Black-capped Petrel

Pterodroma hasitata

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(Shawn M. Billerman, Editor)
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Cover image

Black-capped Petrel (White-faced) *Pterodroma hasitata* (White-faced). Brian Sullivan. 8 June 2018. Dare, North Carolina, United States. ML104206781; eBird S46404207.

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Introduction

The Black-capped Petrel, known as Diablotin ("the little devil") in the Caribbean countries where it nests, is a large gadfly petrel present in the western North Atlantic and adjacent basins of the Caribbean Sea and Gulf of Mexico. It is considered Endangered, and its population is estimated at ~1,000 breeding pairs. On a foggy night in the mountains of Hispaniola, you may hear its eerie calls coming from underneath the forest bed; on a windy day off North Carolina, you may encounter it arching above the waves with a few of its conspecifics. Like most other petrels in the North Atlantic, the recent history of Black-capped Petrel is one of ebullience and disappearance, of quasi-extinction and resilience. But like no other, this enigmatic seabird links worlds and people that never meet, from the cloud forests of the Caribbean's highest mountains to crystalline waters of the Gulf Stream, from Haitian farmers to Carolinian offshore fishermen.

The only gadfly petrel currently known to breed in the Caribbean (the Jamaican Petrel, a distinctive subspecies which some authorities consider a separate species, is likely extinct), the Black-capped Petrel used to be widespread in the Caribbean Basin and nested on at least six of its main islands (from west to east: Cuba, Jamaica, Hispaniola, Guadeloupe, Dominica, and Martinique). The species was reported as common up to the 1800s, but it suffered a precipitous decline due to intensive and sustained harvest by European colonists since the 1600s, and the accidental or deliberate introduction of mammalian predators on all of its breeding grounds. By the 1920s, the species was considered on the verge of extinction, if not extinct. Although likely known by local people, the locations of its breeding areas were lost to science until 1963, when David Wingate rediscovered breeding colonies (but did not confirm nesting activity) in the Massif de la Selle in Haiti after hearing vocalizing Black-capped Petrels. Other populations of calling petrels were identified in Haiti and the Dominican Republic in the 1980s, but it was not until 2002 that the first active nest was located by Theodore Simons and team. From 2008 to 2011, listening surveys by James Goetz and colleagues confirmed the presence of the Black-capped Petrel in the Haitian mountain ranges of Massif de la Hotte and Massif de la Selle. Finally, in 2011, almost fifty years after Wingate's rediscovery, Ernst Rupp and Grupo Jaragua discovered the first active nest with a chick near the border between Haiti and the Dominican Republic. Since then, nesting activity has only been confirmed on Hispaniola but is highly suspected to occur in Dominica and Cuba, and probable in Guadeloupe and Jamaica.

At sea, the Black-capped Petrel was recorded throughout the Caribbean up to the 1800s. In the 1980–1990s, repeated surveys off the coast of the southeastern United States regularly recorded petrels in Gulf Stream waters from North Carolina to Florida. In the 2000s, additional systematic and opportunistic at-sea surveys recorded high numbers of Black-capped Petrels in this area, identifying it as the main marine range for the species year-round. Tracking studies in the 2010s confirmed the use of Gulf Stream waters but also highlighted the significant use of the southern Caribbean Sea by breeding adults. In parallel, recent at-sea surveys in the northern Gulf of Mexico recorded a regular presence in that region.

The small and declining population is affected by threats on land (including, but not limited to, deforestation for agriculture, predation by introduced mammals, light attraction, and collision with communication towers) and at sea (mostly mercury, plastics, and other contaminants, oil spills and attraction to oil platforms, and the effects of climate change such as the reduction of

prey availability and increased hurricane frequency). In 2008, the International Black-capped Petrel Conservation Group was created to tackle these threats by promoting unified and coherent conservation actions. The first version of the Conservation Action Plan for the Black-capped Petrel (Goetz, Hardesty-Norris and Wheeler, 2012) was produced following a 2010 workshop, and the group has been active in its implementation and adaptation ever since. A Conservation Update and Action Plan for the Black-capped Petrel was published in 2021 (Wheeler *et al.*, 2021).

Adding to an already complex natural history and conservation situation, two distinct forms of Black-capped Petrels exist within the nominate subspecies, varying in the amount of white/dark plumage. The causes of these differences are still not well understood and are the subject of much speculation and questioning, including whether these differences warrant new subspecies (or even species) taxonomy. The little devil lives up to its name by complicating the task of those who try to study and conserve it.

Plumages, Molts, and Structure

Plumages

Black-capped Petrel has 10 full-length primaries (numbered distally, p1 to p10), 20-21 secondaries (numbered proximally, s1 to s17 or s18, and including 3 tertials, numbered distally, t1 to t3), and 12 rectrices (numbered distally, r1 to r6, on each side of the tail). Petrels are diastataxic (see Bostwick and Brady 2002), indicating that a secondary has been lost evolutionarily between what we now term s4 and s5. The following is based on descriptions in Howell and Patteson (2008) and Howell (2012), along with examination of Macaulay Library images; Pyle (2008) gives specific information on age and sex determination. See Molts for molt and plumage terminology. Sexes show similar appearances in all plumages. Juvenile Plumage is quite definitive-like in appearance but differs in slight characters of flight-feather shape; thus, definitive appearance is achieved following the Second Prebasic Molt.

Natal Down

Present primarily February-May, in the nest burrow. Covered in fine, filamentous gray down.

Juvenile Plumage

Present primarily July (when fresh) to January-April (when worn). Juvenile Plumage is similar to Definitive Basic Plumage except the juvenile flight feathers are uniform in wear, narrower, more tapered, and pointed (outer primaries) or rounded (outer rectrices) at the tips than basic feathers, and lacking "molt clines" (see below and Pyle 2008). Plumage is fresher in November-May and remiges are typically not molting until May-September. The pale fringing to upperwing coverts forms an evenly scaled appearance (Howell and Patteson, 2008). Pointed tips to the primary and secondary feathers that can be seen using photo analysis (S. Howell, personal communication).

Juvenile Black-capped Petrel, light form (subspecies *hasitata*). Steve Kelling. 08 Jun 2018. North Atlantic Ocean (34.7398,-75.5336), Dare, North Carolina, United States. eBird S46404466; Macaulay Library ML104871641

Juvenile Black-capped Petrel, light form (subspecies *hasitata*). Brian Sullivan. 8 June 2018. North Atlantic Ocean (34.7398,-75.5336), Dare, North Carolina, United States. eBird S46404207; Macaulay Library ML104207821

Juvenile Black-capped Petrel, dark form (subspecies *hasitata*). Doug Gochfeld. 4 August 2018. Brevard, Florida, United States. eBird S47638560; Macaulay Library ML465556871

Formative Plumage

This plumage has not been previously reported in Black-capped Petrel but is present following limited Preformative Molts in other species of Procellariidae (Pyle, 2008). Examination of Macaulay images indicates that a few scattered to many back feathers (at least) can be replaced well before replacement of primaries during the Second Prebasic Molt, perhaps primarily in October-April, indicating the presence of a Formative Plumage. This molt and plumage appears to occur in most birds but may not occur in all individuals. Most of the feathering including flight feathers are juvenile and become worn at this time of year; formative back feathers are contrastingly fresher and grayer, with broad pale fringing that is usually worn off on juvenile feathers. Other body feathers on the crown, nape, and underparts may also be replaced but harder to detect.

Formative Black-capped Petrel, dark form (subspecies *hasitata).* Graham Deese. 14 May 2022. Dare, North Carolina, United States. eBird S110418748; Macaulay Library ML450778701

Formative Black-capped Petrel, dark form (subspecies *hasitata).* Andrew Rapp. 28 May 2021. Dare, North Carolina, United States. eBird S89172815; Macaulay Library ML343326961

Formative Black-capped Petrel, light form (subspecies *hasitata).* Kyle Kittelberger. 25 May 2022. Dare, North Carolina, United States. eBird S111294927; Macaulay Library ML538931951

Second Basic Plumage

Present primarily November-October. Protracted Second Prebasic Molt occurs in June-October and during this period individuals can be identified by worn and pointed outer primaries and rectrices, as described under Juvenile Plumage (see right-hand image under Molts). Some individuals may undergo an incomplete molt, resulting in retained juvenile secondaries among s3-s4 and/or in a block among s7-s12, which are significantly narrower and more worn than replaced second-basic secondaries (Figure 188 in Pyle 2008). Such retained secondaries have not been confirmed in Black-capped Petrel but can be used to identify Second Basic Plumage through the ensuing molt in other species of *Pterodroma*.

Definitive Basic Plumage

As its English name suggests, the Black-capped Petrel has a clearly defined cap, separated from the dark mantle by a white collar. Dark coloration extends from the cap to eye, and down the sides of the face and around the back of the head, giving an almost a hooded appearance. The brownish-black cap is visually accentuated by the white on the nape. In lighetr forms (see below), the cap is restricted to the upper part of the head and separated from the eye by a white supercilium. The conspicuous white “rump” (uppertail coverts) appears to form a broad 'U' shape against the mantle and dark brown tail. In general, upperparts appear brownish-gray to dark or blackish, with the exception of variable white or whitish patches on the forehead, nape, and uppertail coverts. When fresh, upperpart feathers show pale fringes. The uppertail coverts are mostly white, giving these birds their characteristic “white rump” that makes them a “flying field mark” (Howell, 2012) and allowing observers to easily differentiate them from other gadfly petrels in their range; rectrices have dark tips but white bases, contributing to the “white-rumped” appearance. The uppertail can also appear ‘V’-shaped depending on molt. The upperwing is composed of brownish-gray coverts, tertials, primaries, and secondaries can appear blackish or grayish from a distance. The darker coloration of some of the coverts and primaries can give the suggestion of an ‘M’ pattern when feathering is fresh. Individuals in heavy molt can show white patches or a white wing stripe in the upperwing formed by the white bases of secondaries when coverts are missing or growing (see images under Molts).

Underparts are white from chin to under tail, with white and black underwings. A dark brownish to grayish “chest spur” or “neck tab” extends from the mantle to the shoulders and sometimes intrudes upon the white chest. This feature shows great variation among individuals: it is absent in the palest forms but forms a broad patch that looks almost collar-like in the darkest forms. The dark tips of the rectrices are visible from below but not always noticeable in the field. The species has a distinctive black and white underwing pattern; a black ulnar bar formed by varying amounts of black on the marginal and lesser coverts extends into the lesser and median primary coverts. This ulnar bar varies from a thin line in the palest forms to a broad, dark line in the darkest forms. The undersides of the primaries generally have dark webbing but can show white in some individuals. The trailing edge of the underwing is black, this coloration showing from the remiges. In some of the darkest individuals, there is also black in the axillaries and on the sides of the body. Adults of both sexes collected in December had white filoplumes on their crowns, napes, and hind-necks (Simons, Lee and HANEY, 2013). Sexes are similar in general appearance; males appear to have more filoplumes (Simons, Lee and HANEY, 2013).

Black-capped Petrels in Definitive Basic Plumage differ from those in Juvenile Plumage by having less evenly worn plumage due to protracted molts. Pale fringing to the back feathers is present to various degrees relative to plumage wear and does not form an evenly scaled appearance as in Juveniles. Flight feathers are broader and more truncate, the remiges showing "molt clines" reflecting a previous protracted prebasic molt. Primaries become fresher from p1 to p10, secondaries become fresher from s1 to s4 and from s5 and the tertials toward s8-s9, and the outermost secondary (s1) can be noticeably fresher than the innermost primary (p1) as these feathers can be replaced up to 2-3 months apart (Pyle, 2008). Some individuals may show mixed generations of basic secondaries, as found in other *Pterodroma* petrels, indicating at least three years of age.

This species is variable in appearance, with wide variations in both size and coloration (see Systematics: Geographic Variation). Two color forms have been described, varying in the amount of dark and white plumage on the face, nape, and collar; these are commonly called “dark” and “light” forms, but discrete intermediate plumages also exist (Howell and Patteson, 2008). The nape varies from a strikingly white hind collar in the light form, to one that shows a grayish wash in the dark form, seeming to merge the “cap” with the dark back at times. Dark-form birds tend to show dark or black cheeks and auricular areas, forming a broad black mask that merges with the cap; more extensive dark cap extends farther down on the sides of the head; some dark feathers at the base of the mandible; any white in the face is limited to a white stripe above the lores; posterior ear-coverts mottled blackish or solidly blackish; darker plumage on the nape, reducing or covering the white hind-collar (the hind-neck often shows a grayish wash); larger and more obvious dark collar (chest “spurs”).

Definitive Basic Black-capped Petrel, dark form (subspecies *hasitata*). Brian Sullivan. 8 June 2018. North Atlantic Ocean (34.7398,-75.5336), Dare, North Carolina, United States. eBird S46404207; Macaulay Library ML104206791

Definitive Basic Black-capped Petrel, dark form (subspecies *hasitata*). Ed Corey. 10 October 2020. Dare, North Carolina, United States. eBird checklist S74749822; Macaulay Library ML270653771

Definitive Basic Black-capped Petrel, dark form (subspecies *hasitata*). Martina Nordstrand. 28 August 2020. Dare, North Carolina, United States. eBird checklist S73004203; Macaulay Library ML259177671

Light-form birds are primarily opposite of these patterns, showing substantially reduced dark coloration in these areas: the black cap is smaller and mostly restricted to the top of the head; the dark eye is highlighted by a broad white supercilium; black on the ear-coverts is limited; the white hind-collar is broad and bold; dark chest spurs are smaller and lighter, or absent, depending on wear.

Black-capped Petrel commencing Definitive Prebasic Molt, light form (subspecies *hasitata*). 8 June 2018. North Atlantic Ocean (34.7398,-75.5336), Dare, North Carolina, United States. eBird S46404207; Macaulay Library ML104207201

Definitive Basic Black-capped Petrel, light form (subspecies *hasitata*). Kate Sutherland. 23 October 2021. Dare, North Carolina, United States. eBird checklist S96653583; Macaulay Library ML382346191

Definitive Basic Black-capped Petrel, light form (subspecies *hasitata*). Daniel Irons. 20 June 2022. Dare, North Carolina, United States. eBird checklist S113847543; Macaulay Library ML532177271

Molts

Molt and plumage terminology follows Humphrey and Parkes (Humphrey and Parkes, 1959) as modified by Howell et al. (2003). Black-capped Petrel appears to exhibits a Complex Basic Strategy (*cf.* Howell et al. 2003, Howell 2010), including complete prebasic molts and an absent-to-limited Prefromative Molt but no prealternate molts (Pyle, 2008) along with examination of Macaulay Library images, e.g., see those under Plumages).

Limited information has been published on molt in this species, but timing and phenology of molt can be inferred from captured adults, numerous observations at sea, and inferences from closely related taxa such as Bermuda Petrel (see Figure 1, below). Pyle (2008) gives date ranges for molts and Howell and Patteson (2008) discuss molt extensively and comprehensively regarding plumage variation. As suggested in their analysis and by Simons et al. (2013), differences in the timing of molt between dark and light forms of the species likely reflect temporal differences in breeding phenology (see Breeding). This assumption seems corroborated by recent satellite tracking of dark- and light-form petrels captured off Hatteras, North Carolina, US (Satgé et al. 2022; American Bird Conservancy). Additional information is still needed to better describe molt patterns in all forms of Black-capped Petrel.

Prejuvenile Molt

Occurs primarily in February-May (light light) or April-July (dark form), in the nest. Simons et al. (2103) state “The downy plumage of the chick is retained until near fledging and then is shed rapidly in the burrow. Wing and dorsal down are molted first, and some down still remains on the flanks when the chicks depart.”

Preformative Molt

Examination of Macaulay images indicates that some body feathers can be replaced well before initiation of primary replacement during the Second Prebasic Molt; in Procelariidae this has been

considered a limited Preformative Molt (Pyle 2008) that in Black-capped Petrel may occur primarily in October-March in and December-May in dark-form birds. At least some scattered back feathers can be replaced and probably some crown, nape, and perhaps underpart feathers can also be replaced.

Definitive Prebasic Molt

Complete; occurs entirely at sea. Primaries are replaced from innermost to outermost feathers (p1 to p10), secondaries are replaced bidirectionally from the second tertial and distally from s1 and s5, and rectrices can generally be replaced distally on each side of the tail, with some variation expected (Pyle 2008). In the dark form, breeding adults can begin molt with p1–p2 from mid/late May; all primaries are replaced during June–August, with p9–p10 being replaced around early/mid-August, and as late as 21 August (Simons et al. 2013). Rectrices are replaced between May and July. Body molt is most advanced in late July/early August (Simons et al. 2013). Upperwing greater coverts are replaced rather synchronously about when p3-p5 are being replaced, exposing the white bases to the secondaries.

The Second Prebasic Molt initiates earlier within populations than later prebasic molts, by up to 2 or more months, due to lack of breeding constraints (Pyle 2008), but molt rate may also be slower resulting in completion at about the same time as the Definitive Prebasic Molt. In dark-form birds, the Second Prebasic Molt should be expected in spring of their second calendar year, probably April through July (inferred from the Bermuda Petrel; (Brinkley and Sutherland, 2020). In the light form, analysis of at-sea photographs by Howell and Patteson (2008) showed that wing molt occurs 1–2 months earlier than in the dark form. Additionally, of 10 adult Black-capped Petrels captured at sea between 8–14 May 2019, all five light and intermediate forms were molting some primaries, but none of the five dark forms were (Satgé et al. 2022).

Molt of innermost primaries occurs during the chick-rearing months for both forms (from March to end of July; see Breeding). Although the molt and breeding schedules may overlap in gadfly petrels (Bridge, 2004), Black-capped Petrels observed at sea with molting primaries are likely failed breeders or did not attempt to breed that year, including pre-breeding aged birds undergoing their Second-Fourth Prebasic Molts.

Black-capped Petrel commencing Definitive Prebasic Molt, light form (subspecies *hasitata*). Brian Sullivan. 8 June 2018. Dare, North Carolina, United States. eBird S46404207; Macaulay Library ML104207191

Black-capped Petrel commencing Definitive Prebasic Molt, intermediate form (subspecies *hasitata*). Kate Sutherland. 3 June 2022. Dare, North Carolina, United States. eBird checklist S112068026; Macaulay Library ML456251811

Black-capped Petrel completing Second Prebasic Molt, light form (subspecies *hasitata*). Ed Corey. 7 August 2021. Dare, North Carolina, United States. eBird checklist S93003579; Macaulay Library ML360193911

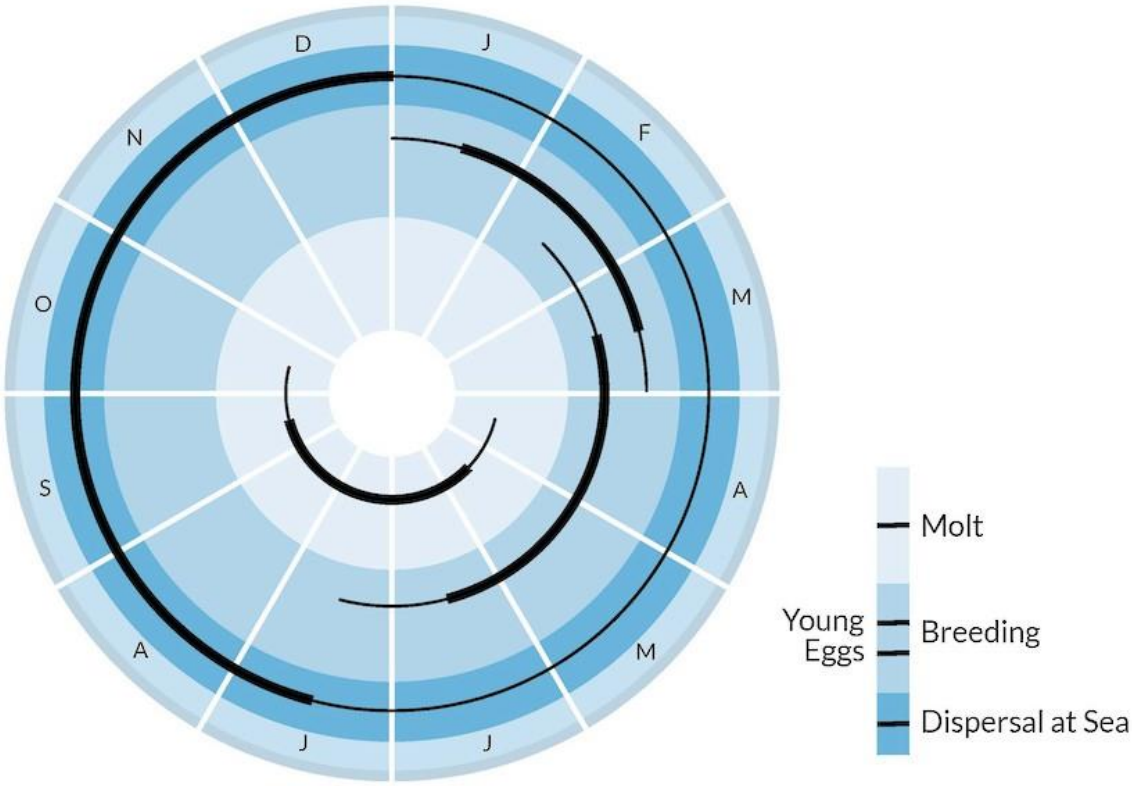


Figure 1. Annual cycle of breeding, molt, and migration.

Bare Parts

Bill and Gape

Bill is stout, with structure typical of Procellariidae in having tubinares at the base of the culmen, containing the nasal passage, and seven to nine distinct horny plates including the maxillary unguis that forms the hook at the tip of the upper mandible. Coloration is deep black, occasionally with slight pinkish or grayish-pink color visible at the base of maxilla and mandible. The gape and tongue are pink.

Iris and Facial Skin

Iris dark brown, often appearing black in the field. Carte (1866) described the iris of subspecies *caribbaea* as "dark hazel."

Legs and Feet

Pink legs. Feet pink proximally but becoming black distally. Distal two-thirds of webs are black but variation exists in the proportion of pink/black in webs and digits. Carte (1866) described the tarsi, toes, and nails of subspecies *caribbaea* as "jet-black," but this was based on museum specimens.

Adult Black-capped Petrel. Tammy McQuade. 23 May 2021. Dare, North Carolina, United States. eBird checklist S88879446; Macaulay Library ML342017191

Black-capped Petrel. George Armistead. 28 May 2021. Dare, North Carolina, United States. eBird checklist S89166858; Macaulay Library ML343245781

Adult Black-capped Petrel. Kate Sutherland. 28 May 2021. Dare, North Carolina, United States. eBird checklist S89173440; Macaulay Library ML343236161

Measurements

Adult birds collected at sea (summarized in Howell and Patteson 2008 and Simons et al. 2013) show significant differences in measurements between the sexes, with mass and bill depth being statistically greater in adult males than adult females. Light-form petrels also have significantly greater mass and bill depth than dark-form birds. Males and light-form birds also have longer exposed culmen and wing chord than females and dark-form birds, but small sample sizes prevent conclusions (Howell and Patteson 2008).

Linear Measurements

Howell and Patteson (2008) provide measurements for specimens held at the North Carolina State Museum (56 adults and 4 juveniles). Simons et al. (2013) also provide measurements from these specimens, but they did not differentiate between adults and juveniles; therefore, unless mentioned otherwise, measurements summarized here are from data in Howell and Patteson (2008; adults only). Satgé et al. (2022) provides measurements for 11 adult petrels captured at sea off Cape Hatteras, North Carolina, US, in May 2019.

Total Length

35–46 cm (Harrison, 1983).

Bill Length

Exposed culmen mean 32.8 mm (range 28.8–36.5 mm, *n* = 56). Females average 32.6 mm (range 28.8–34.0 mm, *n* = 17), and males average 33.0 mm (range 30.1–36.5 mm, *n* = 39). In field conditions, juveniles appear smaller-billed.

Satgé et al. (2019) report bill length (culmen length) in breeding dark-form adults as 32.1 mm (range 30.5–33.4 mm, *n* = 16). Satgé et al. (2022) measured bill length at 33.8 mm (range 31.4–36.0 mm): females ranged 31.4–36.0 mm (*n* = 4) and males ranged 31.5–35.3 mm (*n* = 7).

Bill Depth

Measured at gonys, mean 13.5 mm (range 11.6–15.5 mm, *n* = 55). The difference between females and males is statistically significant, with females averaging 12.7 mm (range 11.6–13.9 mm, *n* = 17) and males averaging 14.1 mm (range 12.3–15.5 mm, *n* = 38). The difference between dark and light forms is also statistically significant, with dark forms averaging 13.3 mm (range 11.6–14.7 mm, *n* = 43) and light forms averaging 13.8 mm (range 12.5–15.5 mm, *n* = 9).

Satgé et al. (2019) report bill depth in breeding dark-form adults as 13.2 mm (range 12.1–14.4 mm, *n* = 16). Satgé et al. (2022) measured bill depth at 14.0 mm (range 13.6–14.4 mm): females ranged 13.7–14.4 mm (*n* = 4) and males ranged 13.6–14.4 mm (*n* = 7).

Wing Length

Mean unflattened wing chord 292.5 mm (range 268–317 mm, *n* =50). Females average 290 mm (range 268–305 mm, *n* = 17); males average 295 mm (range 279–317 mm, *n* = 33).

Satgé et al. (2022) measured mean wing length at 295.6 mm (range 280–315 mm): females ranged 292–315 mm (*n* = 4) and males ranged 280–300 mm (*n* = 7).

Note that Simons et al. (2013) provide “total wing length” at 400 mm (range 375–437 mm, *n* = 57), but it is unclear how measurements were made. For the same measurement, they also provide data for females (mean 399 mm, range 375–432 mm, *n* = 17) and males (mean 400 mm, range 378–437 mm, *n* = 40).

Tarsus Length

Tarsus length is not reported from collected specimens. Satgé et al. (2019) reported tarsus length in breeding dark-form adults at 39.45 mm (range 37.8–41.0 mm, *n* = 16). Satgé et al. (2022) measured tarsus length at 40.1 mm (range 38.7–41.4 mm, *n* = 11), which included individuals of both dark- and light-forms.

Mass

Mean 430 g (range 329–591 g, *n* = 53). The difference between females and males is statistically significant, with females averaging 410 g (range 329–545 g, *n* = 16) and males averaging 451 g (range 329–591 g, *n* = 34). Dark-form birds are generally lighter than light-form ones, and this difference is statistically significant (Howell and Patteson 2008, Simons et al. 2013). Dark forms average 421 g (range 347–591 g, *n* = 40) whereas light forms average 460 g (range 368–557 g, *n* = 9).

Satgé et al. (2019) report that breeding adults (captured at the chick-rearing stage) and adults collected at sea during the breeding months were significantly lighter than adults collected at sea during the non-breeding months (based on data from Simons et al. 2013): chick-rearing adults had a mean mass of 395 g (range 335–450 g, n = 16), and adults collected during the breeding months at sea had a mean mass of 412 g (range 347–545 g, n = 33); for comparison, adults collected during the non-breeding months had a mean mass of 461 g (range 382–557 g, n = 31).

Systematics

Systematics History

Taxonomy, as well as relationships to other *Pterodroma* species, is discussed extensively in Simons et al. (2013). The taxonomy of Black-capped Petrel is complex, with great variation between types (see Plumages), causing Howell and Zufelt (2019) to describe it as "vexed." Here we provide a summary of Simons et al. (2013) and other relevant information. Note that phenotypes in Black-capped Petrel have been referred to as "dark-faced," "black-faced," or "dark morph," and "light-faced," "white-faced," or "light morph". Since there is genetic evidence that these types diverged from a common ancestor (with intermediate types grouped with the light type; (Manly *et al.*, 2013), we chose to use the term "form" until the taxonomy can be better resolved.

Before the 1800s, Black-capped Petrel was placed in the genus *Procellaria* with other gadfly petrels. In 1856, Bonaparte proposed the genus *Pterodroma* for all dark species, and the genus *Aestrelata* for some of species that had white underparts, including theBlack-capped Petrel; Coues (Coues, 1866) designated *hasitata* as the type for this genus. Black-capped Petrel has been placed in the genus *Pterodroma* since Loomis (Loomis, 1918).

In addition to confusion over the status of dark and light-form birds, there is also disagreement on the status of the all-dark taxon *caribbaea*; here it is treated as subspecies of Black-capped Petrel, while others have recognized it as a distinct species, Jamaican Petrel (*Pterodroma caribbaea*; see Subspecies).

Geographic Variation

No clear geographic variation has been described in breeding Black-capped Petrels. At known nesting sites on Hispaniola, most petrels captured or photographed by camera traps have been of the dark form (International Black-capped Petrel Conservation Group, unpublished data). In Haiti and the southern Dominican Republic, most individuals are of the dark form and only a few individuals (notably one petrel opportunistically captured by Wingate upon his rediscovery of breeding activity in Haiti; (Wingate 1964)) have been of the light and intermediate forms. In the central Dominican Republic, only a small number of nests has been located but most of them are those of light form individuals (E. Rupp, unpublished data). Stranded petrels recovered in Dominica in 2007 and 2010 were of the light form (International Black-capped Petrel Conservation Group, unpublished data).

At sea, based on the limited data available, ranges for both forms appear to overlap spatially (but not temporally) in Gulf Stream waters off the eastern coast of the US (Howell and Patteson 2008, Simons et al. 2013), though opportunistic observations (eBird, 2022) and satellite tracking (Satgé et al. 2022) suggest that light forms may commonly use more northerly areas. Both forms have been recorded in the northern Gulf of Mexico (Jodice *et al.*, 2021). Dark forms tracked by satellite from breeding grounds on Hispaniola used the central Caribbean Sea intensively (Jodice *et al.*, 2015), and there is no reason to think that light forms would not also use these productive

waters as well. Both forms have been recorded as vagrants in the Western Palearctic, but light and intermediate forms seem to be more commonly seen (see Table 1).

Subspecies

Two subspecies have been recognized: nominate *Pterodroma hasitata hasitata* and *Pterodroma hasitata caribbaea* (for the all-dark form that is now probably extinct; Simons et al. 2013, (Dickinson and Remsen, 2013), (Clements *et al.*, 2022). Some authors, however, consider *caribbaea* to be a separate species, the Jamaican Petrel *Pterodroma caribbaea* (e.g., (Brooke, 2004), (del Hoyo and Collar, 2014), (Gill, Donsker and Rasmussen, 2022). Here, we use the denominations *P. hasitata* for the Black-capped Petrel, and *P. caribbaea* for the Jamaican Petrel.

Within *hasitata*, two color forms have been described (dark and light, with intermediate forms; see Plumages), with strong variations in plumage and measurements (light-form petrels are generally heavier and bulkier). To elucidate any genetic differences among these different phenotypes, Manly et al. (2013) amplified mitochondrial cytochrome oxidase 1 (CO1) and found a fixed genetic difference between the dark and light forms; individuals classified as intermediate all grouped phylogenetically with the light form. Manly et al. (2013) therefore suggested that some temporal or spatial breeding isolation led to the differentiation of the two color forms. In addition to phylogenetics, the notable differences in the timing of molt (light forms molt earlier; Howell and Patteson 2008), breeding (tracking data suggests that light forms breed earlier; Satgé et al. 2022), and of the use of Gulf Stream foraging areas (dark forms are more common in the late summer and early fall, and light forms in April–June; Howell and Patteson 2008), suggest that subspecies status may have some relevance. Dark and light forms also appear to use different non-breeding areas in the western North Atlantic (Satgé et al. 2022). However, Manly et al. (2013) cautioned that “whether these populations should be considered distinct subspecies or distinct species remains unclear at this time and cannot be resolved in the absence of population and behavioral data from breeding sites and analysis of nuclear DNA (microsatellites).” Better information on the genetic diversity of Black-capped Petrels from known nesting colonies is therefore necessary to draw further conclusions.

EBIRD GROUP (MONOTYPIC)

Black-capped Petrel (hasitata)

Pterodroma hasitata hasitata

Systematics History

Procellaria hasitata Kuhl, 1820, Beiträge zur Zoologie und vergleichenden Anatomie, p. 142 (Kuhl, 1820).

According to Simons et al. (2013), "the type locality of *P. hasitata* was never stated and has since been designated as Dominica."

The type specimen is held at the Naturalis Biodiversity Center (RMNH 87022; Simons et al. 2013).

Distribution

Caribbean Sea and western Atlantic Ocean, with breeding confirmed in Hispaniola (from Massif de la Hotte and Massif de La Selle east to west end of Sierra de Bahoruco, southern Haiti and southwestern Dominican Republic; and southeastern Cordillera Central, Dominican Republic). Probable breeding on Dominica; suspected breeding in southeastern Cuba (Sierra Maestra), Guadeloupe, and Jamaica. May have nested in Martinique, where now believed extinct (Wheeler et al. 2021).

Identification Summary

See Plumages.

EBIRD GROUP (MONOTYPIC)

Black-capped Petrel (Jamaican)

Pterodroma hasitata caribbaea

Systematics History

Pterodroma caribbaea Carte, 1866, Proceedings of the Zoological Society of London 1:93. Type locality given as "Blue Mountains in insula Jamaica" (Carte 1866).

Distribution

Jamaica (probably extinct).

Identification Summary

Similar in structure to nominate *hasitata* but with mostly dark plumage. In their original description of the taxon, Carte (1866) described the head and upperparts a "uniform dark sooty brown," with the outer webs of the primaries slightly darker, and the underparts slightly lighter; the uppertail coverts were described as "light gray or dirty white."

Related Species

Within the genus *Pterodroma*, Black-capped Petrel appears to be sister to a clade of other Atlantic gadfly petrels, including Bermuda Petrel (*Pterodroma cahow*), Fea's Petrel (*Pterodroma feae*), Zino's Petrel (*Pterodroma madeira*), and the extinct Large St. Helena Petrel (*Pterodroma rupinarum*) based on mitochondrial DNA sequence data (Penhallurick and Wink, 2004), (Jesus *et al.*, 2009), (Welch, Olson and Fleischer, 2014), (Tennyson, Cooper and Shepherd, 2015). These results largely agree with those of Imber (Imber, 1985), who placed Black-capped Petrel in a large group with Bermuda Petrel, Fea's Petrel, and Zino's Petrel, as well as other gadfly petrels from the South Atlantic, South Pacific, and southern Indian Ocean, based on morphological characters. The taxon *caribbaea* has not been included in phylogenetic studies, but is assumed to be closely related to *hasitata* and part of the same clade with Bermuda Petrel, Fea's Petrel, and Zino's Petrel (Welch et al. 2014).

Together with the other members of this strongly supported clade of Atlantic gadlfy petrels, Black-capped Petrel appears to be closely related to another clade that includes Atlantic Petrel (*Pterodroma incerta*), White-headed Petrel (*Pterodroma lessonii*), Great-winged Petrel (*Pterodroma macroptera*), and Magenta Petrel (*Pterodroma magentae*) (Welch et al. 2014).

Hybridization

Not known (McCarthy, 2006).

Nomenclature

The origin of hasitata comes from the Latin “haesito,” root to the English word "hesitate," indicating the uncertainty Kuhl (1820) had concerning the recognition of this species (Simons et al. 2013).

Black-capped Petrel is known by several names throughout the Caribbean. In North America and in the English language it is also known as “Capped Petrel” and “West Indian Petrel.” In the Spanish- and French-speaking islands, the petrel is usually referred to as “Diablotin” or “Petrel Diablotin.” Diablotin means "little devil," descriptive of the species’ nocturnal habits and the odd-sounding vocalizations, which likely suggested to locals the presence of evil spirits. A mountain peak where it formerly bred in Haiti is named Morne Diablotin; in Dominica, Morne Diablotins is the highest peak on the island. Other names include “Pájaro de la Bruja” in Cuba (“bruja” is Spanish for “witch”), and “chat-huant/chawan” in Haiti and possibly other French-speaking islands (a generic term for nocturnal calling birds).

As noted by Simons et al. (2013), Zonfrillo (Zonfrillo, 1987) clearly explains why we should seek to call *Pterodroma hasitata* by its local name, Diablotin: “[T]he local name of the bird, Diablotin, appears to be as much in danger of dying out as the species itself. Where birds such as petrels feature in the economic or historical context of islands, or human populations on islands, it is surely not asking a lot to preserve the local name and incorporate it into modern usage? ‘Capped Petrel’, or ‘Black-capped Petrel’ as the bird is now referred to in the USA, are names

which tell little about the bird or its history. There are several species of *Pterodroma* and shearwaters that have caps or a capped appearance. Along with the endangered Cahow *Pterodroma cahow* of Bermuda, the Gon-Gon *Pterodroma feae* of the Deserta and Cape Verde Islands, and the virtually extinct Friera *Pterodroma madeira* of Madeira, the local names are more quaint and evocative than their rather bland English equivalents. The Diablotin, the 'devil-bird', should not be allowed to fade away."

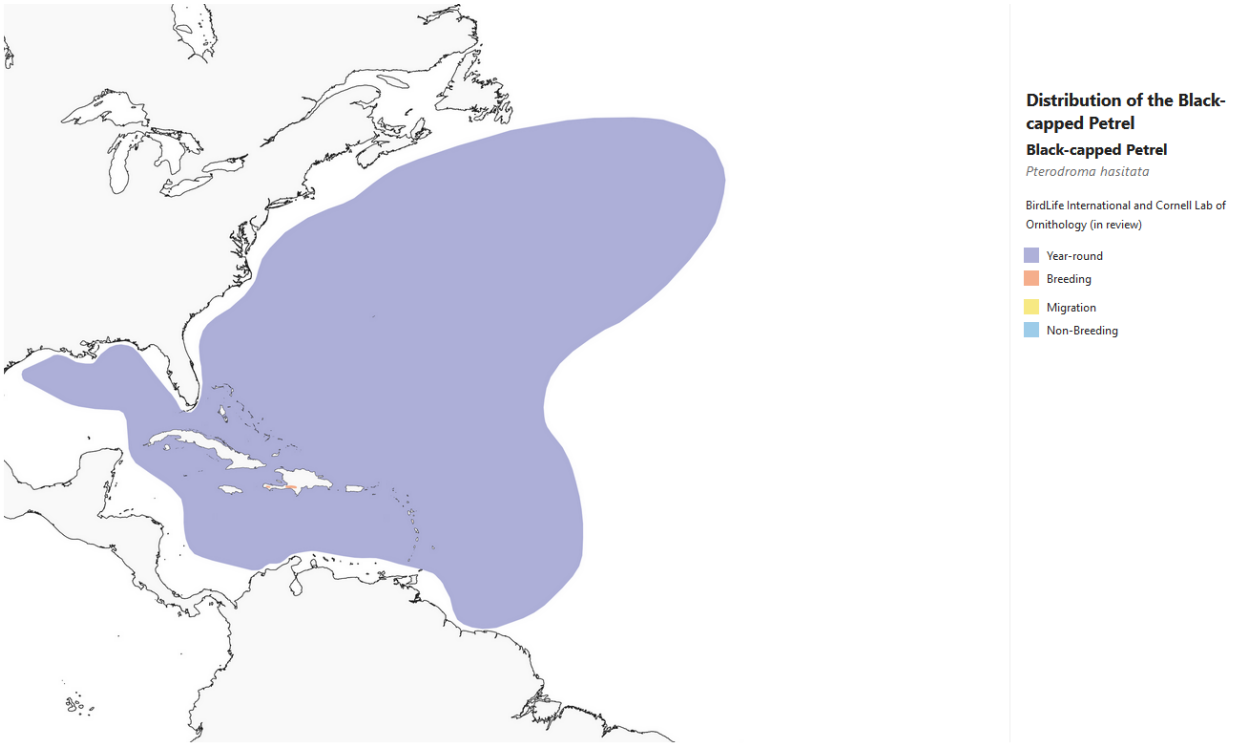
Fossil History

Sub-fossil remains of *Pterodroma*, confirmed or suspected to represent *hasitata*, are known from several sites in Haiti (Simons et al. 2013, (Steadman and Takano, 2013). Remains found in middens in Martinique (Wetmore, 1952), St. Croix (US Virgin Islands; (Wetmore, 1918), and Crooked Island (The Bahamas; (Olson and Hilgartner, 1982) are considered to be from harvested specimens and, in the case of The Bahamas, outside the accepted prehistorical breeding range for the species (Olson and Hilgartner 1982). None of this material has been dated, although samples from Haiti are believed to be from the late Pleistocene to Holocene (Simons et al. 2013, Steadman and Takano 2013).

Distribution

Introduction

Black-capped Petrel is a critically rare and local breeder in the Caribbean, with populations known to nest in Haiti and the Dominican Republic. Birds disperse over the Caribbean Sea, Gulf of Mexico, and western North Atlantic. Historical distributions are described in detail in Simons et al. (2013). The current breeding distribution is described in details in Wheeler et al. (2021). Here we provide a summary of Simons et al. (2013) and Wheeler et al. (2021), and any other relevant information.



Breeding Range

Terrestrial Range

Nesting is confirmed on Hispaniola only. Nest numbers provided as of October 2020. Detailed accounts of nesting areas can be found in "Appendix 2: Sites Profiles" of the 2021 Conservation Update and Action Plan (Wheeler et al. 2021).

In Haiti, most nests have been found on La Visite escarpment (La Visite National Park; n = 42) and in Morne Vincent (Forêt des Pins I National Park; n = 17), both located in the Massif de la Selle mountain range. In May 2022, two active nests were found on Pic de la Selle (Environmental Protection in the Caribbean, 2022). Nesting is probable on Pic Macaya and Pic Formon of Massif de la Hotte, on the remainder of the La Visite escarpment (no nests have been

located but groundings, acoustic evidence, and/or detections by radar highly suggest that breeding activity is occurring).

In the Dominican Republic, nests have been found in western (Loma del Toro; *n* = 28) and eastern Sierra de Bahoruco (Loma Quemada; *n* = 7), both in Sierra de Bahoruco National Park, and in the southeastern Cordillera Central (Valle Nuevo National Park; *n* = 11).

In Dominica, nesting has not yet been confirmed, but the groundings of two petrels in 2007 and 2010 and the detection by radar of petrel-like targets (Brown, 2015, 2020a) suggest that nesting is probable (most likely on the high forested peaks of Morne Diablotins and Morne Trois Pitons). In January 2022, a petrel was observed at night, flying away from Morne Micotrin, near Morne Trois Pitons (Satgé and Millischer, 2022).

In Cuba, records of petrels rafting on the sea near the coast and/or heard or observed flying inland towards the steep mountainsides ((Farnsworth, Stotz and Melian, 2005; Plasencia León *et al.*, 2020, 2022); Pointon, eBird) suggest that nesting is probable in the Sierra Maestra of southeastern Cuba (most likely in the areas of Pico Turquino and Pico la Bayamesa), though definitive evidence has yet to be acquired.

In Guadeloupe, although automated acoustic surveys have so far failed to record calling petrels (Chabrolle, 2017), nesting is suspected based on radar surveys (Brown, 2020b) and audiovisual observations (Chabrolle, Brown and Pavis, 2020).

In Jamaica, nesting is suspected based on a few radar detections (Brown, 2016).

Marine Range

At sea, Black-capped Petrel occurs year-round in the western North Atlantic and is regularly present in the adjacent basins of the Caribbean Sea and Gulf of Mexico. This range is mostly limited to tropical and subtropical waters from 10°N to 40°N and 80°W to 65°W, and is relatively confined and discrete within these bounds. It is very rarely observed above 40°N, but forays into Canadian waters have been recorded as far north as 43°N in petrels tracked by satellite (Satgé et al. 2022). It is a casual visitor to areas east of 65°W, with 16 records between 1850–2022 (Table 1). The southern extent of the range is not as well understood. Putative records from the South Atlantic lack strong documentation; in particular, a record off Brazil (American Ornithologist's Union, 1983) now appears unsubstantiated (Simons et al. 2013). Despite some observation effort in the western tropical Atlantic, the most southerly observations in the Atlantic are confined to coastal waters of the Lesser Antilles (Levesque and Yésou, 2018; Leopold *et al.*, 2019), except for one sighting 450 mi east of Barbados (Johnston, eBird). Seabird surveys conducted off Guyana between fall 2017 and summer 2019 (77 days total) did not record Black-capped Petrel (J. Tims, personal communication).

Table 1. Records of Black-capped Petrel in the Western Palearctic. Adapted from Tarsiger (2022). Phenotypes: DF = dark form, IF = intermediate form, LF = light form (1850–2018 assessed in Flood and Williams 2018; 2019–2022 assessed by YGS).

Date	Location	Phenotype	Additional notes
Spring 1850	Southacre, Swaffham, Norfolk, England	unknown	Caught on a heath at Southacre, Swaffham on March or April, now at Castle Museum, Norwich (CM 108.949). Source: Newton 1852. 1st record for Britain and for Western Palearctic.
16 Dec. 1984	Barmston, East Yorkshire, England	unknown	1st-winter female at Barmston, tideline corpse long dead, 2nd record for Britain and 2nd for Western Palearctic.
30 Apr. 2002	at sea, c 320 km north-west of Cabo Finisterre, Spain (45.01N, 12.16W)	LF/I	Source: Howell 2002. 1st record for Spain and 3rd for Western Palearctic.
26 May 2007	at sea, 16 km south-east of Graciosa, Azores	LF	1st record for Azores and 4th for Western Palearctic.
22 May 2009	at sea, 9-11 km south of Queimada, Azores	LF/I	2nd record for Azores and 5th for Western Palearctic.
8 May 2010	at sea, c 425 km north-east of Madeira (35°50'N, 14°46'W)	LF/I	Source: Flood and Fisher 2013. 1st record for Madeira and 6th for Western Palearctic
7 Sept. 2011	at sea, c 16 km west of Faial, Azores	LF	3rd record for Azores and 7th for Western Palearctic.
23 Mar. 2013	at sea, c 30 km west of Agadir, Morocco	LF/I	Source: Flood and Williams 2018. 1st record for Morocco and mainland Africa, 8th for Western Palearctic.
6 Feb. 2016	Santo Antao, Cape Verde	LF	Caught on land. Source: Garcia del Rey (unpublished data).
11 Mar. 2017	at sea, El Barril headland, São Nicolau, Cape Verde	WF/I	Source: African Bird Club Bulletin 24.2. 2nd record for Capo Verde and 10th for Western Palearctic.
13 Feb. 2018	Santo Antao, Cape Verde	DF	Captured in mistnet near *Pterodroma feae* nesting sites. Source: Militao (2017). 3rd record for Capo Verde and 11th for Western Palearctic
27 Apr. 2019	at sea, near Fogo, Cape Verde	LF/I	Source: Dinis (unpublished data). 4th record for Capo Verde and 12th for Western Palearctic.
6 Feb. 2020	at sea, near Raso, Cape Verde	LF	Source: Stronach (2020). 5th record for Capo Verde and 13th for Western Palearctic
30 Sep. 2020	at sea, south of Pico, Azores	LF	Source: Simião (unpublished data). 4th record for Azores and 14th for Western Palearctic.
29 Jan. 2021	at sea off Fogo, Cape Verde	unclear	Source: Dinis (unpublished data). 6th record for Capo Verde and 15th for Western Palearctic.
27 May 2022	at sea off Madeira	LF	Source: Enright (unpublished data). 2nd record for Madeira and 16th for Western Palearctic

Newton, A. 1852. Some account of a petrel killed at Southacre, Norfolk, with a description and synonymy. Zoologist 10: 3691-3698.

Howell, S. 2002. A Black-capped Petrel off the Bay of Biscay: the fourth for the Western Palearctic. Birding World, 15: 219-220.

Flood, B. and Fisher, A., 2013. Multimedia identification guide to North Atlantic seabirds Pterodroma Petrels.

Flood, R.L. and Williams, A.C. 2018. Black-capped Petrel off Agadir, Morocco, in March 2013. Dutch Birding 40: 92-95.

Stronach P. 2020. Black-capped Petrel kleptoparasitising Red-billed Tropicbirds off Raso, Cape Verde Islands, in February 2020. Dutch Birding 42: 179-181.

Tarsiger. 2022. Targiser.com: Records of observations of Pterodroma hasitata in the Western Palearctic. Accessed on 2022-09-10 at www.tarsiger.com.

Atlantic. The primary range includes neritic Gulf Stream waters and pelagic waters from Cape Canaveral, Florida, US in the south (ca. 28.5°N), to New Jersey, US in the north (ca. 38°N). The range extends eastward from the outer continental shelf to ca. 74°W. The core range is concentrated along the outer continental shelf offshore Cape Hatteras, North Carolina, US. Starting in the late 1970s, numerous observations have been recorded at sea in US waters; to date, more than 5,500 records have been confirmed (Sussman and U.S. Geological Survey, 2014). Black-capped Petrel is scarce in the Sargasso Sea; satellite-tracked petrels do not regularly venture into the area, and only a few historical and contemporary observations have been recorded there, on, or around Bermuda. Petrels are present in all seasons in the Atlantic, but more common in late summer and fall (Simons et al. 2013).

In the Atlantic, the core range is concentrated along the outer continental shelf offshore Cape Hatteras, North Carolina, United States. Linda Chittum. 23 May 2014. Dare, North Carolina, United States. eBird S18545799; Macaulay Library ML117555101

Winship et al. (Winship *et al.*, 2018) modeled the distribution of Black-capped Petrel along the US outer continental shelf; using data from at-sea surveys compiled in Sussman and U.S. Geological Survey (2014), they compared the relative density of the species to multiple spatial and temporal predictor variables and developed seasonal maps of its spatial distribution. Resulting models show a distribution that is limited to a band of pelagic waters along the outer continental shelf in the US Exclusive Economic Zone, with seasonal hotspots offshore the South Atlantic Bight (spring, summer, and winter) and offshore the Outer Banks of North Carolina (summer, fall, and winter).

Caribbean. Knowledge of Black-capped Petrel distribution in the region is based on tracking data of few individuals (n = 6; Jodice et al. 2015, Satgé et al. 2019) and limited at-sea observation (fewer than 100 observation records since 1953; summarized in Leopold et al. 2019). The primary range appears to be confined to the central Caribbean Sea between 67°W and 77°W, with repeated use of the Guajira upwelling off Colombia and Venezuela, and mixed waters between Cuba, Jamaica, and Hispaniola. 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) (Levesque and Yésou 2018). Black-capped Petrel has been observed in all seasons in the area (Leopold et al. 2019).

Gulf of Mexico. Rarely recorded (9 records between 1900–1990) until systematic seabird surveys were organized in 2010–2011 and 2017–2019. Since then, about 40 additional observations have been recorded (Jodice et al. 2021). Petrel observations are more regular in the eastern Gulf, along the continental shelf and slope, from the Florida Keys in the southeast to De Soto Valley in the northwest. The age, breeding status, and origin of birds using the Gulf of Mexico are unclear. Most observations occurred at the outset of the breeding season (end of July to September; Jodice et al. 2021).

Black-capped Petrel is scarce at Gulf of Mexico. TBRC Accepted Records. 26 July 1997. Calhoun, Texas, United States. eBird S101385507; Macaulay Library ML409597511

Breeding Black-capped Petrels were historically assumed to commute to Gulf Stream waters off the US coast (Simons et al. 2013). Recent racking of chick-rearing petrels nesting on Hispaniola, however, seems to partly challenge this assumption. Indeed, of 16 foraging trips made by six tracked petrels in Jodice et al. (2015) and Satgé et al. (2019), 10 were to upwelling waters off the Guajira peninsula; 3 were to mixed waters between Jamaica, Haiti, and Cuba; 1 was to the western Caribbean; and 2 to Gulf Stream waters. This suggests that, although breeding petrels may forage in the western North Atlantic, they are more likely to stay within the bounds of the Caribbean Sea during chick-rearing. Information during incubation is lacking.

Pelagic observations and satellite tracking suggest that dark and light forms have distinct distributions at sea in the western North Atlantic (Satgé et al. 2022). The dark form seems more common in Gulf Stream waters off the southeastern US, and appears concentrated within an approximate 200-km strip of waters extending eastward from the continental shelf into the Gulf Stream. The light form seems more common in mixed pelagic waters of the Middle Atlantic Bight, extending over a wider area between the continental shelf and the northern edge of the Gulf Stream (Satgé et al. 2022).

Historical Changes to the Distribution

Prehistoric and historic records suggest that Black-capped Petrel nested on at least five islands in the Caribbean (Jamaica, Hispaniola, Guadeloupe, Dominica, and Martinique), and possibly on Cuba.

Cuba

There are no records of the occurrence of the species on or around Cuba before the mid-1970s (Simons et al. 2013). In 1977, adults were collected at sea off a point of land called "La Bruja" in the Sierra Maestra, presumably near a breeding colony (Bond, 1978). Nesting sites still remain to be located.

Jamaica

A report by Verrill (Verrill, 1905) of the occurrence of both *hasitata* and *caribbaea* (Jamaican Petrel) on Jamaica exists, but cannot be substantiated. No other historical records of *hasitata* exist for Jamaica, though the darker and smaller *caribbaea* (now considered extinct) was recorded, and specimens were collected, until the mid-1800s (Simons et al. 2013). Simons et al. (2013) add: "As small islands in the Indian Ocean and in the southern and western North Atlantic support more than one breeding species of *Pterodroma*, it is reasonable to think that this was also the case in the West Indies."

Haiti

Pre-Columbian remains encountered between 1,760 m and 2,060 m above sea level in Massif de la Selle suggest a possible prehistoric distribution in other mountainous areas on Hispaniola. However, no information seems to exist on Black-capped Petrel presence in Haiti in historic times, even during colonization (Simons et al. 2013). The earliest account dates from 30 June 1938, with the grounding of a fledging bird in Port-au-Prince. The rediscovery by Wingate (1964) of breeding activity in Massif de la Selle prompted further searches that are still ongoing throughout the country.

Dominican Republic

Little historic information is available. Bones found in prehistoric middens in Haiti suggest that the species may have been present in similar habitats in the Dominican Republican part of Hispaniola as well. The earliest historic records are from two accounts of stranding reported near the coast and inland in 1920 and 1928 respectively (Collar *et al.*, 1992). The presence of a small nesting population was confirmed in 1981 in western Sierra de Bahoruco, near the border with Haiti (Collar 1992); the colony was relocated in 1996 (Williams, Kirwan and Bradshaw, no date). Since then, small scattered groups of nesting petrels have been located in the eastern Sierra de Bahoruco and in the southern Cordillera Central, thus suggesting that, in prehistoric times, the species may have been distributed across the island of Hispaniola.

Guadeloupe

Nesting Black-capped Petrels disappeared from the island around 1850, following hunting and the introduction of predators. The species nested on Soufrière Mountain in the 1800s and, as late as the 1890s, it was reported to be nesting as low as 500 m above sea level (Lawrence, 1891). In 1847, an earthquake caused the collapse of a side of Nez Cassé ridge, near la Soufrière, effectively destroying the remaining colony there. It is suspected that a small nesting population still remains on the island; unidentified flying and calling Procellariiformes were recorded in December 1991 at dusk on a ridge below Pic de la Soufrière (Lorvelec cited in Chabrolle et al. 2020), but systematic acoustic surveys failed to detect the species in recent years (Chabrolle 2017).

Dominica

The species was numerous and well known on Dominica in the early 1800s; historically, the largest portion of the population may have nested there (Simons et al. 2013). Black-capped Petrels were abundant and widespread on the island until at least 1858 (Murphy, 1936), and the last confirmed date of nesting is 1862 (Smith, 1959). Localized searches in the early 1900s failed to locate nesting sites. Petrels were collected on the island in 1932, but an expedition in October/November of 1964 found no evidence of nesting petrels (Wingate 1964). In the 1970's to 1990's, expeditions in Dominica's forests encountered Black-capped Petrels calling or flying (Evans, 1991). In 1977, petrels were heard calling near Morne Diablotin; in 1980, birds were heard in the southern parts of island; in 1982, small numbers were observed along southeast coast and flying inland after dark; in 1984, a flock was seen offshore of Delices in April; in 1989, bird were observed flying off the coast near Morne Fous and potentially coming ashore; in 1990, an adult bird was found grounded in Roseau; and 1997, birds were observed flying over Morne Verte (Evans and James, 1997).

Martinique

Black-capped Petrel was extirpated on Martinique in pre-Columbian times by the indigenous Carib, who used the bird as a source of food (Simons et al. 2013). The species has not been recorded on the island since.

Habitat

Introduction

On land, Black-capped Petrel nests on Caribbean islands, in steep montane forests. All known nesting sites are in mountainous areas 1,600–2,350 m above sea level (mean 2,082 m, *n* = 81), and 15–31 km from the nearest coastline (mean 25.4 km, *n* = 81; (Satgé *et al.*, 2021). The topography at known nest sites is generally of steep ravines and canyons, but nests have also been found on flatter ridgelines (e.g., at Sierra de Bahoruco, Dominican Republic). Most sites are located in limestone terrain or karst materials, but habitat characteristics are somewhat flexible; for instance, unlike most other nesting areas that are in dry, karstic environments in forests dominated by Hispaniola pines (*Pinus occidentalis*), the area around confirmed nesting sites in Valle Nuevo, Dominican Republic, is characterized by steep valleys and ravines with flowing streams, in mixed forests of broadleaf trees and much dispersed Hispaniola pines. In all areas, petrels nest in the thick and mesic understory and excavate burrows in soil, under the roots of trees or arborescent ferns, or in karstic crevasses (see Breeding: Nest Site). It is unclear if current nesting conditions represent the historic habitat preferred by the species or if they are only representative of remaining available habitat.

At sea, it is considered pelagic, but the habitat is better described by the oceanographic features with which it is associated. In the Atlantic Ocean and Gulf of Mexico, petrels use eddies and detached rings of the highly dynamic Gulf Stream and Loop Current; in fact, in both areas, they make extensive use of oceanographic fronts (such as water temperature and density fronts) along the western boundary of both current systems (Haney, 1987)(Winship et al. 2018, Jodice et al. 2021). The area used by petrels along the Atlantic outer continental shelf of the U.S. is also characterized by the mixing of Gulf Stream and upwelling waters associated with Cape Hatteras, North Carolina, and the Blake escarpment off South Carolina and Georgia (Haney 1987, Jodice et al. 2015). Pelagic waters of the Mid-Atlantic Bight used by petrels (off the U.S. states ranging from Massachusetts to North Carolina, from north to south) are significantly deeper and colder waters showing a wider range of temperatures and more complex oceanic processes influenced by detached Gulf Stream eddies (Satgé et al. 2022). In the Caribbean Sea, petrels forage in the colder waters of the strong and persistent Guajira upwelling off Colombia (Jodice et al. 2015, Satgé et al. 2019). Oceanographic fronts and upwelling likely concentrate prey for surface predators by concentrating plankton at the edge of eddies, and by migrating nutrients up through the water column, respectively; these processes thus enhance prey density and availability for foraging Black-capped Petrel. Other habitats include the area of seamounts and mixed waters of the Jamaican Channel.

Movements and Migration

Movement

From their breeding grounds in the Greater Antilles, Black-capped Petrels appear to forage in the Caribbean Sea and western North Atlantic during the chick-rearing period (April to July). Following fledging in mid- to late July, non-breeders apparently migrate north to the western North Atlantic, particularly into the waters of the Carolina bight, where the species is easily seen on pelagic trips during temperate spring and summer periods. During the 1980s and 1990s, it became clear that this species is locally abundant in the Gulf Stream waters off the US mid-Atlantic states, frequenting waters 400 m or deeper. The largest numbers occur during mid-summer and early fall, and comprise birds in a variety of plumage states. In late fall (mid-October), the adults appear to begin returning to breeding areas for nest initiation. A few (e.g., non-breeders) remain in the Gulf Stream from January to April. Occasionally hurricanes may displace petrels and deposit them far inland (Douglas, 1997; Hass, Hyman and Semmens, 2012).

Recent tracking studies of adult petrels have provided details on movements between breeding, foraging, and post-breeding areas. Unless specified otherwise, the details of movements described below result from three tracking studies: Jodice et al. (2015) and Satgé et al. (2019) of chick-rearing petrels nesting in Loma del Toro, Dominican Republic, and Satgé et al. (2022) of non-breeding petrels captured off Cape Hatteras, North Carolina, in spring 2019. Unless mentioned otherwise, phenology detailed here belongs to the dark form.

Information on movements between nest initiation and chick-rearing is not available. It is suspected that, like many species in Procellariidae, female Black-capped Petrel undertake a pre-laying exodus, but the destination of these movements is unknown. During the chick-rearing period, adults breeding on Hispaniola appear to forage mostly in the Caribbean Sea. Of 16 foraging trips made by six tracked petrels in Jodice et al. (2015) and Satgé et al. (2019), 10 were to upwelling waters off the Guajira peninsula, Colombia; three were to mixed waters between Jamaica, Haiti, and Cuba; one was to the western Caribbean; and two to Gulf Stream waters. Those birds foraging in the southern Caribbean Sea off Colombia commuted back and forth between their breeding grounds at Loma del Toro, Dominican Republic and this area.

Dispersal and Site Fidelity

Natal Philopatry and Dispersal

There is no information on natal dispersal, but natal philopatry is the norm in Procellariidae and is likely to occur in this species as well.

Adult Fidelity to Breeding Site and Dispersal

Based on anecdotal information, adults appear to show fidelity to nesting sites. Indeed, in one nesting burrow inspected in April 2018, a satellite tracker from Jodice et al. (2015) was

recovered and confirmed to be from the individual captured in the same burrow in 2014 (Satgé et al. 2019).

Fidelity to Overwintering Home Range

As for many pelagic seabirds, fidelity to overwintering areas is suspected, but no information is available.

Migration Overview

At the end of the chick-rearing period around mid- to late July, post-breeding adults depart the Greater Antilles. Petrels nesting in southern Hispaniola and heading towards the western North Atlantic appear to use the Windward and Mona passages (Jodice et al. 2015, Satgé et al. 2019, Satgé et al. 2022). Petrels then use the waters of the Turk and Caicos and the Bahamas, and the Antilles Current, as flight corridors to reach the outer continental shelf of the US; they then remain in this area for the remainder of the non-breeding period. It is suspected that breeding adults fly back to their breeding grounds for courtship and mating in September–October (for light forms) or November (for dark forms). Two to three weeks later, they go back to sea for a pre-laying exodus until mid- to late January, when females return for egg-laying.

In the Gulf of Mexico, most petrels have been recorded from mid-July to mid-September, at the outset of the breeding season (Jodice et al. 2021). The origin and age of these birds is unknown, and it is unclear if they stay in the Gulf for the remainder of the non-breeding period or if they later move to the Atlantic.

Movement patterns of immatures have not been studied. Howell and Patteson (2008) noted that immature petrels occur off North Carolina from late July to October, though they are rarely detected.

Diet and Foraging

Introduction

Little information is available on the diet of Black-capped Petrel. Current information is based on the examination of the stomachs of 60 individuals collected at sea off the coast of the US (Haney 1987)(Moser and Lee, 1992), and on a molecular analysis of fecal DNA from adult petrels captured at breeding sites and at sea (YGS, unpublished data).

Black-capped Petrel foraging. Peter Flood . 19 August 2022. Dare, North Carolina, United States. eBird 117298765; Macaulay Library ML 489310881

Feeding

Main Foods Taken

Historically suspected to feed mostly on squid and fish (Simons et al. 2013). Recent molecular analysis of fecal DNA suggests a higher diversity of prey, including meso- and bentho-pelagic fish taxa (YGS, unpublished data).

Microhabitat for Foraging

Petrels forage in association with upwellings and fronts induced by eddies (see Habitat). This species typically does not follow ships, although individuals may investigate "chum" slicks for potential food. Black-capped Petrel may feed in multispecific rafts, or individually, picking food items such as squid from the ocean surface.

Food Capture and Consumption

Simons et al. (2013) wrote a detailed discussion of the feeding behavior. We share the main observations here, but encourage readers interested in the details of timing of feeding activity, association with other seabirds, response to chum and offal, and expected visual clues to refer to that publication.

Most Black-capped Petrel feeding activity occurs at night or early in the morning, although birds are often seen feeding during mid-day (Simons et al. 2013). The prominence of pelagic *Cephalopoda* in their diet suggests an adaptation for crepuscular or nocturnal feeding, given that this prey type undergoes nocturnal diel migrations.

The majority of feeding bouts reported by Haney (1987) occurred within flocks (96%), 88% of which included other species (n = 25); these flocks may contain numerous Black-capped Petrels, with up to 65 observed at once (Haney 1987). Petrels were observed feeding at "baitfish" or invertebrate swarms with 12 other species and averaged 4.3 species per feeding flock (range 2–8 species/flock). The most frequent associates were Cory's Shearwater (*Calonectris diomedea*), Great Shearwater (*Ardenna gravis*), Audubon's Shearwater (*Puffinus lherminieri*), and Pomarine Jaeger (*Stercorarius pomarinus*) in summer, and Herring Gull (*Larus argentatus*) and Black-legged Kittiwake (*Rissa tridactyla*) during the winter. Petrels fed with 10 seabird species (mean 3.8 species/flock, range 3–6) at chum slicks, including Great Shearwater, Wilson's Storm-Petrel (*Oceanites oceanicus*), and Pomarine Jaeger in summer and Herring Gull and Laughing Gull (*Leucophaeus atricilla*) in winter. Less common feeding associates observed by Lee (Haney, Lee and Morris, 1999) included South Polar Skua (*Stercorarius maccormicki*), Common Tern (*Sterna hirundo*), Bridled Tern (*Onychoprion anaethetus*), and Sooty Tern (*Onychoprion fuscatus*). With limited exceptions, Black-capped Petrel is not usually seen in association with marine mammals. Lee (in Simons et al. 2013) observed a single petrel foraging around a fin whale (*Balaenoptera physalus*), which was Lee's only record of Black-capped Petrel in shallow (< 30 m) shelf waters. Offshore Hatteras, North Carolina, it has been seen occasionally in association with sperm whales (*Physeter macrocephalus*), pilot whales (presumably short-finned, *Globicephala macrorhynchus*), and Risso's dolphins (*Grampus griseus*) (KES, unpublished data).

As do other species of gadfly petrels, Black-capped Petrel has been observed seizing prey at or just beneath the surface (Haney 1987). It uses at least four foraging postures when feeding: sitting on the ocean surface; aerial dipping and pattering; aerial maneuvering; and, less commonly, sitting on the ocean surface with head and neck submerged underwater (Simons et al. 2013). Though it is commonly mentioned that petrels have "never [been] seen to submerge beneath the ocean surface" (Simons et al. 2013), on a few occasions they were observed and photographed diving underwater for some extent of time in search of natural food and chum (KES, unpublished data). Petrels have been observed arriving from upwind to investigate feeding sites, and therefore do not appear to rely exclusively on olfaction to locate food sources; instead, or in addition, they may use visual clues, with their high arching flight pattern facilitating visual detection of surface slicks (Simons et al. 2013) and feeding groups.

Recent observations suggest that Black-capped Petrel may also kleptoparasitize other seabirds. On two occasions, at chum slicks for pelagic seabirds off Cape Hatteras, Black-capped Petrels have been observed chasing an Audubon's Shearwater (*Puffinus lherminieri*) and Fea's Petrel (*Pterodroma feae*), both with food (KES, unpublished data). Off the coast of Cape Verde, Stronach (Stronach, 2020) observed a Black-capped Petrel kleptoparasitizing several Red-billed Tropicbird (*Phaethon aethereus*) for 17 min, forcing two of them to regurgitate. It is unclear if this behavior is opportunistic or more regular.

Diet

Major Food Items

Moser and Lee (1992) examined the stomachs and crops of 57 Black-capped Petrel collected off North Carolina, which revealed the following (by frequency of occurrence): squid (93.0% of individuals), fish (49.1% of individuals), crustaceans (3.6% of individuals), pieces of Sargassum (14.0% of individuals), plastic (1.8% of individuals), unidentified items (17.5% of individuals), and empty (4% of individuals). Squid were the most frequently encountered food item, but undigestible beak fragments accumulate in crops and may create the false impression of a preference for squid (Simons et al. 2013). A preliminary molecular analysis of prey DNA found in petrel feces suggests more fish are eaten than expected, particularly meso- and bentho-pelagic taxa (including fish that perform diel migrations; YGS, unpublished data).

Sounds and Vocal Behavior

Introduction

Translated into English, “diablotin” means little devil, presumably as a reference to the bird’s haunting nocturnal calls.

Vocalizations

The Black-capped Petrel can be heard overland as a low-octave oooohhhh, oooohhh, ooohhhh-eek. Reynard (recordists notes in ML139296), while collecting sound recordings of the species in Haiti, described the flight calls as “a penetrating resonant growl punctuated by high frequency squeaks.” Simons et al. (2013) report that the birds fly in pairs or small groups calling back and forth, and it is likely that the primary function of calling behavior is related to pair formation and maintenance. Calling is most often heard in and around the colony locations. Calling of petrels in-flight over land away from colonies is rare and the birds seem to be mostly silent when traveling between the sea and nesting areas, though vocalizations have been heard at dusk on coastlines, presumably when flying to nesting areas (Plasencia León et al. 2020, 2022). Occasionally, petrels call from inside their nesting burrows with low grunts or squeaks. The seasonal timing of calls peaks early in the nesting season and steadily declines over the course of the nesting season. At nesting sites, most calling activity is detected during 2–5 hours after local sunset (Fleishman and McKown, personal observation).

At sea, petrels are generally silent. Simons et al. (2013) summarized the observations of Wingate (1964), Imber (1985), and Lee (personal observation) that individuals at chum slicks occasionally uttered single *waaahh* or *aaa-aw* when feeding. On one occasion during December, Lee noted that many petrels he saw at sea were vocal. At sea offshore from Hatteras, North Carolina, petrels have been heard to vocalize (audio) when feeding on chum with other petrels but rarely when feeding on chum with mixed flocks (KES, personal observation, 2019–2021).

Nonvocal Sounds

This species also has a tendency to produce a flute-like sound during nocturnal overflights of the colony, apparently created by wind passing over the birds’ wing (Simons et al. 2013; AB, personal observation).

Behavior

Locomotion

Walking, Running, Hopping, Climbing, etc.

Like most other Procellariiformes, the Black-capped Petrel presumably walks by shuffling on feet and tarsi (Warham, 1996). It is suspected that most locomotion on the ground is restricted to the vicinity of the nesting burrow. When birds depart their burrow during the breeding season, it is generally suspected that they take off from an elevated location such as rocky outcrops or tree stumps. Camera traps recorded adult petrels scrambling up rocks and trees using their feet and wings, presumably before taking off (Ernst Rupp, personal communication; see Figure 9.3 in Warham 1996).

Flight

Black-capped Petrel employs flight patterns typical of gadfly petrels (*Pterodroma* sp.), using dynamic soaring with occasional flaps and high arcs above the wave surface to move rapidly over large distances. In winds greater than 18.5 km/h (10 knots), the species adopts a sinusoidal motion, one wing pointed at the water, the other at the sky. Petrels usually fly in rapid "roller coaster" flight on bowed and angled wings; this behavior results in a distinctive rising-and-falling progression (Harrison 1983). Haney (1987) reported on the marine habitat and behavior off Georgia:

Occasionally, they rose to 20–25 m above the sea at the peaks of the arcs. The extent of wing-flapping in this flight mode was inversely related to wind speed. At wind speeds ≤ 11.1 km/h (6 knots), petrels used a very slow and labored flight with many deep, rapid wing-beats, particularly when taking off from the ocean surface. Gull-like soaring on horizontal wings from 50–100 m above the ocean surface was observed very rarely during moderate wind conditions (11.1–77.8 km/h or 6–15 knots). In higher winds, Black-capped Petrel may spring directly into the air from the water surface (Harrison 1983), whereas in low winds (<11.1 km/h or 6), they run along the ocean surface for 2–4 m before taking flight (Haney, 1983).

Swimming or Diving

Birds will swim on the surface of the water. While rare, they may also dive completely beneath the surface of the water in search of prey (KES, unpublished data; see Feeding).

Self-Maintenance

Preening, Head-Scratching, Stretching, Sunbathing, Anting, etc.

Information needed.

Sleeping, Roosting

Information needed.

Daily Time Budget

It comes to land only at dusk and under the cover of darkness, to breed in remote, high-elevation locations. During the breeding season, adult petrels leave or approach nesting areas in the dark. After sunset, adults leave the sea and head over land towards breeding areas, often using watersheds as flight corridors. Upon arriving near the nesting site, adults crash-land through the forest canopy onto the soil surrounding their nest, and rapidly enter the burrow. Monitoring of nesting burrows by trail camera showed that chick-rearing adults arrived between 2213–0408 h (n = 9) and departed between 2200–0417 h (n = 36), and time at nest averaged 30.7 ± 8.9 min (Jodice et al. 2015). Satellite-tracked adults and their breeding partners spent, on average, between 4.8–22.5 d at sea between nest visits (Jodice et al. 2015, Satgé et al. 2019). During the egg incubation phase of breeding, it is believed that the mates switch once the inbound adult reaches the nest, with the second adult then flying overland to the sea, also at night. Upon exiting the burrow, adults may spend time near the burrow's entrance, resting or preening (E. Rupp, personal communication).

At sea, Black-capped Petrel is active during the daytime, with peaks in activity from 0700–0900 h and 1700–1900 h (Haney 1987). The degree of activity during nighttime is not known.

Agonistic Behavior

Petrels commonly defend their burrow against other petrels. For instance, following the invasion of the Loma del Toro colony by dogs, two petrels (possibly a pair) were recorded inspecting a burrow before being fought and chased away by a third petrel (possibly the owner of this or a nearby burrow); this occurred two days in a row (E. Rupp, personal communication).

At sea when attending a chum slick, Black-capped Petrel may squabble over fish pieces and chase one another similar to other seabird species (YGS, personal observation). Nothing is known about agonistic behavior at sea under natural conditions.

Sexual Behavior

Mating System and Operational Sex Ratio

Presumably monogamous.

Courtship, Copulation, and Pair Bond

Courtship behavior is suspected to be similar to that of other *Pterodroma* species, with the Black-capped Petrel performing nocturnal courtship flights and calls near breeding areas, during

the early breeding period (from nest initiation to egg hatching). Records by camera traps suggest that mating and copulation occur outside the burrow (E. Rupp, personal communication).

Social and Interspecific Behavior

Degree of Sociality

Social behavior is not well understood, but records by camera traps provide some clues into intraspecific interactions. For instance, during nest initiation, members of a pair cooperate to prepare the nest site; on one occasion, a petrel cleaned the entrance of its burrow while its partner was inside. Another time, both members of a pair were observed cleaning the path to their burrow in unison.

Radar studies on Hispaniola show that adults occasionally fly in overland flight corridors in small groups (3–5 individuals). Upon reaching the breeding areas, petrels are occasionally observed, via radar, flying back and forth, sometimes circling above the breeding area, before descending to a nesting burrow (AB, unpublished data).

At sea, the species occasionally forms rafts of tens of individuals. Presumably, concentrations in the tens of birds, as seen in the Gulf Stream and in Cuban waters, are regular occurrences (Simons et al. 2013). Although most resting rafts have been observed in offshore conditions, Rosenberg (eBird) observed rafting petrels within sight off the coast of Cuba. In two instances, birds tracked by GPS displayed a behavior consistent with coastal rafting (Satgé et al. 2019); tracked petrels rested close to shore, off southwest Haiti and off southern Cuba, in the proximity of known or suspected breeding colonies. Both birds arrived in the middle of the day and departed after sunset; the petrel rafting near Haiti subsequently flew back to its breeding colony.

Nonpredatory Interspecific Interactions

Black-capped Petrel occasionally forms small intraspecific rafts during the day. When foraging, it is also often associated with mixed species flocks (88% of occurrences, $n = 25$); it frequently associates with Cory's Shearwater, Great Shearwater, Audubon's Shearwater, and Pomarine Jaeger in summer, and Herring Gull and Black-legged Kittiwake (see Feeding for more detail; Haney 1987).

Both Parasitic Jaeger (*Stercorarius parasiticus*) and Pomarine Jaeger have been recorded attempting to parasitize feeding petrels as they rested on the surface (Haney 1987). Offshore Hatteras, North Carolina, seabirding pelagic cruises regularly use chum and oil slick to attract birds to the boat, including jaegers and skuas. Black-capped Petrels are commonly observed pursuing individual jaegers or skuas, either singly or in groups of up to nine petrels; it appears that dark-morph jaegers are more often pursued than light-morph ones (KES, unpublished data). It is unclear why Black-capped Petrels pursue these kleptoparasitic species, but the pursuit behavior appears similar to mobbing, with petrels flying closely behind jaegers or skuas, almost brushing them as they fly past. Petrels have been observed flying just above or just below jaegers or skuas, before maneuvering closer and then flying away; photographs show that Black-capped

Petrels are intently focused on jaegers or skuas, and this behavior has sometimes resulted in jaegers or skuas leaving the area (KES, unpublished data).

Black-capped Petrel and Sooty Shearwater (*Ardenna grisea*). Tommy Quarles. 24 May 2022. Dare, North Carolina, United States. eBird 111216939; Macaulay Library ML 453059891

Lee (in Haney et al. 1999) watched a Bridled Tern repeatedly attack a Black-capped Petrel that was trying to feed on the wing; the pursuit continued for some time with the petrel eventually leaving the area. This was the only such incidence observed during 15 years of study.

On land, the Hispaniolan hutia (*Plagiodontia aedium*) uses petrel burrows and, on one occasion, a petrel was observed fighting a hutia (E. Rupp, personal communication). However, most interspecific interactions recorded at nest sites have remained indirect. For instance, in June 2012 and May 2021, camera traps recorded Pine Warbler (*Setophaga pinus*) entering petrel burrows to collect breast feathers, supposedly for nest material (E. Rupp, personal communication). In April 2018, researchers found a caterpillar (Lepidoptera, family Tineidae) using Black-capped Petrel feathers to make a case (i.e., cocoon). Caterpillars of case-making moths are known to incorporate animal material into their cases to feed on them (YGS, unpublished data).

Predation

Mammals are frequent predators of eggs, chicks, and adults. It is not known if endemic mammals (most of which are extinct on on Hispaniola and other probable and suspected nesting areas) depredate Black-capped Petrels. However, introduced mammals known to prey on birds are present at all confirmed and suspected nesting sites within the Caribbean region (see Conservation and Management: Effects of Human Activity). These include, but are not limited to, rats (*Rattus* sp.), cats (*Felis catus*), dogs (*Canis familiaris*), Indian mongoose (*Herpestes edwardsii*), and feral pig (*Sus scrofa*).

It is unclear if Black-capped Petrel is also subject to predation by other avian species. On land, their nocturnal habits may prevent predation by birds of prey, as no large nocturnal raptors are present in the Caribbean. At sea, Brinkley (Brinkley, 1994) reported evasive maneuvers by individuals pursued by South Polar Skua and Pomarine Jaeger, suggesting possible predation by these species. On at least two occasions, South Polar Skua was observed feeding on the carcass

of a Black-capped Petrel, but the cause of death was unknown (Brinkley 1994; KES, unpublished data).

Breeding

Introduction

Black-capped Petrel breeds in loose colonies, with nesting habitat found in both montane broadleaf and pine forests. All currently described petrel nests occur in areas with both soil and vegetation present. The species nests in mountain ranges composed primarily of dolomitic limestone. The female lays a single egg at the end of a burrow that both members of a pair help to construct. Both adults share in incubation, brooding, and feeding duties

Phenology

In the dark form, breeding occurs between November and August. Nest initiation begins in November. Petrels lay eggs in mid- to late January. Chicks hatch from mid- to late March and fledge from mid-June to as late as early August (see Figure 1).

The timing of breeding appears to be different for the light-form (Howell and Patteson 2008, Satgé et al. 2022), with nest initiation beginning as early as October and egg-laying beginning in December. Fledging occurs in April (E. Rupp, unpublished data).

Nest Site

Microhabitat

The species nests in rock crevices, dirt burrows, or burrows dug into pine needles. Burrow depths are between 0.5–3.0 m (Ernst Rupp, personal communication).

Site Characteristics

On Hispaniola, petrel nests are found between 15–25 km from the sea at elevations between 1,500–2,300 meters above sea level (Satgé et al. 2020). Nests may occur on flat, moderately steep, or extremely steep slopes, and can be found on north, south, east, and west facing slopes. Of the nests that have been identified, some are alone and 100-200 m away from the nearest nest (Loma Quemada); others are in loose clusters of 3 to 10 nests, grouped within a 20-50m radius (La Visite, Loma del Toro, Valle Nuevo; Anderson Jean, personal communication; Ernst Rupp, personal communication). Within a nesting area, clusters may be 100-200m away from each other (Wheeler et al. 2021).

Nest

Construction Process

Structure and Composition

Nest cups are often lined with leaf litter, pine needles, or feathers, but are also occasionally devoid of introduced materials (Ernst Rupp, personal communication).

Dimensions

Microclimate

Maintenance or Reuse of Nests

Eggs

Shape

Rounded-ovate.

Size

The average dimensions of 6 failed eggs collected in the Dominican Republic in 2018 were as follows: length 62.6 mm (55.9–66.3 mm ± 3.4 SD); breadth 46.2 mm (45.5–47.6 mm ± 0.7 SD) (YGS, unpublished data).

Eggshell Thickness

From 6 failed eggs collected in the Dominican Republic: 0.4 mm (0.3–0.5 mm ± 0.0 SD) (YGS, unpublished data).

Color and Surface Texture

White.

Clutch Size

Females lay a single egg.

Incubation

Information needed.

Hatching

Information needed.

Young Birds

Limited information exists on the early life of chicks. Camera trap information suggests that until 2–3 weeks old, chicks are guarded by an adult at all times. Later, chicks are left on their own while parents are foraging. Starting at 2.5–3 months old, chicks come out of the burrow at night to preen, stretch, and practice flapping (E. Rupp, personal communication).

Parental Care

Information needed.

Fledgling Stage

Chicks fledge at 3.5 months of age (Ernst Rupp, personal communication).

Immature Stage

Not reported; as in other *Pterodroma*, immatures are expected to remain at sea until they reach sexual maturity (expected to be at 3-5 years of age).

Demography and Populations

Measures of Breeding Activity

No information is available on colony occupancy (proportion of active nest sites) or annual adult return rate. Reproductive success is highly variable between years and nesting areas and can range from complete failure to presumed complete success at a given site (2). Estimates of annual reproductive success (chicks fledged/active nest) from 2012-2020 averaged 65.1% ± 24.5 SD (range 0–100; *n* = 406 nests: range 1–43 monitored active nests per year) (Wheeler et al. 2021).

Life Span and Survivorship

Information needed.

Disease and Body Parasites

Information needed.

Causes of Mortality

Causes of mortality are discussed in details in the most recent conservation update and action plan (Wheeler et al. 2021) and in Conservation and Management.

Exposure

Documented causes of direct mortality include fire and hurricane fallout.

Depredation

Introduced mammalian predators pose a direct threat to both adult petrels as well as eggs and nestlings.

Direct Human Impacts

Collisions and groundings due to telecommunication towers and light pollution have both led to direct mortality in Black-capped Petrel. In addition, direct harvest of adults has been a cause of mortality in the past, but does not seem to be a main source of mortality now (see Effects of Human Activity). In addition to those direct impacts, a number of impacts are suspected to cause mortality, including oil spills, attraction to and collision with marine infrastructure, fisheries bycatch, and mercury, plastics, and other environmental contaminants.

Population Status

Population Size

The global population size is estimated to be about 5,000 individuals. Little information is available on demography, and data collection may be confounded by variations in presence at sea (Howell and Patteson 2008). Known nests are currently only found on the island of Hispaniola (Dominican Republic and Haiti). Recent Black-capped Petrel flight activity near-shore or on-shore has been described for Cuba (Plasencia León et al. 2020, 2022), Jamaica (Brown 2016), Guadeloupe (Brown 2020a), and Dominica (Brown 2020b).

The use of marine radar (2012–present) has allowed researchers to locate Black-capped Petrel flight corridors and nest areas, as well as track local populations of petrels where radar targets are used as an index of petrel population (Wheeler et al. 2021). This index does not represent population size.

Dominican Republic

From 2010 to 2021, annual surveys for Black-capped Petrel have taken place via a variety of methods, including audio-visual, radar, and ground surveys (Rupp, Garrido and Wallace, 2012; Rupp and Garrido, 2013, 2016; Brown, 2014, 2017; Rupp, 2017, 2018). Known nesting colonies are found in both the Cordillera Central and Sierra de Bahoruco mountain ranges. Petrel-like flight activity observed via radar in the Sierra de Neiba also suggests possible petrel activity in that small mountain range. Petrel-like target numbers via radar suggest a population index of 597, with specific mountain range indices being: Cordillera Central, 140; Sierra de Bahoruco, 443; and Sierra de Neiba, 14.

Haiti

Known nesting colonies occur in both the Massif de la Selle and Massif de la Hotte mountain ranges. Radar surveys, audio-visual, and nesting surveys have shown widespread petrel activity throughout both of these major ranges (Brown, 2014, 2017; Jean *et al.*, 2018; Brown and Jean, 2019, 2020a, 2020b). Petrel-like target numbers via radar suggest a population index of 3,931, with specific mountain range indices being: Massif de la Selle, 3,856; and Massif de la Hotte, 75. Based on radar data, the La Visite Escarpment within La Visite National Park, located in the western end of the Massif de la Selle mountain range, likely has the largest nesting colony in the Caribbean.

Dominica

In 1820, the holotype of the species, RMNH 87022, was collected on Dominica; the species was considered widespread on the island at the time of this collection. The population diminished over time and the last known nesting petrel was in 1862; however, the species was still commonly observed offshore until the 1930s. Between 1936 and 2013, numerous petrels were observed flying over the island or on the ground within historic flyways. Two grounded petrels in 2007, another in 2013, and yet another in 2015 led to an expedition in 2015; during this expedition, radar and night vision equipment was used to locate and observe Black-capped Petrel (Brown 2015). Radar located 968 petrel-like targets, and 8 petrels were observed flying over land

with night vision. Following the passing of Hurricane Maria, a follow-up survey in 2020, also using radar and night vision, was completed at locations with high detection rates in 2015; the team observed 240 petrel-like targets at stations where a total of 691 were observed in 2015, and 6 petrels were also observed with night vision (Brown 2020). In January 2022, thermal binoculars were used to survey flyways around potential nesting areas on the island; a single petrel was observed, flying away from a suspected nesting area on Morne Micotrin (Satgé and Millischer 2022). While highly suspected, Black-capped Petrel is not known to currently nest on Dominica.

Guadeloupe

Black-capped Petrel was historically known to breed at the highest elevations on Guadeloupe. However, since the immense 8.4 magnitude earthquake of 1847, no petrels have been observed nesting. Recent confirmed observations of petrels offshore (Levesque and Yésou, 2005), as well as unconfirmed sightings of petrels flying overland (Chabrolle 2017), have provided evidence to support increased petrel monitoring efforts on Guadeloupe. Acoustic recording devices deployed on the slopes of Soufriere and Nez Cassé in 2016–2020 did not detect petrels. Radar was used in 2020, and 13 petrel-like targets were observed in the area of Soufriere (n = 9) and Nez Cassé (n = 4) (Brown 2020, Chabrolle et al. 2020). In January 2022, thermal binoculars were used to survey flyways around potential nesting areas; although no petrels were observed, one petrel was heard calling near a potential nesting area (Chabrolle and Millischer, personal observation). To date, there are no known Black-capped Petrel nests on Guadeloupe.

Jamaica

There are no known records of Black-capped Petrel nesting on Jamaica. However, observations of 46 Black-capped Petrels offshore in 2009 (Shirihai *et al.*, 2010) provided evidence that it might nest in remote areas in Jamaica. An expedition using radar and night vision equipment to locate overland petrels on Jamaica was completed in 2016 (Brown 2016), and 6 petrel-like targets were observed with radar near Cinchona on the slopes of Blue Mountain.

Cuba

There are no known records of nesting on Cuba. Regular observations of petrels just offshore along the southeast coast of Cuba in the area of the Sierra Maestra have led to speculation that petrels might nest in remote areas of mountains along that coastline. A number of published reports of petrels nesting on Cuba have since been clarified as misinformation and, in fact, were records of birds observed and captured from offshore areas (Lee and Viña Dávila, 1993). The most recent observations of Black-capped Petrel near Cuba were as follows: in 2004, 46 petrels were observed just offshore and flying towards the coast after sunset (Farnsworth et al. 2005); in 2019, 4 petrels were observed 800–1500m offshore (Pointon, eBird); in 2020, 6 petrels were observed within 1 km of the coast (Plasencia León et al. 2020); and in 2022, 28 petrels were observed from the coast (Plasencia León et al. 2022). All of these observations occurred along the southern coast of Cuba, near the town of La Bruja. To date, there are no known Black-capped Petrel nests on Cuba.

Conservation and Management

Conservation Status

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 at 2,000–4,000 birds. Five-year follow-up radar surveys in 2017 (Hispaniola) and 2020 (Dominica) do suggest population declines are ongoing (Brown 2017, 2020), as does loss of suitable habitat in Hispaniola, including at known nesting areas (Satgé et al. 2020).

Effects of Human Activity

Wheeler et al. (2021) provides a threat assessment based on field documentation from 2010–2021 and earlier descriptions of hazards to the species (Simons et al. 2013)(BirdLife International, 2018; U.S. Fish and Wildlife Service, 2018). Among threats of direct mortality, predation by introduced mammals was rated as a High threat in all nesting locations. Fire mortality and tower collisions and groundings were high for some locations. The threats of nesting habitat degradation and loss due to agricultural expansion were Very High at nesting sites in Haiti. Other threats to habitat considered High in some locations were expansion of grazing, rooting feral pigs, and collection of forest resources. For threats to Black-capped Petrels at sea, threats that directly affected foraging birds (adults and subadults) and, indirectly, their offspring on land, were assessed. All marine threats were rated Medium or Low; there is, however, a notable amount of uncertainty associated with marine exposures and impacts.

Habitat Loss and Degradation

Agricultural Expansion

All remaining habitat in Haiti is adjacent to human communities. Observed deforestation at known and probable Haitian nesting sites is primarily for row crop agriculture, undertaken by people who struggle economically and lack environmental knowledge and, as a result, use unsustainable agronomic techniques. 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 (Food and Agriculture Organization of the United Nations (FAO), 2010; Churches *et al.*, 2014; Pauleus and Aide, 2020).

In all countries, most of the confirmed, probable, or suspected nesting sites fall within protected area boundaries (i.e., national parks and reserves). 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 generally better protected from conversion, although incursions into parks for commercial and subsistence agriculture have occurred.

Expansion of Grazing and 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 and Invasive Ferns

Fires lit intentionally (for clearing underbrush) are rarely big enough to destroy trees or 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 area in the Dominican Republic; these fern thickets are too dense for petrel use and are an obstruction to field teams (E. Rupp, personal observation).

Fire Mortality

Petrels may die in natural or intentional forest fires affecting nesting areas; fires can be fatal to adults, chicks, or eggs in burrows depending on severity. In addition, petrels are attracted to large fires burning at night during peak breeding season and there are documented cases of as many as 100 petrels being killed by flying into fires (International Black-capped Petrel Conservation Group (IBPCG), 2014; Brown and Jean, 2019). In early 2021, forest fires of high-intensity threatened colonies on the Haiti-Dominican border; camera traps on confirmed nests captured images of smoke and flames, which destroyed nearby buildings and towers (International Black-capped Petrel Conservation Group (IBPCG), 2021).

Wood Harvest and 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, Haiti, the recent harvest of live tree ferns (sold for landscaping purposes) has impacted Black-capped Petrel reproduction (Jean et al. 2018).

Effects of Invasive Species

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

Monitoring at Hispaniolan sites has shown that the presence of cats and mongoose can cause reproductive failure of an entire colony (Rupp 2018, Brown and Jean 2019). Predation by rats has not been documented, but based on work with other *Pterodroma*, they probably are predators of eggs and young chicks. Direct mortality of adult petrels by dogs was documented at two confirmed sites in late 2020 and early 2021 International Black-capped Petrel Conservation Group (IBPCG) 2021). Although not yet documented for Black-capped Petrel, depredation by cats is likely; in other parts of the world, single cats have caused numerous adult fatalities ((Faulquier *et al.*, 2009); A. Raine, personal communication). Rooting feral pigs destroy petrel burrows and can depredate burrow occupants (Rodríguez et al. 2019); feral pig presence is most notable at Loma Quemada (Dominican Republic), Dominica, and Guadeloupe.

Shooting and Trapping

Systematic harvest of Black-capped Petrel as a food source is known only from historical records; planned collection has not been documented in recent times. Petrels killed in fires, or discovered as habitat is being cleared, are sometimes collected for human consumption, but this harvest appears to be purely opportunistic (E. Rupp, J. Goetz, A. Jean, personal communication).

Pesticides and Other Contaminants/Toxics

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 southern 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, Callies and Fleet, 2009). Exploration is ongoing in the southeastern Canadian Exclusive Economic Zone, with the possibility of future oil extraction in this area used by some petrels (Satgé et al. 2022).

Collisions with Stationary/Moving Structures or Objects

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 birds participating 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 Norris and Rupp, 2012).

Black-capped Petrel, like many other seabird species, is 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 (E. Rupp, personal communication).

Bird landed on the ground attracted to light of the cell phone tower; Ouest, Haiti. Jim Tietz. 09 February 2013. Ouest, Haiti. eBird 12976088; Macaulay Library ML 390665571

At sea, 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 collision with trawling cables, attraction to lighted vessels, or entanglement in gear (Zhou, Jiao and Browder, 2019). A petrel was documented colliding with a fisheries research vessel in the northern Gulf of Mexico in late July 2018 (J. C. Haney, personal communication).

Management

Conservation Measures and Habitat Management

Wheeler et al. (2021) developed multiple strategies for the conservation of Black-capped Petrel. Most of these strategies directly address land-based and at-sea threats, although some are aimed at overcoming the challenges posed by lack of information and lack of local capacity. A few strategies are well underway, while others are in preliminary stages. One that has yet to be commenced is colony restoration through social attraction and translocation—methods that have been effective for other imperiled petrel species. It is recommended that exploration of restoration methods begin with undertaking a detailed analysis/feasibility study of translocation and social attraction with respect to Black-capped Petrel, evaluating efficacy, cost and logistics, and best practice techniques. The conservation of Black-capped Petrel relies on engaging individuals and organizations that operate on the local to national scales. Therefore, direct conservation measures and management activities are accompanied by efforts to enable in-country capacity (e.g., institutional strengthening and relationship building as well as technical and project management skills).

Reducing Predator Pressure

Since locating nests on Hispaniola for the first time in 2011, petrel field teams have been collecting information about the presence and effects of introduced mammalian predators with camera traps. In some locations, limited live trapping has been conducted. Plans are underway to

increase the duration of the live trapping effort and identify unattended, automatic-resetting lethal traps safe for native wildlife. Eradication is impossible on Hispaniola and fencing is not currently feasible.

Reducing Collisions and Groundings

The International Black-capped Petrel Conservation 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. Letters and briefings have been shared for private tower owners and government agencies with recommendations to reduce collisions and groundings. Outreach with information on rescue and release protocols have been circulated to park guards and communities along petrel flyways.

Community Development to Reduce Loss and Degradation of Habitat

Although located in protected areas, nesting sites in Haiti face loss and degradation due to expanding agriculture practiced by nearby communities. In one community on the border between Haiti and the Dominican Republic, Boukan Chat, agro-ecological programs are underway to improve yields in existing fields and foster tree crops as a long-term farming option. Other community development strategies ongoing or under development in Boukan Chat include environmental awareness and education programs, as well as methods of economic empowerment.

Park Management in the Dominican Republic

All nesting sites in the Dominican Republic fall within national parks. Local partners foster collaboration with park administrators for expertise on petrels and petrel habitat, seek public engagement to gain public backing, and showcase habitat restoration projects to park administrators.

Addressing Threats at Sea Through Advocacy

Given the scope of marine threats (reduced prey availability, plastics and other pollutants, and oil spills), the most effective and feasible interventions are to advocate for the species' interest in the realm of marine policies, by highlighting Black-capped Petrel in science/policy forums and contributing data to regulatory agencies.

Effectiveness of Measures

The effectiveness of direct measures has been limited to date as they have only commenced in recent years and in few locations. For example, reduction of predator pressure has not yet been achieved; reduction of collisions and groundings has been achieved only locally (i.e., removal of a spotlight at a particularly dangerous tower on Tet Kay Jak); and outreach about petrel groundings has resulted in increased reporting, and a small number of downed birds have been successfully recovered and released in recent years in both Haiti and Dominican Republic.

The strategies to manage habitat involve multiple interconnected steps, and take many years to resolve. Only the effectiveness of initial steps can be assessed at this time. Community development strategies in Boukan Chat were made possible by building relationships, undertaking consultations, and supporting development work in the town. Agro-ecological training and public outreach about petrels have been well-received and the local villagers have expressed support for petrel field work. Detailed mapping to assess crop conversions and associated habitat effects has yet to take place. Engagement with Dominican Republic park authorities has been effective in that Grupo Jaragua and other field practitioners regularly engage staff at the Ministry of the Environment to obtain permits and arrange logistics for field work. Under some administrations, government involvement and support in conservation projects has been significant, with regular dialogue between organization executives, combined planning exercises, and arrangements in which management projects are viewed as partnerships or collaborations.

The effectiveness of advocacy in order to address threats at sea is difficult to gauge, given the scope of at-sea threats. However, advocacy has resulted in the elevation of Black-capped Petrel in national and international policy instruments (e.g., inclusion in SPAW-RAC Appendix, proposed listing under the U.S. Endangered Species Act.)

Priorities for Future Research

Introduction

The Appendix 7: Information Needs in Wheeler et al. (2021) summarizes the most critical information gaps with regards to Black-capped Petrel conservation. These gaps relate to rating threats, assessing status (i.e., key ecological attributes used as measures of success), and developing and implementing strategies.

Research is needed to understand the impact of threats on the viability of Black-capped Petrel, especially threats rated as High or associated with high uncertainty. Impact of a threat is defined as the changes in population vital rates and the extent of the population that is affected. There are notable gaps on some basic natural history parameters used to assess petrel population viability. These include (but are not limited to) life span, age at sexual maturity, survival rates of adults and immatures, food selection, and marine distribution of immatures. Wheeler et al. (2021) identified seven Key Ecological Attributes (KEAs) to define the health of Black-capped Petrel and its nesting habitat. These relate to demographic parameters (population size, productivity, survival) and habitat parameters (distribution, intactness and management). For three KEAs, 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. Ongoing monitoring is necessary to acquire the indicator data to track all KEAs.

Finally, there are priority research needs associated with the conservation strategies recommended for Black-capped Petrel. These included testing of methods or protocols (especially related to predator reduction and habitat restoration), as well as the assumptions underlying selected interventions (especially related to community development). To address the latter, social science is needed along with biological and ecological

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