: Broadleaf takes longer to recover. (Based on observations from nearby fire 15 years ago).
Non-timber Forest Product collection		Not Occurring (N/O) and unlikely to occur.	n/a	n/a
Predation by introduced mammals - cats	High	HIGH: Higher frequency of cats than Loma del Toro, but abundance unknown (usually see one cat at a time).	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: <i>Rattus rattus</i> is everywhere, potentially visiting every nest.	HIGH: Observations so far indicate that the effects are low, but collecting data now with camera traps. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	HIGH: Transiting birds encounter wind farm at base of flyway, coming over towns with lights.	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality		Not Occurring (N/O) and unlikely to occur. No lights/towers in breeding area.	n/a	n/a
Wood harvest		Not Occurring (N/O) and unlikely to occur.	n/a	n/a
Site: Valle Nuevo				
Justifications based on interviews with Ernst Rupp and Adam Brown, April 21 and 22, 2020 with supplemental comments inserted June 24, 2020.				
Invasive fern species (unique to Valle Nuevo)	Low	LOW: Guess - low. Spatial extent not mapped.	HIGH: Heavy thickets, sticky paste, out-compete other plants, bad for petrels. Spread with fire.	MEDIUM: Petrels who have left might return; immatures might come to prospect?
Agriculture	Low	LOW: Farming close (not as close as Morne Vincent, but is going on.) Intensive strawberry, root crops farming in the past, could come back.	MEDIUM: Agriculture may have reduced nests nearby; terrain may provide some protection for remaining nests. June: Valle Nuevo is more difficult to judge, since there should be more active nesting sites than presently known.	MEDIUM: The decreased quality of nesting habitat could be reversed, but with soil quality damaged and vegetation removed, restoration would take 6-20 years.
Harvest by humans		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Fire (damaging habitat, mortality in nests)	Medium	LOW: Fire speeds fern invasion, which affects petrel habitat requirement (access to ground). So guess of low, based on spatial extent of ferns.	HIGH: Heavy thickets, sticky paste, out-compete other plants, bad for petrels. Spread with fire.	MEDIUM: Based on fern eradication, above.
Livestock grazing		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Non-timber Forest Product collection	Low	LOW: Complex situation - when commercial farms are active, rely on migrant workers, who may extract from forest. Commercial farms not currently active.	LOW: Will ultimately thin vegetation or cause other damage, but does not directly harm the petrel habitat requirements. (Danger is if people are accompanied by dog.)	MEDIUM: Damaged broadleaf takes a while to recover.
Predation by introduced mammals - mongoose	High	HIGH: Mongoose seen, documented. Maybe cats, but not seen. No pig sign.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, mongoose known to take older age classes.
Predation by introduced mammals - rats	Medium	VERY HIGH: <i>Rattus rattus</i> is everywhere, potentially visiting every nest.	HIGH: Observations so far indicate that the effects are low, but collecting data now with camera traps. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.

Strandings in populated areas due to light attraction	Medium	HIGH: Most pass Ocoa (bigger town of 82,000) to big bay. Big highway, lots of disturbance on coast.	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality		HIGH: Abandoned towers/antennas. 2600-m peak with antennas, no lights. No nests up that high. Not likely to come back on line.	N/O	N/O
Wood harvest	Low	LOW: Complex situation - when farms are active, rely on migrant workers, who may extract from forest.	LOW: Will ultimately kill trees, but does not directly harm the petrel habitat requirements. (Danger is if people are accompanied by dog.)	MEDIUM: Damaged woody growth takes a while to recover and collectors aren't likely to ease up. Growth of new trees is slow.
Site: LaVisite - Tet Opak specifically		Justifications based on interviews with Ernst Rupp and Adam Brown, April 21 and 22, 2020 with supplemental comments inserted June 24, 2020.		
Agriculture	Very high	HIGH: Based on 3 years evidence, estimate is 10 out of 42 nests have been severely impacted by encroachment.	VERY HIGH: Actually, nests holding on farmed areas (just grassy cover). Accompanying disturbance prob. low. However, eventually these burrows won't persist in areas overrun by agricultural effort (row crops).	VERY HIGH: Once the area is severely degraded, it would take a lot of effort to restore it to any kind of ecological function. The nesting site is "lost." Adults could attempt to find new locations, but unknown amount of energy to re-nest.
Fire on habitat.	Low	LOW: Yet to see a fire on the escarpment; no signs of fire.	MEDIUM: No data on this yet so rating is an estimate	HIGH: Damaging to broadleaf vegetation, and recovery efforts require a number of factors to converge (i.e. restoration could work if people re-located, there was adequate seed bank remaining in the soil, precipitation patterns were conducive.)
Livestock grazing	High	HIGH: On upper part of colony now but creeping down slope and up slope	HIGH: Grazing is a step towards full clearing. Exposes burrows.	HIGH: Once the area is degraded down to pasture, it would take a lot of effort to restore it to any kind of ecological function. The nesting site might be "lost." Adults could attempt to find new locations, but unknown amount of energy to re-nest.
Non-timber Forest Product collection	Medium	MEDIUM: Tree fern harvest identified as primary reason for entry - stumps and stacks.	LOW: Can cause mortality by blocking nests. Ratings based on guesses, three years data.	MEDIUM: Effects depends if chick or adults trapped and die. Restoration of degraded habitat could happen if tree fern nurseries, replanting.
Fatal fire Attraction (fires to expand agriculture; community celebrations)	High	VERY HIGH: Incidents of adults attracted to fires right near nesting areas.	HIGH: Mortality event in 2019; 110 adults burned. 5 nests were abandoned after. Fires are in pine areas within a kilometer of nesting area.	MEDIUM: Reversing this threat is based on behavior change in human populations (seasonal clearing technique). Over time, maybe sustainable agriculture could be put in place to prevent lighting of fires in farmed areas.
Harvest by humans	Low	LOW: Haven't documented this but humans are farming in colony	MEDIUM: No education so people likely to take a petrel encountered.	LOW: Recovery extended if adults lost.
Predation by introduced mammals	High	VERY HIGH: Predators documented by camera trap at all nests monitored: cats, mongoose, black rats.	HIGH: Defaulted to high.	MEDIUM: Recovery depends on age class. Note: Is it possible this is a more manageable area, being more confined?
Strandings in populated areas due to light attraction	Medium	HIGH: Pass over Marigot, HT (estimate lesser light problem), Port-au-Prince (estimate larger light problem)	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	Low	LOW: Towers at Tet Kay Jak ~1km west from Tet Opak. Tower strikes documented at these towers in the past. Light altered.	MEDIUM: Mostly fledglings	LOW: Most egregious spotlight now removed.
Wood harvest	Medium	MEDIUM: Haven't seen yet but probably happening around because seeing charcoal piles	HIGH: Removal of woody vegetation is a step towards greater clearing.	MEDIUM: Damaged woody growth takes a while to recover and collectors aren't likely to ease up. Growth of new trees is slow.
Site: Macaya		Interview with Anderson Jean, May 14, 2020		

Agricultural encroachment	Very high	HIGH: No real farming up in petrel area now, but farming at the bottom of hill. Fires for clearing. Definitely getting closer.	VERY HIGH: Eventually burrows won't persist in areas overrun by agricultural effort (row crops).	VERY HIGH: Once the area is severely degraded, it would take a lot of effort to restore it to any kind of ecological function. The nesting site is "lost." Adults could attempt to find new locations, but unknown amount of energy to re-nest.
Harvest by humans		Not Occurring (N/O) and unlikely to occur. Not many people even know about the petrel; no one is seeking them out.	N/O	N/O
Fire (damaging habitat, mortality in nests)	Low	LOW: Most common fires are human activities, burn during dry season. Rain starts May and June. June and July will burn and plant beans, during fledging. But no evidence of wildfires up in suspected nest area.	MEDIUM: Guess. Damage depends on nature of fire.	HIGH: Guess. Broadleaf takes longer to recover.
Livestock grazing		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Non-timber Forest Product collection		Not occurring (N/O) No ferns or other non-timber products known to be collected.	N/O	N/O
Pig Damage	High	VERY HIGH: Now there are pigs (not mentioned in 1980s). Last visit, saw where they were rooting in the ground.	HIGH: May have limited petrel populations in the past. Severity of pig rooting damage unknown; defaulted to "high".	MEDIUM: The decreased quality of nesting habitat could be reversed, but with soil quality damaged and vegetation removed, restoration would take 6-20 years. Note: Legal pig hunting is feasible and would prob. be effective.
Predation by introduced mammals - cats	High	HIGH: Abundant, can see cats on walks at night.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: Full suite of introduced predators there... high abundance of rats in Macaya, can see them swarming your camp. On trails up Pic Formon and La Selle... easy to see.	HIGH: Observations so far indicate that the effects are low, but collecting data now with camera traps. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	HIGH: No strandings reported in nearby communities, the smaller towns at either end of the flyway have lights (though not like coming down from Massif la Selle... Jacmel and Port au Prince are dense population centers), buildings, towers.	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	Low	LOW: Towers and antennas are a great distance from Macaya, 15-20 km away. In general, this area has less technological development than other Haitian sites.	MEDIUM: Guessing mostly fledglings.	LOW: Recovery based on age class. Resources for recovery: Not as many hazards to deal with.
Wood harvest	High	VERY HIGH: Firewood, people cut trees for construction, housing, cooking/starter every day. Hardwood is the focus. In the past, there was a project with park rangers to mitigate number of trees cut; now, rangers not paid.	HIGH: Removal of woody vegetation is a step towards greater clearing.	MEDIUM: Damaged woody growth takes a while to recover and collectors aren't likely to ease up. Growth of new trees is slow.

Site: Dominica				
Interview with Adam Brown, May 13, 2020				
Agriculture (meaning planted crops farming)		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Barn Owl		Information gap	n/a	n/a
Fire (damaging habitat, but also some mortality in nests or adults)		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Livestock grazing		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Non-timber Forest Product collection		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Pig rooting	Low	HIGH: Pigs definitely overlap with petrels; but people pig hunt already so density maybe not that high	MEDIUM: Pigs damage burrows and cause mortality.	LOW: Recovery depends on degree of damage to burrow.
Predation by humans		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Predation by introduced mammals - cats	High	VERY HIGH: No mongoose. All areas subject to these introduced animals.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: No mongoose. All areas subject to these introduced animals.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to "high" based on studies of other petrel species.	MEDIUM: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	HIGH: Documented but not often. Enough awareness that word would get out. Varied level of coastal development around island, but Roseau is at the head of lots of flyways.	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	Low	MEDIUM: 2015- towers mapped. On Flyways. Morne Micotrin has array. Near Morne Anglais. Below Morne Trois Piton. Estimated that 30% of population is exposed.	LOW: Birds rarely found.	LOW: Recovery depends on age classes harmed.
Wood harvest		Not Occurring (N/O) and unlikely to occur. All on peaks; all in Park	N/O	N/O
Site: Guadeloupe				
Interview with Adam Brown, May 13, 2020				
Agriculture (meaning planted crops farming)		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Barn Owl		Wondering about their presence/effect	n/a	n/a
Fire (damaging habitat, but also some mortality in nests or adults)		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Livestock grazing		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Non-timber Forest Product collection		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Pig rooting	Low	HIGH: Guess - Ask Parc staff/Antoine	MEDIUM: A guess	LOW: Guess

Harvest by humans		Not Occurring (N/O) There is bird hunting in parks, but certainly not petrels.	n/a	n/a
Predation by introduced mammals – mongoose, other	High	VERY HIGH: Overrun by mongoose. Raccoons are also widespread	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to “high” based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - cats	High	VERY HIGH: All areas subject to these introduced animals, so assuming all nests.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to “high” based on studies of other petrel species (Rodríguez et al. 2019)	MEDIUM: Reversibility depends on petrel productivity, which is generally slow; moreover, cats known to take older age classes (Le Corre 2008).
Predation by introduced mammals - rats	High	VERY HIGH: All areas subject to these introduced animals, so assuming all nests.	HIGH: Impact being studied... presence has been linked to complete loss at other sites. Lack of data about severity of predation; defaulted to “high” based on studies of other petrel species.	LOW: Reversibility depends on petrel productivity, which is generally slow. Chicks replaced more easily than adults.
Strandings in populated areas due to light attraction	Medium	HIGH: Big city on routes out to sea; no record of groundings (but very few birds).	MEDIUM: Severity hard to know as all reporting is incidental. Expect that there are more downed birds than are found.	MEDIUM: Losses believed mostly to fledglings, which have a lower survival rate generally (losses are likely compensatory). (Rodríguez et al. 2017)
Towers/structures mortality	Low	MEDIUM: Not mapped, but exist on flanks on flyways	LOW: Birds rarely found.	LOW: Recovery depends on age classes harmed.
Wood harvest		Not Occurring (N/O) and unlikely to occur.	N/O	N/O
Notes		MIRADI/Conservation Standards Definitions:		
Overall rating for introduced predators ultimately set at worst-case scenario (scope Very High, severity High, irreversibility Medium) regardless of site (which may differ in density of various predators).		Notes on Scope (used criteria in Miradi): Ranges of 1-10%, 11-30%, 31-70% and 71-%100.	Notes on Severity (used criteria in Miradi): Ranges of 1-10%, 11-30%, 31-70% and 71-%100.	Notes on Irreversibility (used criteria in Miradi, which is intended to look at reversibility of the effects, not the threat): Ranges of 1-5 years/low cost, 6-20 years/ reasonable cost, 21-100 years/not affordable, 100+ years/can't be done.

Table A3-2 At-Sea Threat Ratings and Justifications

Threat	Overall Miradi	Scope	Severity	Irreversibility	Uncertainty
Target: Breeding adults (spatial use: 70% Caribbean Sea, 30% Gulf Stream)					
Reduced prey availability *^	Medium	MEDIUM: The foraging areas for breeding adults (mostly southern Caribbean Sea) are limited in size (available habitat) and location (central-place foraging); upwelling processes in the southern Caribbean Sea are negatively impacted by climate change and show reduced upwelled nutrient, and fishery collapse (Taylor et al 2012).	MEDIUM: Petrels may adjust to other prey if they are available, and be moderately affected by the threat. Under extreme scenario, death of breeding adults may occur as changes in prey quality can have substantial effects on body condition (e.g. shearwater die offs). Other effects of the threat may include decreased fitness, potentially decreased life expectancy. Reduced reproductive success is a consequence but does not directly affect the target.	HIGH: The threat is pervasive and its effects (decreased life expectancy, potential mortality) cannot affectively be reversed by compensation measures at nest sites.	High
Plastic *	High	HIGH: Plastic pollution is diffuse and widespread in the marine environment. Relative debris density is low in the Caribbean Sea but higher in the western north Atlantic and enclosed Gulf of Mexico (Wilcox et al. 2015).	MEDIUM: The effects of the threat are likely sublethal for self-feeding birds (here, breeding adults) but may result in reduced body condition, decreased fitness, reduced survival and shorter life expectancy. The threat is cumulative and irreversible, and high exposure can be lethal. Reduced reproductive success is a consequence but does not directly affect the target.	VERY HIGH: The effect of the threat (decreased survival and life expectancy) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	Medium
Mercury *	Medium	HIGH: Breeding adults are expected to be spatially affected by mercury and methylmercury in the Caribbean Sea and Gulf Stream.	LOW: Concentrations of mercury in the southern Caribbean Sea are estimated to be on the lower spectrum (Semeniuk and Dastoor 2016). Bioaccumulation may occur in other areas such as Gulf Stream waters. The effects of the threat are likely sublethal for the target population (reduced fitness, reduced survival and shorter life expectancy) but high exposure can be lethal. Reduced reproductive success is a consequence but does not directly affect the target.	VERY HIGH: The effect of the threat (decreased survival and life expectancy) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	High

Other contaminants *	Medium	HIGH: In the southern Caribbean Sea, sources include O&G, shipping and agricultural runoff. We suspect that most breeding adults use the Caribbean Sea for foraging, hence scope affecting >70% of population.	LOW: The threat has likely sublethal effects on the target population but high exposure can be lethal (impact on survival in the lower spectrum). Other impacts may include decreased fitness. Reduced reproductive success is a consequence but does not directly affect the target.	VERY HIGH: The effect of the threat (decreased survival) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	Medium
Oil spills (O&G, shipping) *	High	MEDIUM: The most likely area for breeding adults to encounter oil spills is discrete areas of the south Caribbean Sea, during foraging. If most breeders use the same foraging areas in the south Caribbean Sea, diffuse oil spills may potentially impact a medium proportion of breeding adults (11-30% in Miradi).	MEDIUM: The target population will be impacted through direct mortality. Sudden death of breeding adults will impact the population over several generations but proportion of reduction is difficult to estimate. Proportion of individuals affected is difficult to estimate but seems reasonable to expect 11-30% of population to be impacted. The number of oil platforms in foraging areas is limited (2-3 in extraction and <5 in exploration) but could increase in the future (Agencia Nacional de Hidrocarburos 2020).	VERY HIGH: The effect of the threat (acute mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. If low numbers of individuals are affected, improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Medium
Attraction and/or Collisions with infrastructure *	Medium	MEDIUM: This is a discrete, point-source threat: in the south Caribbean Sea, 3 O&G platforms are in active extraction in areas used by petrels. More exploration platforms or ships are located in the area (<10). Lighted squid fishery present in that area could attract petrels. Collisions with lighted ships such as cargo or tanker ships have occurred.	MEDIUM: The target population will be impacted through direct mortality. Sudden death of breeding adults will impact the population over several generations but proportion of reduction is difficult to estimate. Proportion of individuals affected is difficult to estimate but seems reasonable to expect 1-10% of population to be impacted. The number of oil platforms in foraging areas is limited (2-3 in extraction and <5 in exploration; although it could increase in the future).	HIGH: The effect of the threat (direct mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. Low numbers of individuals affected suggest that improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Medium
Fisheries bycatch *	Low	MEDIUM: Active international fisheries (including squid and longline) are present in the southern Caribbean Sea and overlaps somewhat with petrel foraging areas there. Local fisheries also present but unquantified. A medium scope can be expected.	LOW: No bycatch of petrels has been observed in US Atlantic fisheries. Pterodroma petrels are usually surface feeders and are not usually subject to bycatch in hook fisheries. Even considering differences in fisheries between Atlantic and Caribbean, it is reasonable to expect a low severity. The target population would be impacted through direct mortality.	HIGH: The effect of the threat (direct mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. Low numbers of individuals affected suggest that improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Medium
Hurricane fallout *^	NA	Not Occurring (N/O) during the breeding season	N/O	N/O	NA

Target: Offspring: eggs to fledglings (spatial “use”: same as their parents, unless specified otherwise)					
Reduced prey availability *^	Medium	MEDIUM: Similar to that of Breeding Adults.	MEDIUM: Depleted prey base may affect chicks more than adults: under feeding stress, adults may abandon chick. There may also be decreases in the provisioning rate or decreases in meal quality that can impact growth and survival.	HIGH: The threat is pervasive and, although some of its effects (decreased fledging success) may be temporarily reversed, compensation measures will likely not be effective or be too expensive (supplemental feeding).	High
Plastic *	High	HIGH: Similar to that of Breeding Adults.	MEDIUM: The effects of the threat can be lethal for juveniles. Sublethal effects include reduced body condition, which is linked to lower fledging success.	VERY HIGH: Similar to that of Breeding Adults. The effects of the threat (decreased fledging success) may be temporarily reversed by compensation measures but long-term effects on the population will not be compensated.	Low
Mercury *	Medium	HIGH: Similar to that of Breeding Adults - or higher, if pre-breeding females use contaminated areas outside the considered scope for Breeding Adults.	MEDIUM: Mercury in offspring may impact fetal development, reduce hatching success, reduce development success and impact fledging success. Rate and extent unknown. Developmental effects are difficult to quantify and failure to hatch or fledge may be due to other factors but 10-20% of the population affected seems reasonable.	HIGH: Similar to that of Breeding Adults. The effects of the threat (decreased fledging success) may be temporarily reversed by compensation measures but long-term effects on the population will not be compensated.	High
Other contaminants *	Medium	HIGH: Similar to that of Breeding Adults. Similar to that of Breeding Adults - or higher, if pre-breeding females use contaminated areas outside the considered scope for Breeding Adults.	MEDIUM: Developmental effects are difficult to quantify and failure to hatch or fledge may be due to other factors but 10-20% of the population affected seems reasonable.	HIGH: Similar to that of Breeding Adults. The effects of the threat (decreased fledging success) may be temporarily reversed by compensation measures but long-term effects on the population will not be compensated.	Medium
Oil spills (O&G, shipping) *	Medium	MEDIUM: Similar to that of Breeding Adults.	HIGH: Similar to that of Breeding Adults. Direct mortality of adults may induce the death of their offsprings: if parent(s) die, then chick mortality is probable (e.g., chicks may fledge if near to fledging age and single parent can provision final meal(s)). With one offspring per pair, the size of the offspring population is half the size of the adult population, therefore the proportion of offsprings being affected is higher. Also, the reduction of population of breeding adults will impact the subsequent populations of offsprings (number of offsprings produced) at a higher rate until breeding adult population is regenerated.	MEDIUM: The effects of the threat (acute mortality in population) may be temporarily reversed by compensation measures.	Low

Attraction and/or Collisions with infrastructure *	Medium	MEDIUM: Similar to that of Breeding Adults.	MEDIUM: Direct mortality of adults may induce the death of their offsprings: if parent(s) die, then chick mortality is probable (e.g., chicks may fledge if near to fledging age and single parent can provision final meal(s)). With one offspring per pair, the size of the offspring population is half the size of the adult population, therefore the proportion of offsprings being affected is higher. Also, the reduction of population of breeding adults will impact the subsequent populations of offsprings (number of offsprings produced) at a higher rate until breeding adult population is regenerated.	HIGH: Similar to that of Breeding Adults. The effects of the threat (chronic mortality in population) may be temporarily reversed by compensation measures but long-term effects on the population will not be compensated.	Medium
Fisheries bycatch *	Medium	MEDIUM: Similar to that of Breeding Adults.	MEDIUM: Direct mortality of adults may induce the death of their offsprings: if parent(s) die, then chick mortality is probable (e.g., chicks may fledge if near to fledging age and single parent can provision final meal(s)). With one offspring per pair, the size of the offspring population is half the size of the adult population, therefore the proportion of offsprings being affected is higher. Also, the reduction of population of breeding adults will impact the subsequent populations of offsprings (number of offsprings produced) at a higher rate until breeding adult population is regenerated.	HIGH: Similar to that of Breeding Adults. The effects of the threat (chronic mortality in population) may be temporarily reversed by compensation measures but long-term effects on the population will not be compensated.	Medium
Hurricane fallout *^	NA	Not Occurring (N/O) during the breeding season	N/O	N/O	NA
Target: Non-breeding adults; immatures (spatial use: 90% Gulf Stream, 10% Gulf of Mexico)					
Reduced prey availability *^	Medium	MEDIUM: Some future scenarios for climate change show possible change in Gulf Stream regimes (Yang et al. 2016). Since they are not constrained by central-place foraging (as breeding adults are), individuals in the target population may be able to spatially adjust their distribution to follow geographic changes in prey availability.	MEDIUM: Petrels in the target population may be able to adjust to other prey and, depending on the characteristics of available prey, may be moderately affected by the threat. Under extreme scenario, death of breeding adults may occur as changes in prey quality can have substantial effects on body condition (e.g. shearwater die offs). Other effects of the threat may include decreased fitness and lower reproductive success, potentially decreased life expectancy.	HIGH: The threat is pervasive and its effects (decreased life expectancy, potential mortality) cannot affectively be reversed by compensation measures at nest sites.	High

Plastic *	High	HIGH: Similar to that of Breeding Adults. Plastic pollution is diffuse and widespread in the marine environment. Relative debris density is low in the Caribbean Sea but higher in the western north Atlantic and enclosed Gulf of Mexico (Wilcox et al. 2015).	MEDIUM: The effects of the threat are sublethal for self-feeding birds but may result in reduced body condition, decreased fitness, and shorter life expectancy. The threat is cumulative and irreversible, and high exposure can be lethal.	VERY HIGH: The effect of the threat (decreased survival and life expectancy) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	Low
Mercury *	Medium	VERY HIGH: The target population is spatially impacted in the Atlantic (where its distribution is largely near-pelagic) and Gulf of Mexico. Concentrations of mercury are higher in the Atlantic, due to the ingress of the southern Labrador Current carrying arctic waters with high mercury concentrations (Semeniuk and Dastoor 2016). Note that mercury accumulates, so the distinction between breeding and non-breeding adults may be irrelevant.	LOW: The threat has sublethal effects on the target population, with an impact on survival in the lower spectrum.	VERY HIGH: The effect of the threat (decreased survival and life expectancy) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	High
Other contaminants *	Medium	MEDIUM: Non-breeding and dispersal areas include western north Atlantic and Gulf of Mexico, which are areas with medium to high pollution.	LOW: The threat has sublethal effects on the target population, with an impact on survival in the lower spectrum.	VERY HIGH: The effect of the threat (decreased survival) cannot be reversed. Increased survival at nest sites could compensate the decreased survival due to the threat but with difficulty and over several generations. Other compensation measures at nest sites (higher nest site availability, predator control) could compensate reduced fitness and early loss of breeding adults by increasing recruitment but with difficulty and over several generations. Rate of improved recruitment may not compensate reduced survival.	Medium
Oil spills (O&G, shipping) *	Medium	MEDIUM: The most likely areas for non-breeding adults and immatures to encounter oil spills are the Gulf of Mexico and shipping channels in the Atlantic. O&G activity may occur in Canadian waters in the future but we did not include it in this threat rating. Because the threat is relatively discrete, only a portion of the population will be affected at a time by an oil spill. The worst area for a spill would be off Cape Hatteras and could spatially affect up to 30% of the population.	HIGH: Similar to that of Breeding Adults. The target population will be impacted through direct mortality. This threat could impact both adults and immatures (as compared to only adults in the Breeding Adults target). Dead immatures will not recruit into the target population therefore the proportion of the target population that is impacted should be higher than in Breeding Adults (into which immatures will recruit - if a spill affects Breeding Adults, it does not affect immatures).	HIGH: Similar to that of Breeding Adults. The effect of the threat (acute mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. If low number of individuals are affected, improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Low

Attraction and/or Collisions with infrastructure *	Medium	MEDIUM: There are no marine infrastructures in the western north Atlantic (though Canada may authorize O&G exploration in areas used by petrels). Wind farms proposed in the US are currently too coastal to impact the target. O&G infrastructure are widespread in the Gulf of Mexico and petrels have been observed as close to O&G platforms as 10km; however, the proportion of petrels using the Gulf of Mexico appears to be low. If occurring, attraction to lighted fishing vessels is low because lighted fisheries are uncommon in the areas of interest. However, collisions with lighted ships such as cargo or tanker ships have occurred.	MEDIUM: The target population will be impacted through direct mortality. Impact on population is difficult to estimate. The Gulf of Mexico is an area with very dense concentration of lighted O&G platforms so it seems reasonable to expect that 1-10% of the target population could be impacted.	HIGH: Similar to that of Breeding Adults. The effect of the threat (direct mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. Low number of individuals affected suggest that improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Low
Fisheries bycatch *	Low	LOW: Pelagic fisheries occur in the Atlantic and Gulf of Mexico but their overlap with petrel distribution are limited. Therefore it is reasonable to assume a low scope.	LOW: No bycatch of petrels has been observed in US Atlantic fisheries. Pterodroma petrels are usually surface scavengers and are not usually subject to bycatch in hook fisheries.	HIGH: Similar to that of Breeding Adults. The effect of the threat (direct mortality) cannot be reversed by compensation measures at nest sites. Increased fledging success could compensate early loss of breeding adults but with difficulty and over several generations. Low number of individuals affected suggest that improved adult survival at nest sites (predation control) and/or improved fledging success could compensate for early loss of breeding adults but it could take 20-100yrs to achieve this at the population level.	Low
Hurricane fallout *^	Low	MEDIUM: Most of the target population from the Gulf of Mexico to Cape Hatteras is subject to hurricanes but not all at the same time. Therefore, it is reasonable to assume the maximum scope to be medium, for the individuals in the path of a hurricane.	MEDIUM: Satellite tracking has shown that petrels can avoid, precede or follow a storm. Therefore, individuals may have the capacity to avoid being blown on land. At most, it is reasonable to expect a maximum severity at medium. Hass et al. model 100s of groundings, which is 5<<10% of the population i.e. low-medium severity.	HIGH: Similar to that of Breeding Adults. Given the low number of individuals affected, the effects of the threat (acute mortality) could be reversed by compensation measures at nest sites but with difficulty and over several generations.	Low

* = data gap; ^ = impacted by climate change

REFERENCES

- Agencia Nacional de Hidrocarburos. 2020. Geovisor ANH v2.1.0. <https://geovisor.anh.gov.co>. Accessed 1 November 2020.
- Foundations of Success (FOS), 2009. Conceptualizing and planning conservation projects and programs: A training manual. Foundations of Success, Bethesda, Maryland, USA.
- Conservation Measures Partnership (CMP) and Sitka Technology Group, 2020. Miradi Adaptive Management Software for Conservation Projects. Conservation Measures Partnership and Sitka Technology Group 2013–2016. Accessed from [<https://www.miradi.org>] on 2020-02-01.
- Le Corre, M. 2008. Cats, Rats and Seabirds. *Nature* 451(7175):134-5
- Rodríguez, A., Holmes, N.D., Ryan, P.G., Wilson, K.J., Faulquier, L., Murillo, Y., Raine, A.F., Penniman, J.F., Neves, V., Rodríguez, B. and Negro, J.J., 2017. Seabird mortality induced by land-based artificial lights. *Conservation Biology*, 31(5), pp.986-1001.
- Rodríguez, A., Arcos, J.M., Bretagnolle, V., Dias, M.P., Holmes, N.D., Louzao, M., Provencher, J., Raine, A.F., Ramirez, F., Rodriguez, B. and Ronconi, R.A., 2019. Future directions in conservation research on petrels and shearwaters. *Frontiers in Marine Science*, 6, p.94.
- Semeniuk, K. and Dastoor, A., 2017. Development of a global ocean mercury model with a methylation cycle: Outstanding issues. *Global Biogeochemical Cycles*, 31(2), pp.400-433.
- Taylor, G.T., Muller-Karger, F.E., Thunell, R.C., Scranton, M.I., Astor, Y., Varela, R., Ghinaglia, L.T., Lorenzoni, L., Fanning, K.A., Hameed, S. and Doherty, O., 2012. Ecosystem responses in the southern Caribbean Sea to global climate change. *Proceedings of the National Academy of Sciences*, 109(47), pp.19315-19320.
- Wilcox, C., Van Sebille, E. and Hardesty, B.D., 2015. Threat of plastic pollution to seabirds is global, pervasive, and increasing. *Proceedings of the National Academy of Sciences*, 112(38), pp.11899-11904.
- Yang, H., Lohmann, G., Wei, W., Dima, M., Ionita, M. and Liu, J., 2016. Intensification and poleward shift of subtropical western boundary currents in a warming climate. *Journal of Geophysical Research: Oceans*, 121(7), pp.4928-4945.

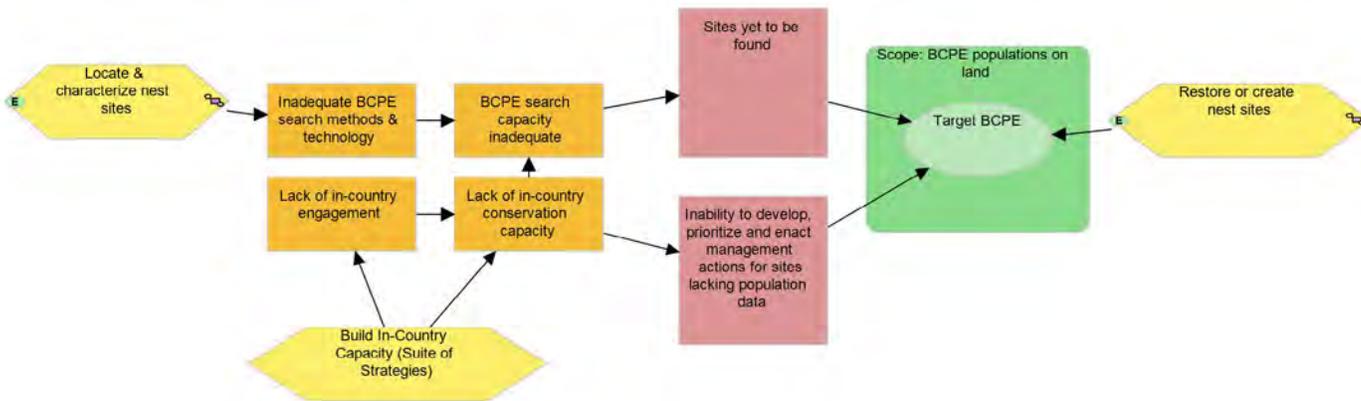
APPENDIX 4: SITUATIONAL ANALYSIS/CONCEPTUAL MODELS

Conceptual models are intended to depict the links between targets, their direct threats, the factors contributing to these threats, and the possible strategies to ultimately reduce the threats.

Key



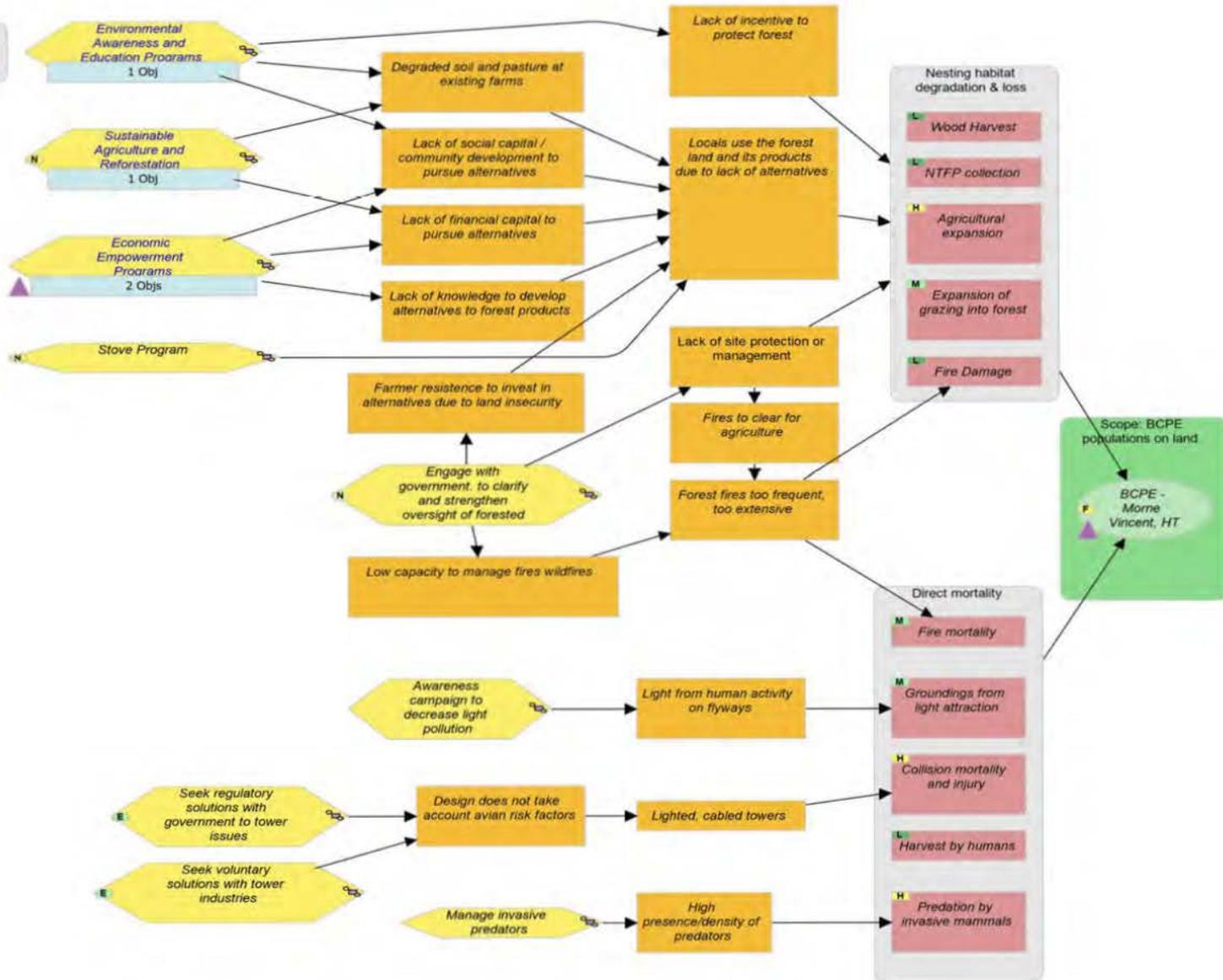
Enabling Conditions



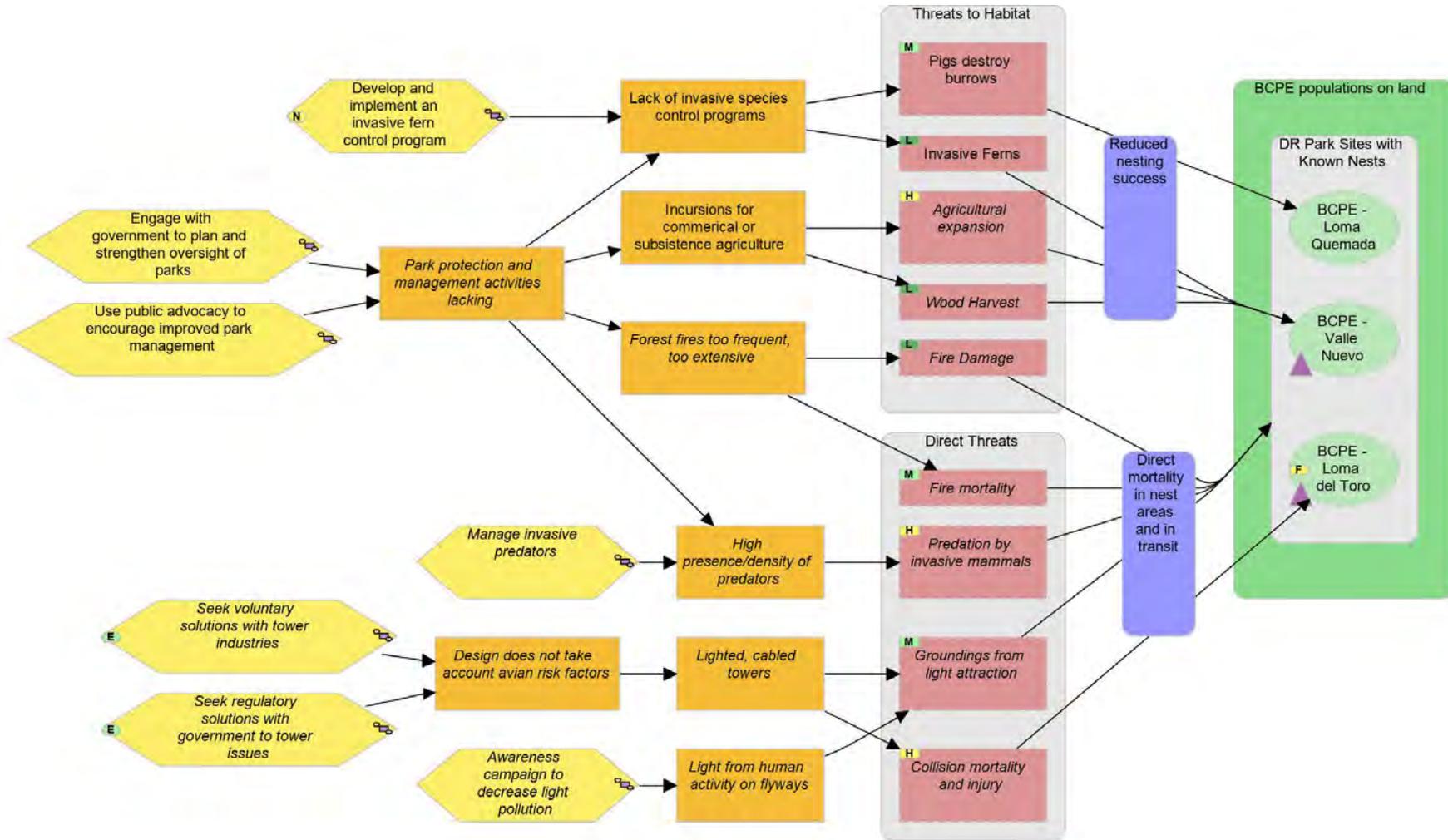
Morne Vincent

Ongoing interventions (blue font) appear to have reduced pressure on petrel habitat

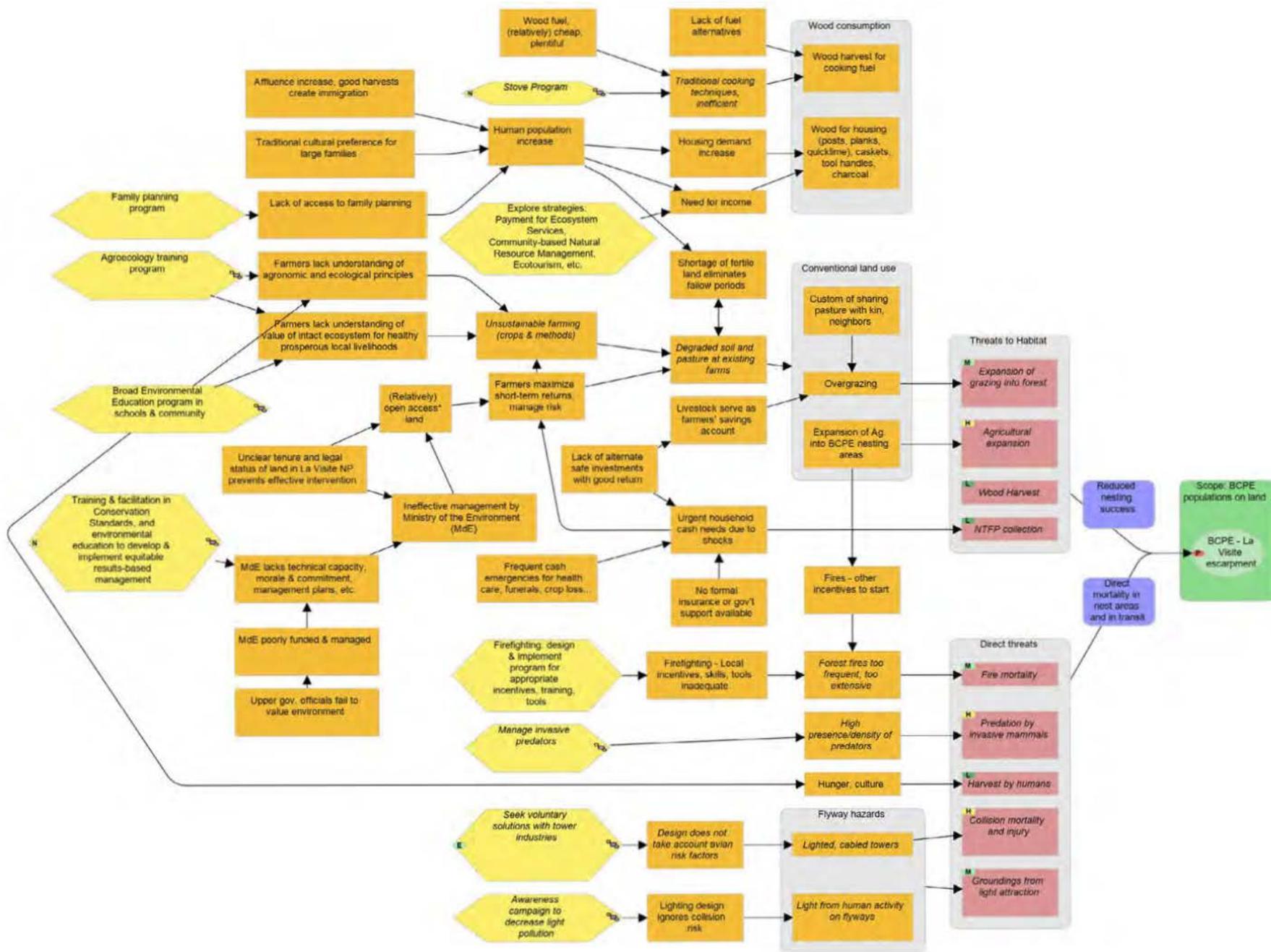
Enabling conditions due to community organization and build-up of social capital



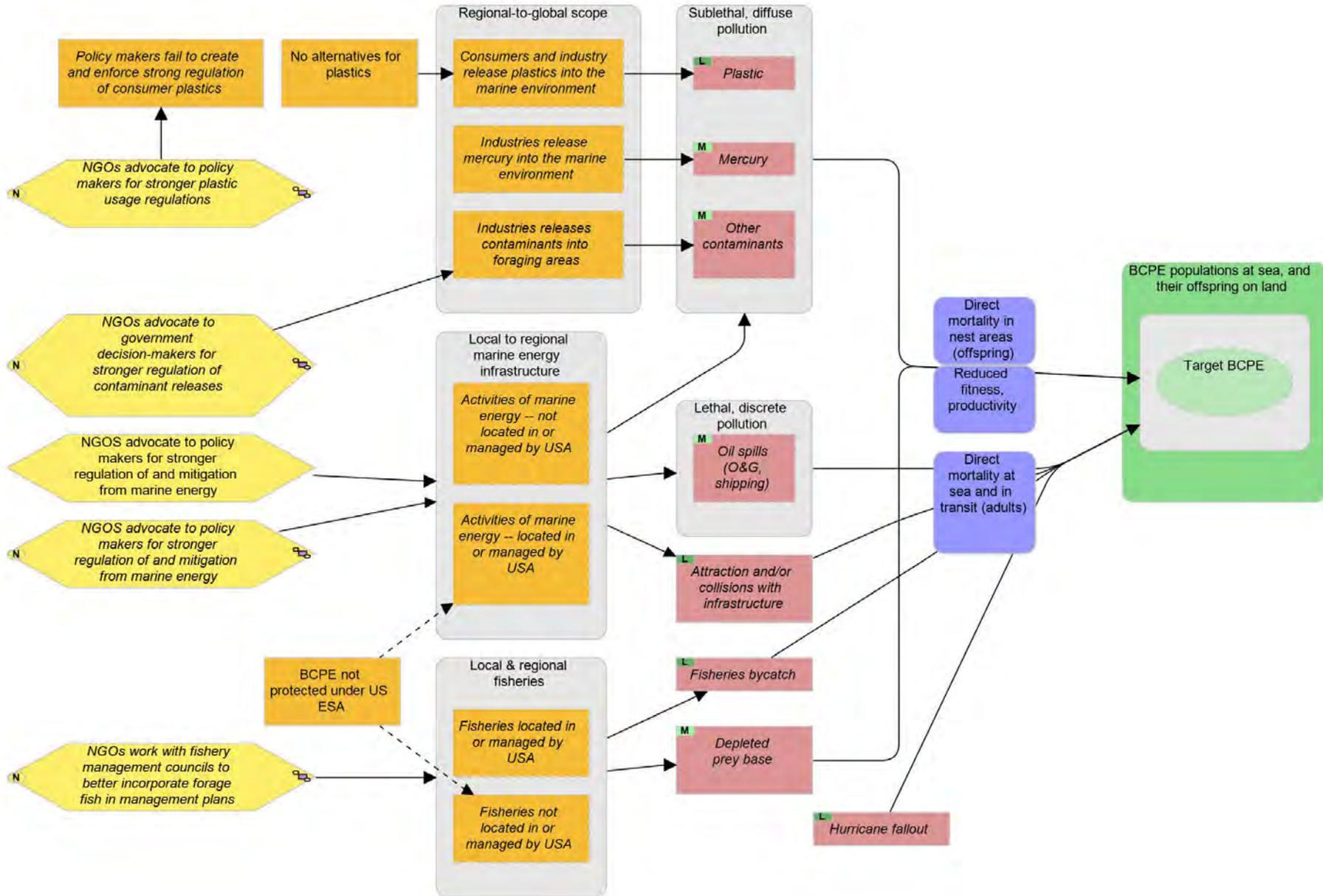
Dominican Republic Parks



La Visite



At-Sea





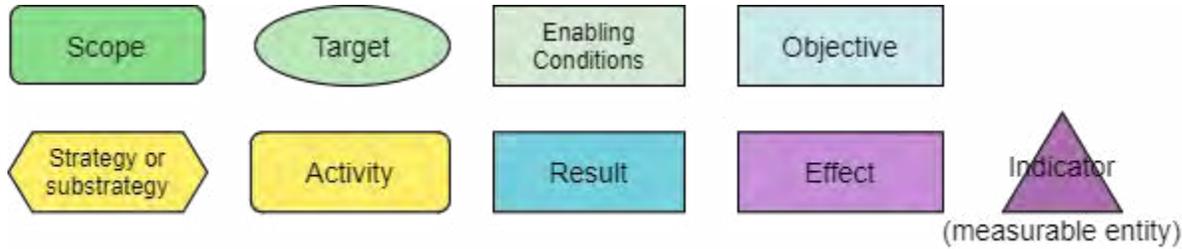
Kate Sutherland

APPENDIX 5: THEORY OF CHANGE - RESULTS CHAINS

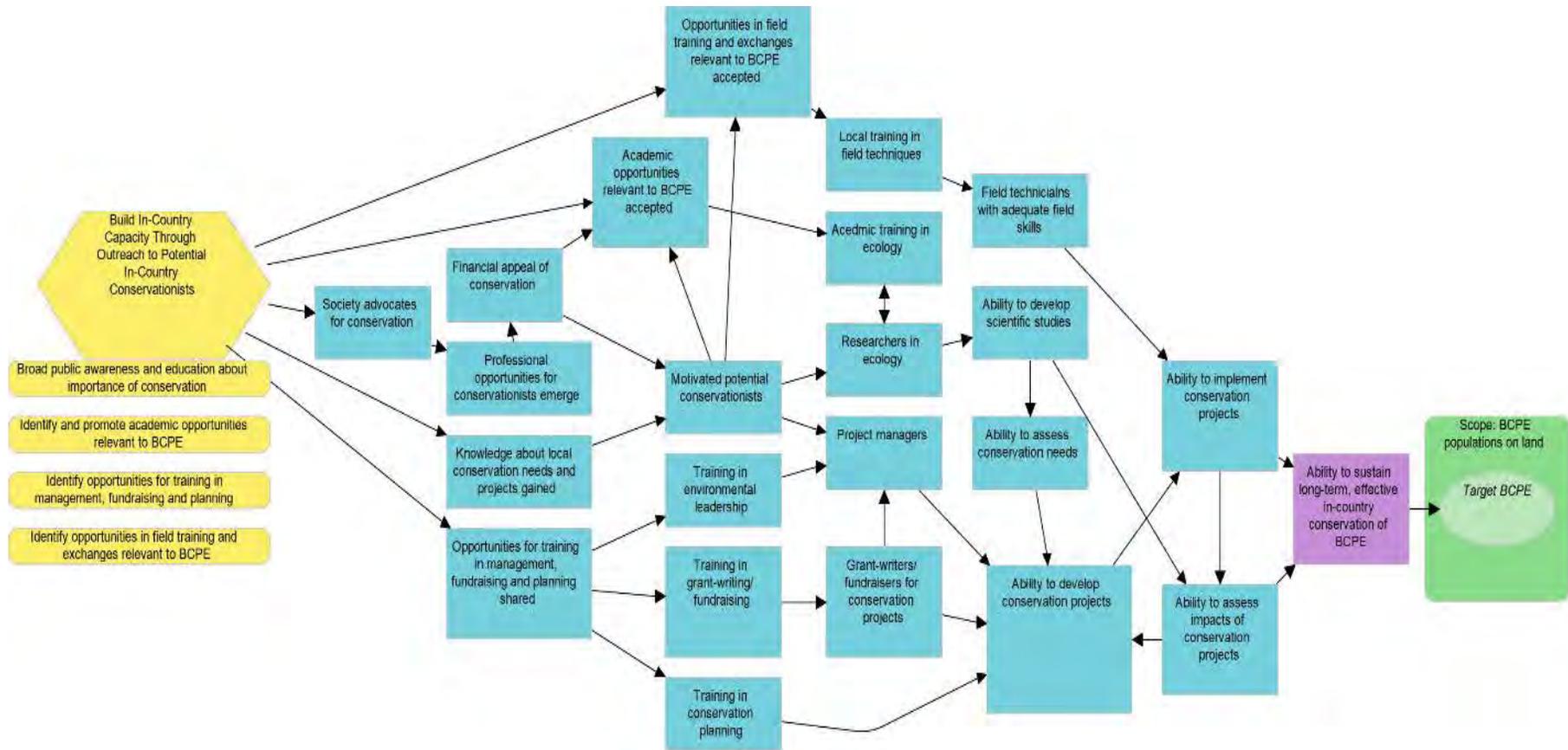
A theory of change is defined as a series of causally linked assumptions about how strategies lead to the achievement of both intermediate results and longer term conservation goals. We created a chain of results that flows from each strategy to a target.

These diagrams were greatly simplified for presentation in the main text.

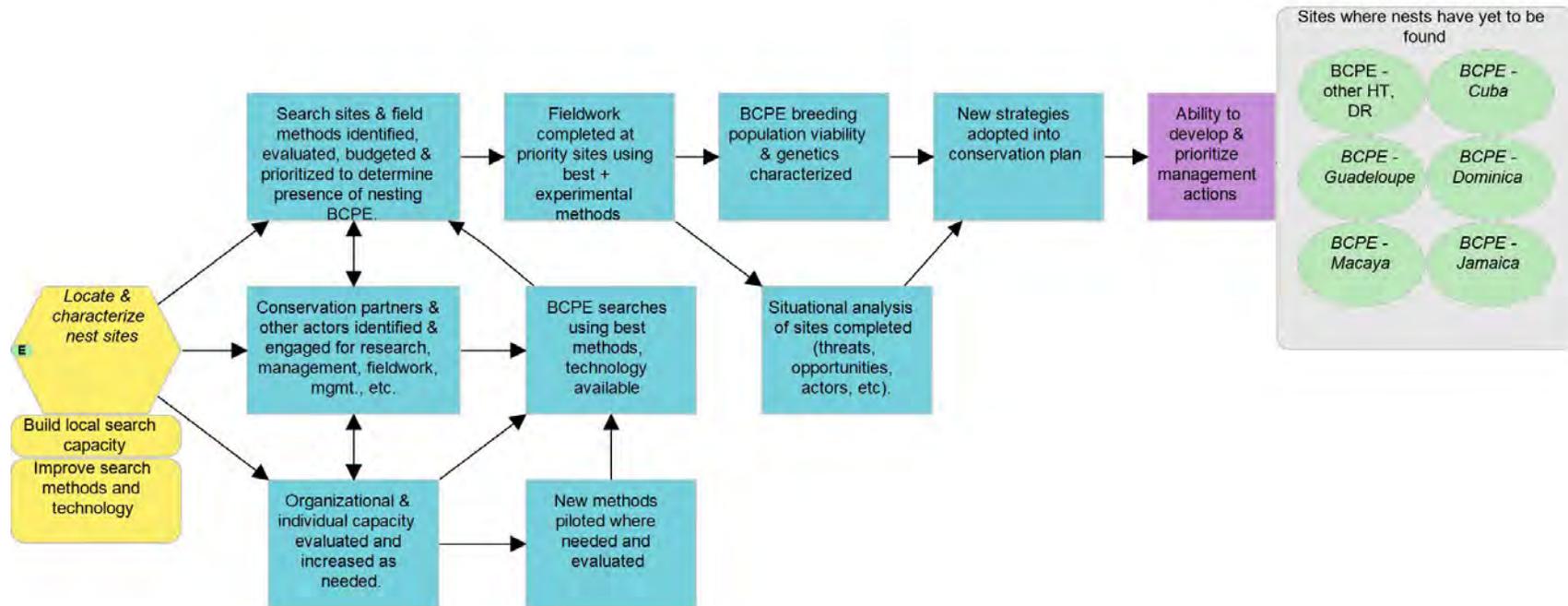
Key



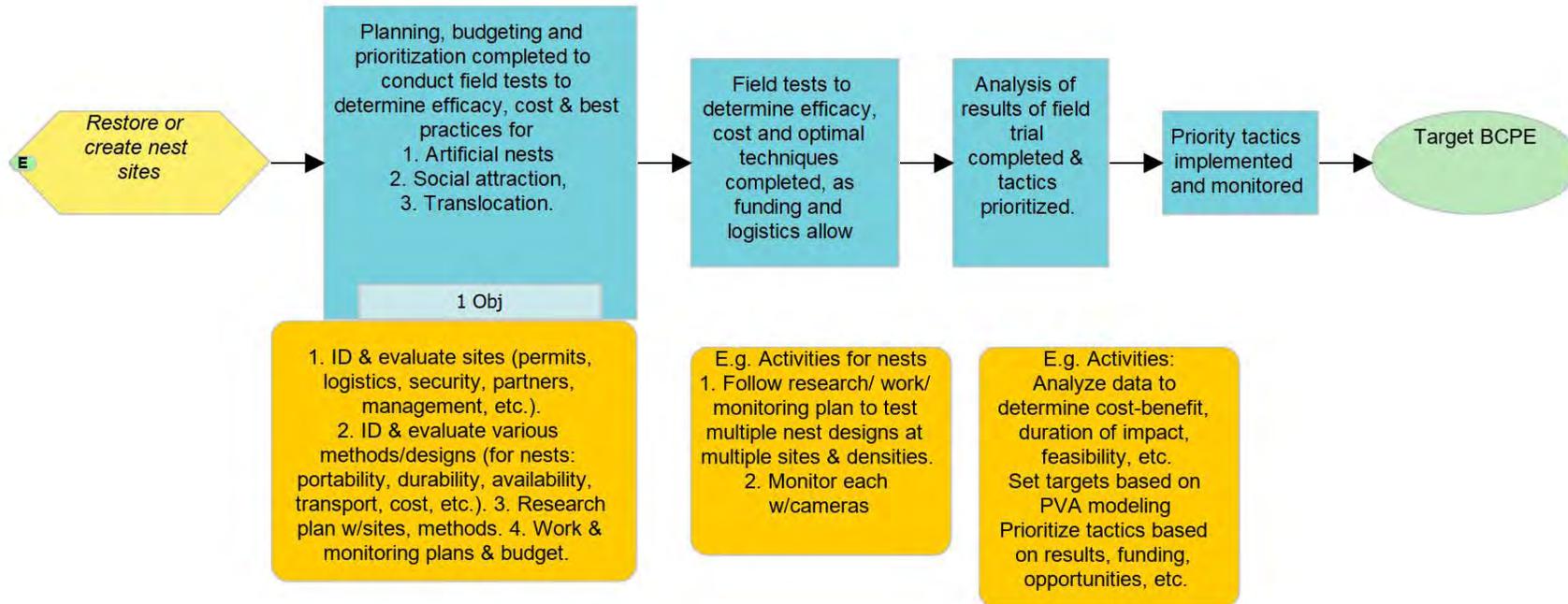
Strategy 1: Build In-Country Capacity



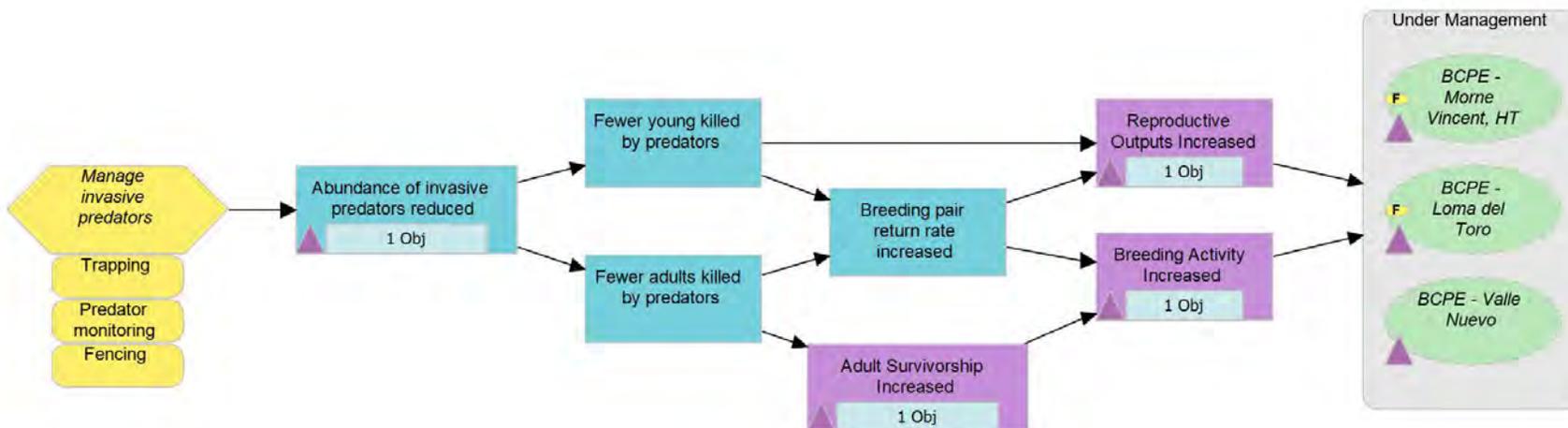
Strategy 2: Locate and Characterize Nest Sites



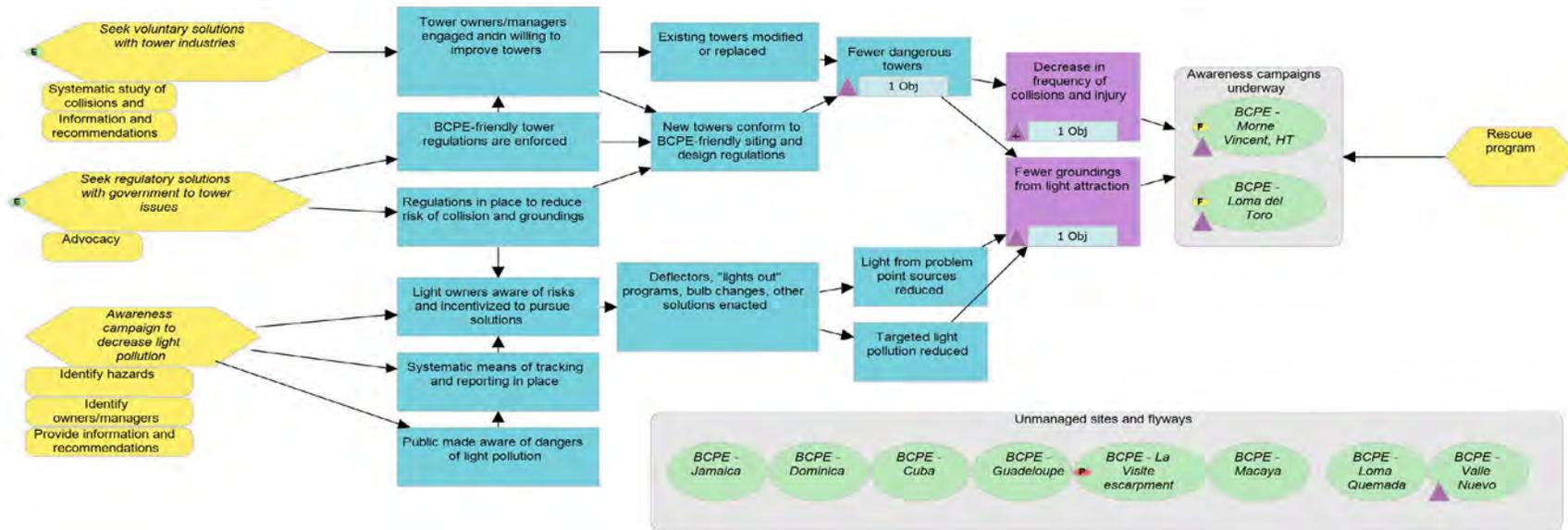
Strategy 3: Explore Restoration Methods



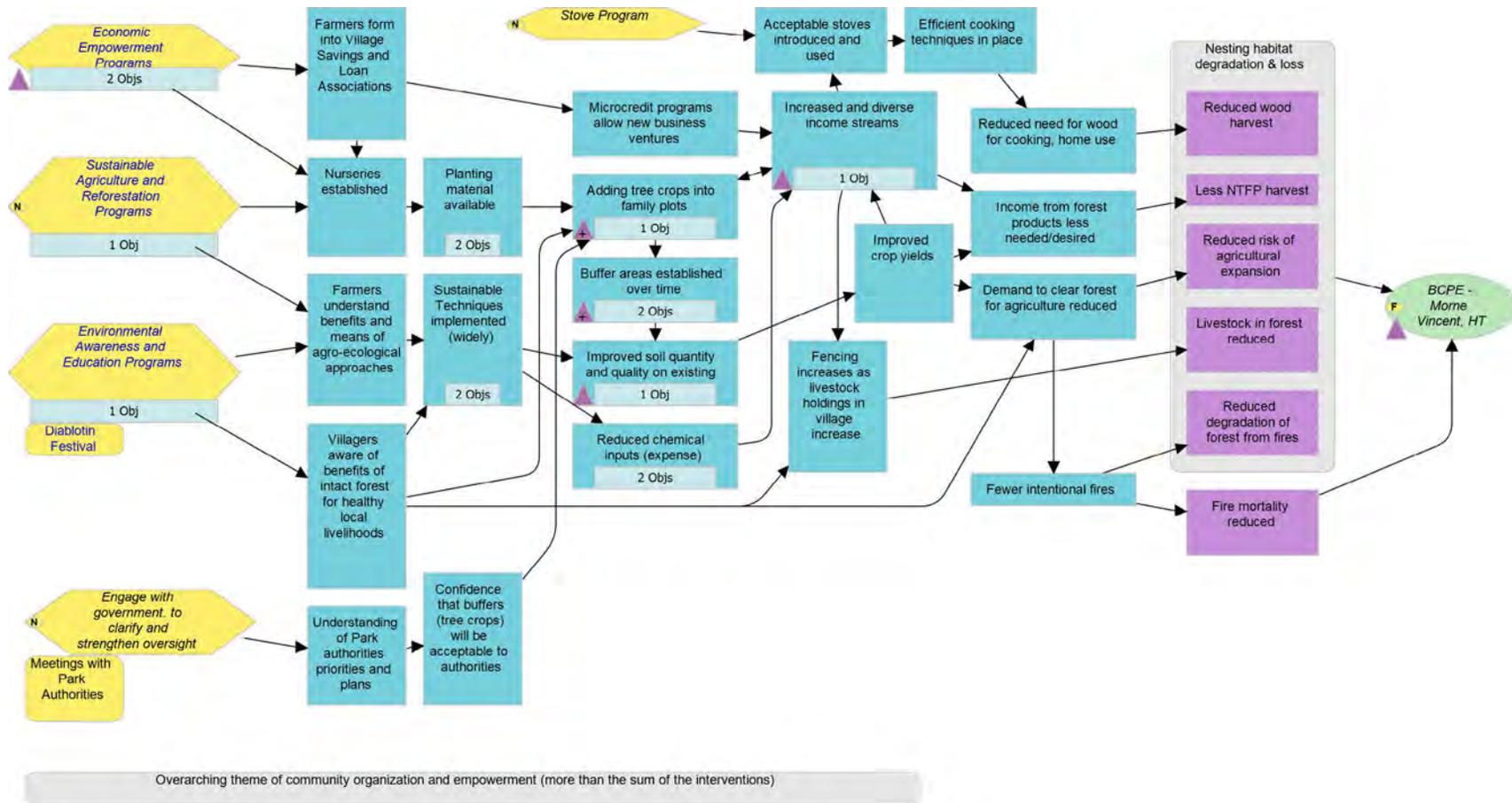
Strategy 4: Reduce Predator Pressure



Strategy 5: Reduce Collisions and Groundings

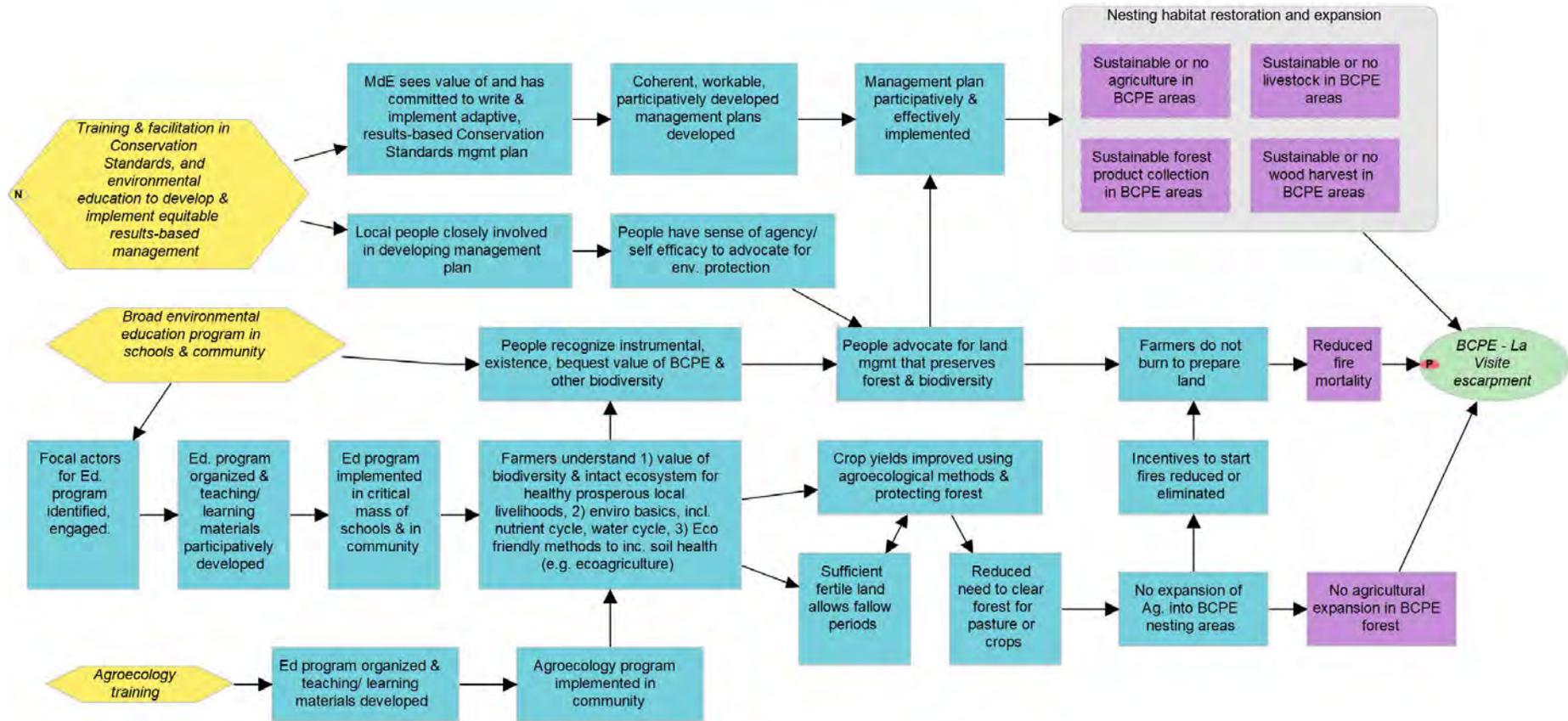


Strategy 6: Support of Community Development at Boukan Chat

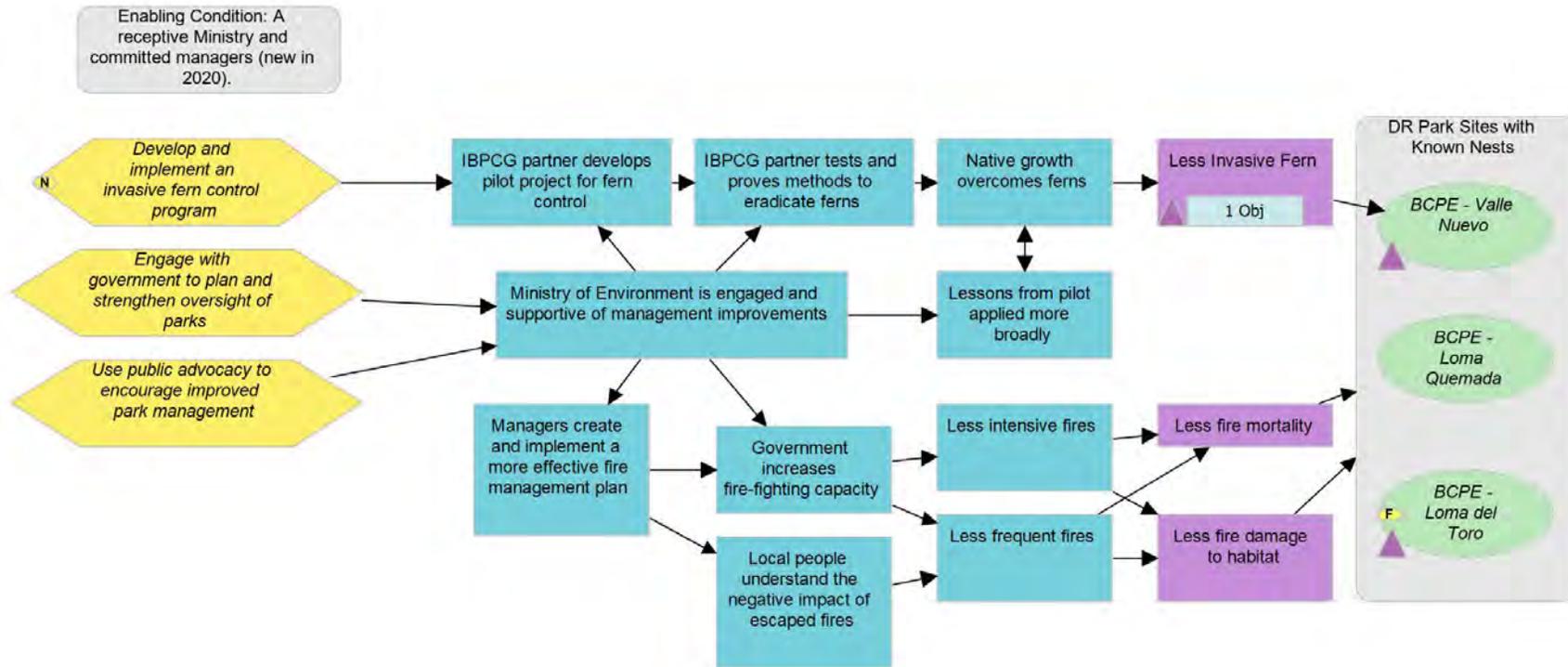


Strategy 7: Draft Strategies for La Visite

Deferred in favor of Strategy to Undertake a scoping study of socio-economic drivers of threats at La Visite



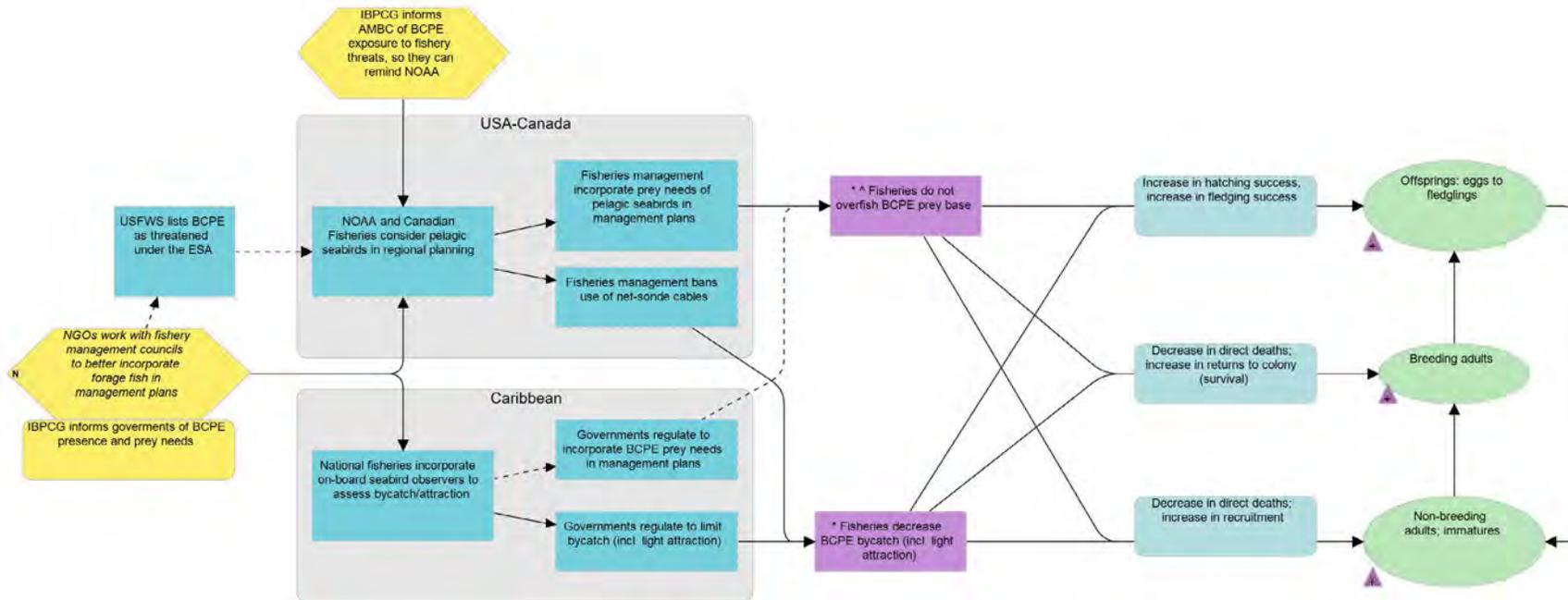
Strategy 8: Engage Dominican Republic to plan and strengthen oversight of parks



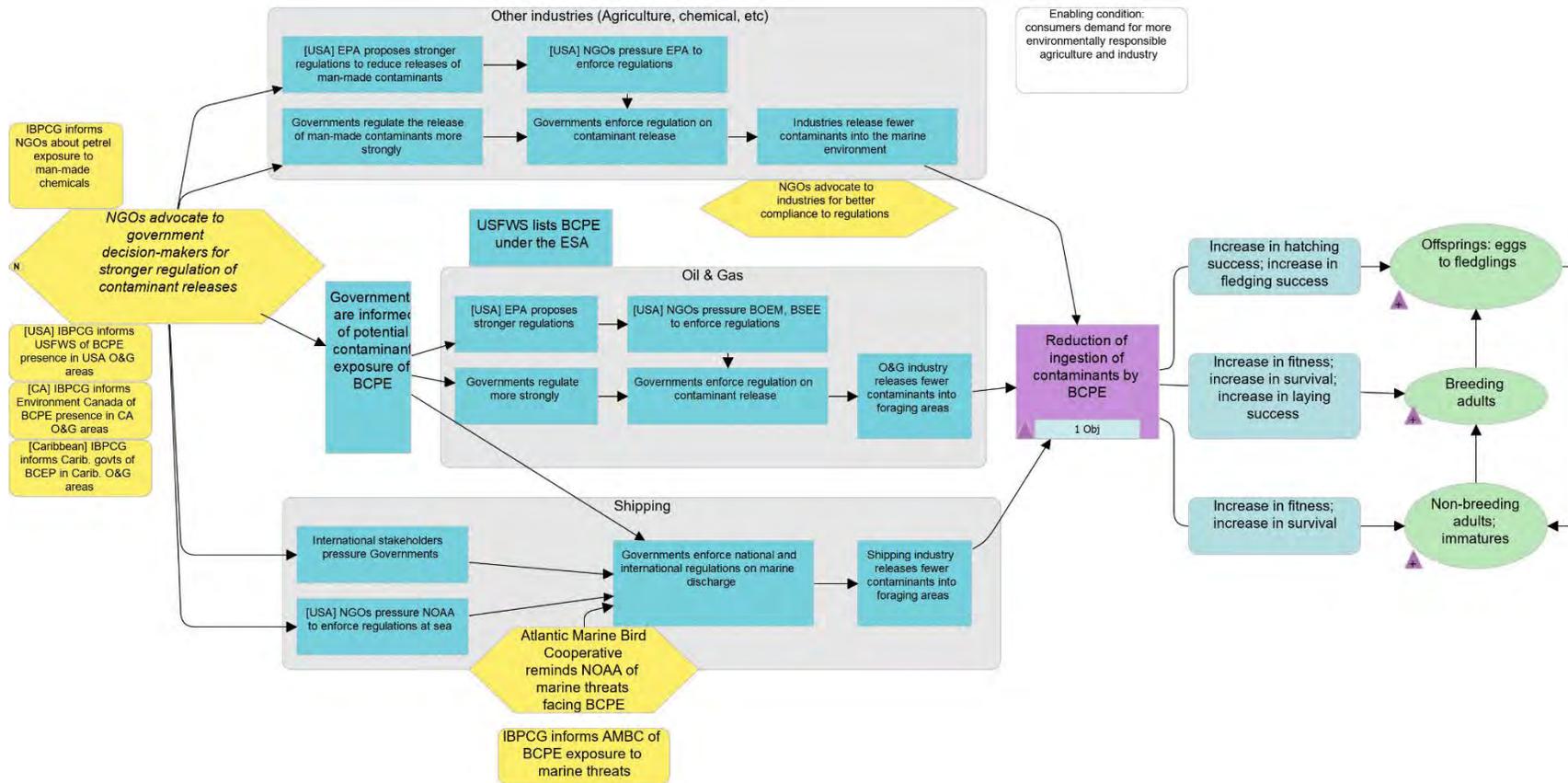
Strategy 9: Address Threats at Sea Through Advocacy

The following four diagrams were combined into one in the main text of the plan.

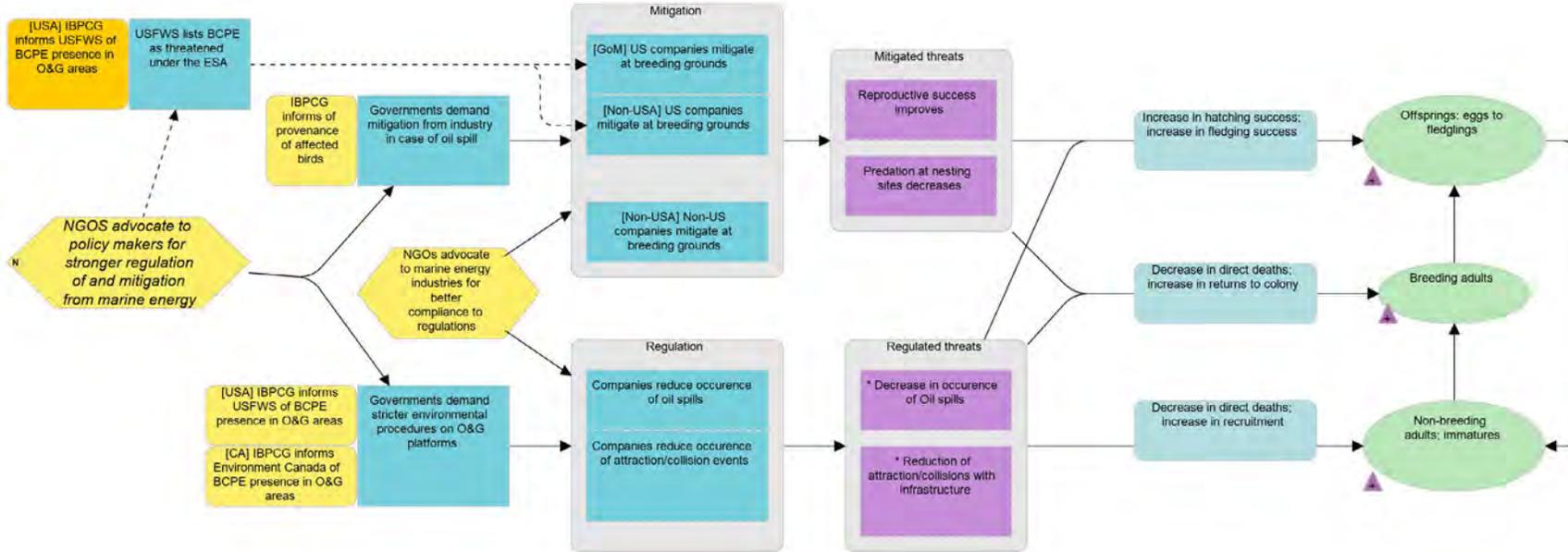
Fisheries



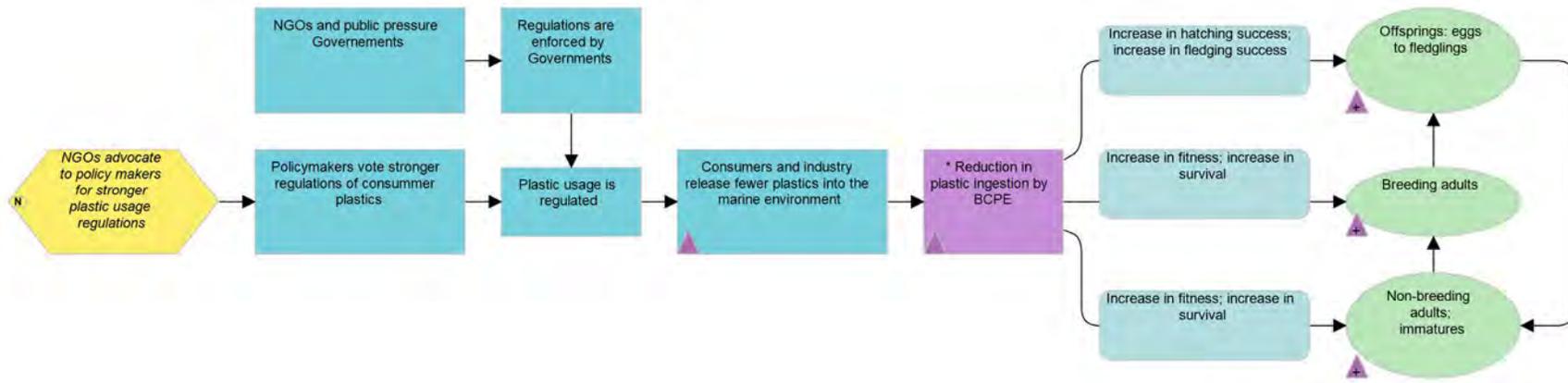
Contaminants



Marine Energy



Plastics





EPIC

APPENDIX 6: STRATEGY RATING

Method

After we had assembled the strategies that were most important and relevant, and developed theory of change results chains, we undertook a criteria-based comparison in order to further differentiate between strategies.

Each strategy was scored on a four-point scale for several criteria. Scores were averaged across team members involved in the rating, then averages combined to generate ratings of overall impact and feasibility.

Impact Criteria

To assess impact, we asked the question “If implemented, will the strategy lead to desired changes in the situation at the project site, that is, meaningfully reducing a threat or the effects of a threat?” considering probability and duration of impact.

Probability of impact, using qualitative descriptions,

4. “this will make all the difference!”
3. “yes, this will make a difference”
2. “maybe this will help”
1. “this won’t help”

Estimated **duration** of change:

4. 100-plus years
3. 21 to 100 years
2. 6 to 20 years
1. 1 to 5 years

Note that duration in this case relates to change in threat conditions (e.g., reduced predation) not duration of effect on the target status (e.g., alterations in the population curve).

Feasibility Criteria

Overall feasibility was based on the ratings for four criteria.

Financial feasibility had raters considering the cost (of the full strategy, not just a single activity).

- 4: ≤\$50,000
3. ≤\$100,000
2. ≤\$1,000,000
1. Millions of dollars

Technical feasibility, referring to existing know-how within the field of conservation biology.

4. Has been done here or elsewhere, seems ready to go
3. This has been done elsewhere, but many site-specific details have to be worked out
2. There are few precedents for this strategy
1. Possible only in theory, very difficult, or experimental

Organizational capacity of the planning team or collaborators was considered.

4. Capable and in place
3. Good and building
2. Prospects exist
1. Partners not established

Ethical/social feasibility, considering the range of stakeholders, and challenges or barriers to implementation.

4. “Likely to be acceptable to all stakeholders”
3. “May be some issues”
2. “A lot of issues”
1. “Strategy won’t be accepted”

Table A6-1 shows the overall feasibility and impact scores for each strategy.

ID	Enabling Strategies	Impact Score	Concerns	Feasibility Score	Concerns
1	Build In-country capacity	not rated as considered essential	systemic lack of opportunities	not rated as considered essential	conservation careers not competitive
2	Locate & characterize nesting sites throughout Caribbean	4	(no concerns)	3	expense and expanse of searches
3	Explore Restoration Methods	3	information needs	3	information needs
Strategies to Address Threats					
4	Reduce predator pressure	3	control not lasting	3	expense
5	Reduce flight hazards (collisions and groundings)				
5a	Voluntary solutions with tower industries	3	resistance	4	
5b	Regulatory solutions with government to tower issues	3	government turnover	4	
5c	Awareness campaign to decrease light pollution	3	won't change behavior	3	pollution too spread out
6	Undertake strategies of community development in Boukan Chat				
6a	Sustainable agriculture and reforestation programs	3	too slow	3	overwhelming challenges
6b	Environmental awareness and education programs	3	won't change behavior	3	overwhelming challenges
6c	Economic empowerment - VSLA facilitation	2	no direct effect	3	lacking expertise
6d	Economic empowerment - livelihood training	2	unintended consequences	3	lacking expertise
6e	Engage with government to clarify and strengthen oversight of forested areas	2	government not responsive	3	government not functional
6f	Stove Program	2	petrel gain low	3	may not be accepted
7	Scoping study of socio-economic drivers of the threats at La Visite	Not rated. This is an enabling strategy created when we recognized that information was insufficient to focus interventions or select among community development strategies			
8	Engage with DR government to plan and strengthen park management for the benefit of petrels				
8a	Direct Engagement	3	fire risk not manageable	3	govt connections
8b	Public Advocacy	2	fire risk not manageable	3	too political
8c	Habitat Restoration	3	petrel gain low	3	fire/hurricanes threaten success
9	Advocate for reduction of threats at sea				
9a	Better incorporation of pelagic seabirds in fishery management plans	2	petrel gain low	3	fisheries resistance, international
9b	Stronger regulation of and mitigation from marine energy	3	slow change	3	powerful sector to challenge
9c	Better compliance of marine energy industries to regulations	3	petrel gain low	3	powerful sector to challenge
9d	Stronger regulation of contaminant releases	2	risk too diffuse	2	no capacity to regulate
9e	Stronger regulations of plastic usage regionally	2	too slow, damage done	3	Enforcement

Strategy Limitations/Risks

Table A6-1 presents brief notes about the concerns raised during ratings. Team members have varying levels of familiarity with the strategies and different experiences with similar strategies in other parts of the world. The rating exercise was helpful in allowing us to raise questions and air concerns within the group. The rating exercise also allowed us to express varying levels of optimism about the cause-and-effect assumptions in the theory of change models. Where there are significant information gaps, we may lack confidence in the situational analyses underpinning our strategies. Even when confident in our understanding of the situation, we may feel strategies are not realistic given the difficulty of achieving some results and the influences of other factors. Indeed, we may be concerned that strategies carry the risk of unintended consequences that may harm, rather than help the target.

Concerns about limitations and risks are detailed below by strategy.

Strategy #1: Build In-Country Capacity: Community outreach provides a necessary introduction to petrels and conservation principles to villagers; however, increased awareness, interest and concern may not change behaviors driven by overwhelming socioeconomic needs. Proposed additions to secondary or undergraduate programs may be difficult to implement since curriculums in Haiti and the Dominican Republic are more generally geared towards agriculture science and forestry than ecology or conservation. Even when made available, students may not choose to enter an ecology/conservation curriculum because of the limited prospects and salaries offered in these branches.

Strategy #2: Locate and Characterize Nest Sites: Nest searches have been ongoing on Hispaniola since the 2010s and some searches have recently occurred in Dominica and Guadeloupe. Despite the relatively limited size of the areas to cover, these efforts are thwarted by the roughness of the terrain that needs to be searched and the attendant logistical challenges. In Cuba and Jamaica, there are very large geographical expanses that need to be searched, as we lack evidence to refine searches. Other urgent, actionable conservation projects often take priority over searches for “lost” species; organizations only have so much staff and resources to deploy. Loss of species “champions” due to turnover in personnel can stall initiatives.

Strategy #3: Explore Restoration Methods: Although restoration strategies have limits of their own (which should be investigated and identified), even to begin exploring restoration methods requires knowledge of Black-capped Petrel biology and natural history. Most of this information is still unknown and will need to be gathered before accurate recommendations on restoration can be made.

Strategy #4: Reduce Predator Pressure: Introduced predators are widespread at confirmed, probable and suspected petrel nest sites and cannot be entirely eradicated. Therefore, control efforts must be established and ongoing, and at a level of effectiveness that improves the population viability of slow-reproducing Black-capped Petrel. Such “permanent control” – as well as the construction of exclosures -- requires substantial financial input not available within most of the Caribbean countries hosting Black-capped Petrels.

Strategy #5: Reduce Collisions and Groundings: Until regulations are in place, we expect resistance from some tower owners to make changes, particularly if these changes incur expenses. Turnover of government personnel after changes in administration will slow down efforts to find regulatory solutions. Awareness campaign to decrease light pollution may have little effect on behaviors, which are driven by societal needs (e.g. prevent burglary) and convictions (e.g. light represents progress; lack of light represents poverty); that is, concerns over safety and economics might override concerns over wildlife. Light pollution may also be too spread out, particularly in Haiti’s capital Port-au-Prince, which is on a radar documented flight corridor and may be on a fledging corridor from the La Visite nesting area. Finally, major electrification projects may annihilate all efforts to reduce anthropogenic light.

Strategy #6: Undertake Strategies of Community Development in Boukan Chat: As is often the case with the implementation of sustainable agriculture programs, impacts on yields and habitat may take several years to take effect, which may reduce faith in agro-ecological practices. Environmental awareness and reforestation programs may not necessarily change behaviors, which are driven by socio-economic needs. Economic empowerment may have unintended consequences such as increasing immigration and demand for land in the area, and will not have direct effects on habitat

conservation. Recent governments have not been functional enough to oversee forested areas; it is assumed that future government may equally fail to clarify and strengthen oversight of forested areas, thus resulting in the ineffective *status quo* that has been the norm for the last decades. A stove improvement program, if implemented, may only have small impact on petrel habitat, and may not be accepted by villagers. Overall, despite increasing goodwill from Boukan Chat community members, strategies of community development will face overwhelming challenges resulting from the state of poverty in which the community is found.

Strategy #7: Scoping study of socio-economic drivers of threats at La Visite: Limitations were not rated for this strategy: we created this strategy as a “pre-requisite” when we recognized that information was insufficient to focus interventions, or select among community development strategies for La Visite.

Strategy #8: Engage with Dominican Republic government to plan and strengthen oversight of parks: In the pine forests characteristic of Dominican parks where petrels nest, fires are mostly due to natural causes and fire risk may not be manageable. Moreover, engaging with the government requires connections which may be severed after each change in administration. Using public advocacy to encourage the government to manage threats to petrels may become too political and damage relationships. Finally, habitat restoration will only have limited impact on petrel habitat, and success may be threatened by hurricanes and fires.

Strategy #9: Address marine threats through advocacy: The spatiotemporal scale of the threats affecting petrels at sea limits our ability to meaningfully influence them. Fisheries: The industry may express resistance to changes in their management of stocks given economic concerns. Also, some fisheries in the Caribbean Sea are from foreign fleets outside the range of Black-capped Petrel (e.g. Japanese squid fishery in the Guajira upwelling zone of Colombia, Global Fishing Watch 2020) and not responsive to petrel advocacy. Finally, even fisheries management that fully considers the needs of seabirds won’t prevent the overarching ecosystem disturbances expected from climate change. Marine Energy: Strategies to address threats related marine energy will face a powerful industrial sector that is generally inert to environmentally-driven changes. The need for energy independence may lead Caribbean nations to favor offshore windfarms over wildlife conservation. If any regulations can be implemented, changes will occur slowly thus limiting gains for petrel populations. Pollution: Our capacity to act towards the reduction of pollution from heavy metals, chemicals or plastics is greatly limited by the facts that these pollutants are too diffuse, originate in many different countries, or challenge unwilling industrial sectors. Regulations (and the enforcement of those existing or possible regulations) are also greatly limited by the geographic scope and prevalence of these threats in society; great volumes of pollutants have already entered the environment and changes may occur too slowly to have effects on petrel populations.

Clearly the implementation of the conservation strategies recommended for Black-capped Petrels do not assure that we will have success in reaching our goals and vision. What is assured is the necessity to prepare for strategies to evolve as assumptions are tested, and new information becomes available and/or conditions change. We must recognize that the conservation of the petrel is a “long game” required decades of dedication, persistence, and that we must maintain perpetual vigilance against looming threats. We can take heart that the species without intervention has managed to hold on in unlikely places despite great challenges. The Black-capped Petrel is a species like no other in the Caribbean, and since it serves as a symbol and reflection of human quality of life, hope should spring eternal.

Integrating the Threat Level

For strategies of threat reduction (that is, interventions directed at threats or at one of the factors contributing to that threat), we developed an additional rating that integrated the level of the threat. Specifically, we identified the highest rated threat to which a given strategy applies and applied scores as follows: 4 to Very High threats, 3 to High threats, 2 to Medium Threats, and 1 to Low threats. We then multiplied the average of the overall impact and feasibility scores for each strategy times the threat rating. This allowed highlighting strategies that were not only feasible and impactful but also that could reduce the most significant threats to petrel populations.

Table A6-2 presents the threat-based strategy ratings. Note those strategies rated 12: These are considered paramount for the current conservation plan, along with enabling strategies.

Table A6-2 Threat-based Strategy Ratings

ID	Strategies to Address Threats	Combined Impact/ Feasibility Score	Highest Threat addressed	Threat level	Threat rating	Threat-based Strategy Rating
4	Reduce predator pressure	3	Predation	Very High*	4	12
5	Reduce flight hazards (collisions and groundings)					
5a	Voluntary solutions with tower industries	3	Towers	High	3	9
5b	Regulatory solutions with government to tower issues	3	Towers	High	3	9
5c	Awareness campaign to decrease light pollution	3	Light pollution	Medium	2	6
6	Undertake strategies of community development in Boukan Chat					
6a	Sustainable agriculture and reforestation programs	3	Ag. Expansion	Very High**	4	12
6b	Environmental awareness and education programs	3	Ag. Expansion	Very High**	4	12
6c	Economic empowerment - VSLA facilitation	2	Ag. Expansion	Very High**	4	8
6d	Economic empowerment - livelihood training	2	Ag. Expansion	Very High**	4	8
6e	Engage with government to clarify and strengthen oversight of forested areas	2	Ag. Expansion	Very High**	4	8
6f	Stove Program	2	Wood harvest	Medium	2	4
7	Scoping study of socio-economic drivers of the threats at La Visite			not-rated		
8	Engage with DR government to plan and strengthen park management for the benefit of petrels					
8a	Direct Engagement	3	Predation	High	3	9
8b	Public Advocacy	2	Predation	High	3	6
8c	Habitat Restoration	3	Invasive ferns	Medium	2	6
9	Advocate for reduction of threats at Sea					
9a	Better incorporation of pelagic seabirds in fishery management plans	2	Red. Prey Avail.	Medium	2.5	5
9b	Stronger regulation of and mitigation from marine energy	3	Oil spills	Medium	2	6
9c	Better compliance of marine energy industries to regulations	3	Oil spills	Medium	2	6
9d	Stronger regulation of contaminant releases	2	Contaminants	Medium	2	4
9e	Stronger regulations of plastic usage regionally	2	Plastics	High	2	4

* Predation rated “high” at every site, so a roll-up across sites produces a range-wide “very high” threat rating.

** In the absence of current interventions



Ernst Rupp

APPENDIX 7: INFORMATION NEEDS

There are many unknowns concerning the BCPE. Here, we summarize those that are most critical to rating threats, assessing status (KEAs), and developing and implementing strategies.

Code	Threat	Nature of Research	Notes on implementation
RT1	Very High Threat: Agriculture Expansion	Degree of Impact*; Location, Speed; Socio-economic drivers.	Ground surveys and monitoring; Regular re-evaluations of habitat availability, using satellite data. Socio-economic scoping study at La Visite.
RT2	Very High Threat: Predation by Introduced Species	Degree of Impact*; Location; Seasonality of predation events.	Grupo Jaragua and EPIC to continue monitoring active petrel nests with camera traps, confirming or ruling out negative effects of introduced predators.
RT3	High Threat: Pigs destroy burrows	Degree of Impact*; Location; Seasonality of events.	Grupo Jaragua to continue monitoring active petrel nests with camera traps, confirming or ruling out negative effects of introduced predators.
RT4	High Threat: Collision mortality and injury	Degree of Impact*; Nature (e.g. telecommunication towers, terrestrial wind turbines); Location; Seasonality of collisions; Frequency of occurrence; Ownership of infrastructures.	Grupo Jaragua and EPIC to monitor frequency of collisions with ARUs mounted on tower cables. Assemble baseline data to assess effects of strategy.
RT5	High Threat: Fire mortality	Degree of Impact*; Location; Seasonality of mortality events due to fires; Frequency of occurrence.	Ground surveys and monitoring. Potential to locate harmful fires using remote detection.
RT6	Medium Threat: Groundings from light attraction	Degree of Impact*; Nature (e.g. types, sources of lights causing attractions); Location; Seasonality; Frequency of occurrence; Ownership of light sources.	Ground surveys and monitoring; Awareness campaign.
RT7	Medium Threat: Wood harvest	Degree of Impact*; Socioeconomic drivers.	Ground survey; Socio-economic scoping study at La Visite.
RT8	Medium Threat: Oil spills (O&G, shipping)	Degree of Impact*; Nature (e.g. accidental spill at platform, wreckage, illegal bilge dumping); Location and Seasonality of exposure (e.g. breeding vs nonbreeding); Frequency of occurrence; Governance (e.g. regulatory country).	Spatial data (tracking and ship-based) to assess exposure. Surveys as part of damage assessment.
RT9	Medium Threat: Mercury and other contaminants	Degree of Impact*; Location and Seasonality of exposure (e.g. breeding vs. non-breeding). Impacts on survival and reproduction.	Spatial data (tracking and ship-based) to assess exposure. Diet study to assess pathway. Impact and source of contamination through tissue analysis.
RT10	Medium Threat: Livestock grazing	Degree of Impact*; Location; Socioeconomic drivers.	Ground survey; Socio-economic scoping study at La Visite.
RT11	Medium Threat: Reduced prey availability	Degree of Impact*; Location of exposure; Seasonality (e.g. breeding vs. non-breeding); Drivers of depletion (e.g. impact of climate change on prey availability). Impacts on survival and reproduction.	Diet study; spatial data (tracking and ship-based) to assess exposure to changes.
RT12	High Threat: Plastics	Degree of Impact*; Location and Seasonality of exposure (e.g. breeding vs. non-breeding). Impact on survival and reproduction.	Dedicated study to assess impact and source of contamination, in individuals found dead.
RT13	Low Threat: Non-timber Forest Product collection	Degree of Impact*; Nature; Location; Socioeconomic drivers.	Ground survey; Socio-economic scoping study at La Visite.
RT14	Low Threat: Invasive fern spread	Degree of Impact*; Location of highest impact.	Grupo Jaragua to monitor through ground survey.

RT15	Low Threat: Hurricane fallout	Degree of Impact*; Population-level impact (short- and long-term); Frequency of occurrence; Effects of climate change.	Statistical modeling; Population viability analysis to estimate population-level impact. Citizen science for surveys of grounded birds (eBird).
RT16	Low Threat: Fisheries bycatch (incl. lights)	Degree of Impact*; Nature (e.g. type of fishery, type of exposure); Location and seasonality of exposure (e.g. breeding vs nonbreeding); Economics and governance (e.g. country of origin of fleet, regulatory country).	Spatial data (tracking and ship-based) to assess exposure. Diet study to identify the nature of exposure.
RT17	Low Threat: Fire damage (habitat)	Degree of Impact*; Nature (natural vs anthropic); Location and Seasonality. Impact on current and suitable habitat.	Ground surveys and monitoring. Potential to locate harmful fires using remote detection and habitat modeling.
RT18	Medium Threat: Attraction and/or collisions with marine infrastructure	Degree of Impact*; Nature (e.g. type of infrastructure); Location and seasonality of exposure (e.g. breeding vs nonbreeding); Frequency of occurrence; Governance (e.g. regulatory country).	Spatial data (tracking and ship-based) to assess exposure. Surveys (e.g. on offshore platforms).
RT19	All marine threats**	Revision of marine range and threats at sea; Movements, foraging habitat characteristics; Location and seasonality of exposure.	Spatial data (tracking and ship-based) to assess risk overlap. Assess use and distribution in Gulf of Mexico, eastern Caribbean Sea and tropical Atlantic.

* Degree of impact = change in vital rates; extent of population affected.

**See also Table 4 in the main text

Table A7-2: Monitoring needs to assess status and trends of Black-capped Petrel populations

(repeat of Table 5 in main text)

Code	KEA	Indicator	Target	Monitoring need
M1	Flyway Population Index	Number of radar targets/effort at selected flyways	All known, probable or suspected nest sites	Refine sampling and analytic protocols; specifically select drainages/flyways and decide frequency and timing that give power to detect trends. Look to Marbled Murrelet monitoring as an example.
M2	Breeding Vocal Activity	Call rate (calls per minute, during peak activity period) at nesting sites	All known, probable or suspected nest sites	Develop sampling and analytic protocols, considering density and range; intensify ARU deployment for baseline
M3	Colony Occupancy	Active nests/Total nests at each nesting site	All known nest sites	Establish study zones (consistent across years) within sites; develop a protocol that is consistent across sites, including dates or period for assessing activity, accepted proofs of activity.
M4	Reproductive Success	Fledged nests/Active nests at each nesting site	All known nest sites	Establish study zones (consistent across years) within sites; develop a protocol that is consistent across sites, including dates or period for assessing fledging, accepted proofs of fledging; tools to standardize data.
M5	Breeder Return Rate	Number of individual breeders that return in following year (%)	All known nest sites	Develop a mark-recapture program.
M6	Habitat Intactness	% of Minimum Suitable Breeding Habitat Cleared	Known nest sites subject to clearing	Establish minimum suitable polygons consistent across years.
M7	Breeding Distribution	Number of confirmed nesting sites	Global population	Continue searches in probable and suspected areas.

Table A7-3: Research needs to develop Key Ecological Attribute Indicators, and collect information on basic natural history

Code	Indicator or Need	Nature of Research	How is the question that will be answered relevant to assessment or strategy?
RK1	Desired KEA: Population size	Assess if current observations at sea can be used to provide an index of population size, with the objective to update Simons et al. (2013) population estimate.	Population size is key to estimate population viability, and address threats. Adult Survival is key to estimate population viability. Differentiation between populations will have to be considered ahead of certain management activities (e.g., attraction, translocation, etc.). Information needed to address threats, implement and evaluate strategies, and as prerequisite for further research.
RK2	Desired KEA: Adult survival	Develop a mark-recapture program to determine annual adult return rate (proximate) and survival (ultimate). Assess differences between sites.	
RK3	Desired KEA: Meta-populations	Assess the degree of genetic variability in the global population; assess subspecies status between known phenotypes.	
RK4	Breeding biology	Estimate basic reproductive indicators, including (but not limited to) nest-site fidelity, age at first reproduction, nest attendance patterns. Estimate survival between and during life stages.	
RK5	Spatial and movement ecology	Locate terrestrial flight corridors. Assess marine use, including (but not limited to) fidelity and connectivity to foraging locations; post-fledging dispersal; use of Gulf of Mexico, eastern Caribbean Sea, and tropical Atlantic.	
RK6	Foraging ecology	Assess diet across annual cycle.	

Table A7-4: Information needs for Enabling Strategies that create new opportunities

Code	Strategy	Nature of Research	Relevance
RES1	Strategy ES1: Build in-country capacity	Social science on effective institutional strengthening for relevant Caribbean nations, as well as the factors influencing the development of natural resource conservation ethic in their societies.	Each country has unique factors that influence capacity, so there is a need to work with local social scientists and ethnologists.
RES2	Strategy ES2: Locate and characterize nest sites	This strategy consists of research. Confirmation and detailed information on nesting locations.	Tracking of birds captured at sea will assist discovery of new breeding areas.
RES3	Strategy ES3: Explore Restoration Methods	We anticipate that a translocation feasibility study will call for research on growth and feeding rates; diet composition, quantity, and quality. Additionally, the suitability of the restoration site as breeding habitat is paramount and much is unknown about microhabitat needs. Since current populations of Black-capped Petrels represent relicts of their former distribution, it is also not clear how closely historic populations were tied to current habitats (Simons et al. 2013).	Information needed to evaluate feasibility of strategies

Table A7-5: Information needs for Strategies to reduce threats

Code	Strategy	Nature of Research	Notes on implementation
RS1	Strategy 4: Reduce Predator Pressure	Determine the impacts of predation on Black-capped Petrel, particularly on adult survival, and the techniques that will best control predation (e.g., effective traps, deployment pattern, etc.).	Grupo Jaragua and EPIC to continue monitoring effects of introduced predators, and test trapping options. Look at experiences in Hawaiian archipelago for examples and lessons learned.
RS2	Strategy 5: Reduce collisions and groundings	Fill gaps in our knowledge of the occurrence and impact of collisions and groundings, especially on adults. Flyways to and from colonies, and fledging corridors also need to be located. Some recommendations to tower owners may need to be piloted on-site (e.g., efficacy of diverters or other devices deployed to mark guy wires).	Look at experiences around the world for emerging tools and lessons learned.
RS3	Strategy 6a: Sustainable Agriculture and Reforestation Programs	Social research to determine if interventions affect attitudes and behavior over the long term. Also, precise mapping of land use around petrel habitat (extent of cleared areas converted to trees, extent of buffer to habitat/primary forest patch) will indicate if agriculture expansion actually stopped or reversed.	Test logic and assumptions underlying strategies at Morne Vincent.
RS4	Strategy 7: Scoping study of socio-economic drivers of threats at La Visite	This strategy consists of research. We need a more in-depth analysis of the situation at La Visite, Haiti, the largest known colony of petrels, in order to move forward on planning and implementing conservation actions to reduce threats to habitat.	Draw on expertise of social scientists operating in the region.
RS5	Strategy 8c: Habitat restoration projects	Test feasibility and efficacy of protocols developed to control invasive ferns in the Dominican Republic. Native species best adapted to recolonize restored habitat.	Grupo Jaragua or other partner needs to locate best areas for testing protocol, assess availability of restoration species in nurseries.
RS6	Strategy 9: Address threats at sea through advocacy	Continue to study the at-sea movements and overlap with risk factors using tracking information, in particular in the Eastern Caribbean Sea and tropical Atlantic.	Needed to better assess marine threats, and to give focus to our advocacy.

APPENDIX 8: NATIONAL AND INTERNATIONAL INSTRUMENTS

There is a variety of instruments which nominally protect the Black-capped Petrel or its habitat; there are others that could yield conservation benefits if the species was listed. Included in the tables below are nations with confirmed, probable, or suspected nest sites and/or nations for which the overlap of Exclusive Economic Zone (EEZ) and overall range of the Black-capped Petrel is greater than 2%. (See [Appendix 2: Site Profiles](#)).

Table 8A-1: Legal Status of Black-capped Petrels (BCPE) According to National Instruments*

Nation	Legal Instrument and Status	BCPE or BCPE Locations Covered?	Actual degree of protection/ Enforcement
Nations with confirmed, probable or suspected breeding sites			
Haiti	Decree on hunting and wild bird protection (Moniteur number 26, 1 April 1971), decree on national natural parks (Moniteur number 41, 23 June 1983)	Yes, as a wild bird, and to the degree habitat is in protected areas	Poor
Dominican Republic	Environment and Natural Resources General Law (No.64- 00) and sector- specific laws such as the Law of Protected Areas (No.202- 04)	Yes, to the degree habitat is in protected areas	Fair
Dominica	Forestry and Wildlife Act [Ch. 60:02, 1976], National Parks and Protected Areas Act [Ch. 42:02, 1975], and associated regulations	Yes, as a wild bird, and to the degree habitat is in protected areas	Good
Guadeloupe	Nature Protection Law 1976	Yes, to the degree habitat is in protected areas	Fair
Jamaica	1945 Wildlife Protection Act, enhanced by many regulations, 1991 Natural Resources Conservation Authority Act	Yes, as a wild bird and the degree habitat is in protected areas Yes, as a wild bird	Fair
Cuba	La Ley 81 (1997) del Medio Ambiente and other laws, decrees, and resolutions that protect habitat.	Yes, to the degree habitat is in the protected areas	Good
Additional nations with significant overlap (>2%) of Economic Exclusion Zone (EEZ) and overall marine range			
U.S.	Migratory Bird Treaty Act	Yes, as a wild bird	Fair
	U.S. Endangered Species Act	TBD: Proposed Threatened	N/A
	Magnuson-Stevens Fishery Conservation and Management Act	Yes, as subject to bycatch	Poor
Colombia ^a	No legal status	N/A	N/A
Venezuela	Under La Ley de Gestión de la Diversidad Biológica (2008), all wild animals are protected, native or not	Yes, as a wild bird	N/A

*Information by and large drawn from the Caribbean IBA book (Wege and Anadon-Irizarry 2011). Should be confirmed by reviewers. Wege, D. and Anadon-Irizarry, V. 2011. Important Bird Areas in the Caribbean: Key Sites for Conservation. Birdlife International. 348 pages.

^a In *Prioridad de Investigación PI2 (alta, of PI1-Urgente, PI2-Alta)*; in *Prioridad de Conservación PC2 (alta, of PC1-Urgente, PC2-Alta, PC3-Mediana)* Arzuza, D.E., Moreno, M.I., & Salaman, P. (2008) Conservación de las aves acuáticas en Colombia. *Conservación Colombiana* 6:1-72. Junio 2008.

Table A8-2: International Instruments that Include or Could Include Black-capped Petrel (BCPE)

Instrument	BCPE or BCPE Locations Designated?	Haiti	DR	Cuba	Dominica	Guad.	Jamaica	US	Colombia	Venezuela
Declaración de Santo Domingo: Corredor Biológico del Caribe (Caribbean Biological Corridor)	Yes ^a	◆	◆	◆			(observer)	◆ Puerto Rico		
Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (SPAW Protocol to Cartagena Convention)	Yes		◆	◆		◆		◆	◆	◆
Convention on International Trade in Endangered Species (CITES)	No		◆	◆	◆	◆	◆	◆	◆	◆
Agreement on the Conservation of Albatrosses and Petrels (ACAP)	No									
Convention on Migratory Species (CMS)	No			◆		◆	◆			
Convention on Biological Diversity (CBD)	No	◆	◆	◆	◆	◆	◆	◆	◆	◆
World Heritage Convention (WHC)	Two: Dominica, Jamaica	◆	◆	◆	◆ Morne Trois Pitons	◆	◆ Blue and John Crow Mountains	◆	◆	◆

◆ Signed and Ratified/Accepted

◆ Signed, not Ratified

Table generated from the following websites, accessed 2/11/2020:

<http://cbcbio.org/> ALSO UNEP factsheet

<https://www.unenvironment.org/cep/what-we-do/specially-protected-areas-and-wildlife-spaw>

<https://cites.org/eng/disc/parties/index.php>

<https://www.acap.aq/resources/parties-to-acap>

<https://www.cms.int/en/parties-range-states>

<https://www.cbd.int/countries/>

<https://whc.unesco.org/en/statesparties/>

<https://whc.unesco.org/en/convention/>

<https://www.cbd.int/countries/>

<https://www.cbd.int/information/parties.shtml>

