

FORAGING AREAS OF NESTING AINLEY'S STORM PETREL *HYDROBATES CHEIMOMNESTES*

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ABSTRACT

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Acquiring basic knowledge such as at-sea distribution is often difficult for cryptic seabird species. Northern storm petrels (Hydrobatidae) are one family of seabirds that includes several cryptic species, including Ainley's Storm Petrel *Hydrobates cheimomnestes*, which appears quite similar to southern Leach's *H. leucorhous* and Townsend's *H. socorroensis* Storm Petrels when at sea. For the first time, we describe the at-sea distribution of breeding Ainley's Storm Petrels obtained using GPS tracking. We found that these birds visit waters of the eastern North Pacific between central Baja California, Mexico and southern Alta California, USA. These findings expand existing knowledge of the range of this species, which had previously been based on a few at-sea sightings and specimens.

Key words: GPS-tracking, Leach's Storm Petrel, seabird, Townsend's Storm Petrel, California, Baja California

INTRODUCTION

Cryptic speciation refers to the genetic divergence of species with little or no morphological differentiation. This process is widespread in Procellariiformes, including albatrosses (Eda *et al.* 2020, Abeyrama *et al.* 2021), shearwaters (Rodríguez *et al.* 2020), and storm petrels (Taylor *et al.* 2018). Due to a lack of clearly discernable morphological differences, most cryptic bird species have been described only recently, aided by the advent of molecular techniques. Teasing these species apart at sea is challenging, and therefore, we lack a basic understanding of species-specific attributes such as their distribution, which is essential for conservation planning (Bernard *et al.* 2021).

One way to determine the distribution of cryptic seabirds is to use devices such as GPS loggers and light-level geolocators to track their movements. To date, the use of GPS devices has allowed the detailed description of the movements of dozens of species of medium- and large-sized seabirds (Bernard *et al.* 2021). However, the progressive miniaturization of GPS loggers has only recently reached a size appropriate for tracking foraging trips among the smallest seabirds: the storm petrels (e.g., Rotger *et al.* 2020, Bolton 2021, Collins *et al.* 2022).

Ainley's Storm Petrel *Hydrobates cheimomnestes* and Townsend's Storm Petrel *H. socorroensis* are two cryptic species that have recently been separated from the clade of the Leach's Storm Petrel *H. leucorhous* based on morphological and vocal differences (Ainley 1980, Howell 2012, Kratter 2016, Chesser *et al.* 2021). While both species breed in islets surrounding Guadalupe Island off the west coast of Baja California, Mexico, their speciation was driven, at least in part, by an allochronic process, i.e., divergence by way of their timing of breeding as well as vocalizations (see Ainley 1980). The at-sea identification of these two cryptic taxa is fraught with

uncertainty (Howell 2012, Howell & Zufelt 2019), and Ainley's Storm Petrel is particularly difficult to distinguish from Leach's Storm Petrel, in part owing to their similar coloration and a southward reduction in body size of the latter, making the body sizes of both species similar (Ainley 1980, Howell & Zufelt 2019). The only characteristic that can be used reliably to distinguish these two species at sea is the timing of adult wing molt. Storm petrels replace their flight feathers after breeding; thus, adult Ainley's Storm Petrels begin replacement at the end of the winter, whereas adult Leach's and Townsend's Storm Petrels begin replacement at the end of summer (Howell 2015, Howell & Zufelt 2019). Unsurprisingly, maps of the distribution of Ainley's Storm Petrels contain many question marks (e.g., Howell 2012, Howell & Zufelt 2019). In this note, we describe results from the biologging of breeding Ainley's Storm Petrels.

METHODS

We deployed miniaturized GPS loggers (NanoGeo-mini from Pathtrack, Otley, UK, weighing 0.9 g) on adult Ainley's Storm Petrels that were incubating eggs or feeding chicks between December 2021 and February 2022 at Morro Prieto Islet (known also as Islote Negro, 28.906°N, -118.288°W). These devices collected one position every 2 hours. This is a small islet off the southern tip of Guadalupe Island. Loggers were attached to the tail with Tesa tape. To minimize the detrimental effects of the tags, logger weight was always < 3% of the body mass of the birds. Deployment and recovery of GPS loggers and sampling procedures took less than five minutes per bird and had no visible detrimental effects on the birds.

RESULTS AND DISCUSSION

We obtained data from a total of 57 foraging trips from 34 different adult, breeding Ainley's Storm Petrels (Fig. 1). Most of the flights

occurred within the Mexican Exclusive Economic Zone (EEZ), especially in the area south of Guadalupe Island, as far as Cedros and San Benito islands, Baja California (Fig. 1). Birds remained in pelagic waters off the continental shelf. Several individuals also visited waters off Southern California, within the United States EEZ. This confirms, for the first time, the presence of Ainley's Storm Petrel in US waters.

The area in which Ainley's Storm Petrels were found to occur during the breeding season is frequented by several other storm petrel species during summer, including Ashy Storm Petrel *H. homochroa*, Black Storm Petrel *H. melania*, Least Storm Petrel *H. microsoma*, Leach's Storm Petrel, and presumably Townsend's Storm Petrel (Howell 2012, Howell & Zufelt 2019). Different color morphs of Leach's Storm Petrel also occur in this area (Ainley 1980). Whether some individuals of Ainley's Storm Petrel occur in these waters during summer remains to be determined. Why there exists such a diversity of storm petrels in this region during summer remains an ongoing question, first posed by Spear & Ainley (2007). Our study has only described the distribution of adult Ainley's Storm Petrels during their breeding season (boreal winter), leaving its distribution during the non-breeding season (boreal summer) open to conjecture (e.g., Howell & Zufelt 2019). We suggest the use of geolocators to track this species' movements year-round, which will provide insight into the importance of areas of the eastern Pacific Ocean over an entire annual cycle.

Visitation of US waters by Ainley's Storm Petrel has important conservation implications. Notably, because this species is globally assessed as Vulnerable by the IUCN (BirdLife International, 2018), it may qualify for listing under the US Endangered Species Act. If so, this will necessitate the development of agreements between the governments of Mexico and the US to create synergistic strategies to protect this species. This may include the regulation of light pollution on the coast and at sea to minimize collisions, which has been suggested for other endangered storm petrel species in California and Baja California (Carter *et al.* 2016).

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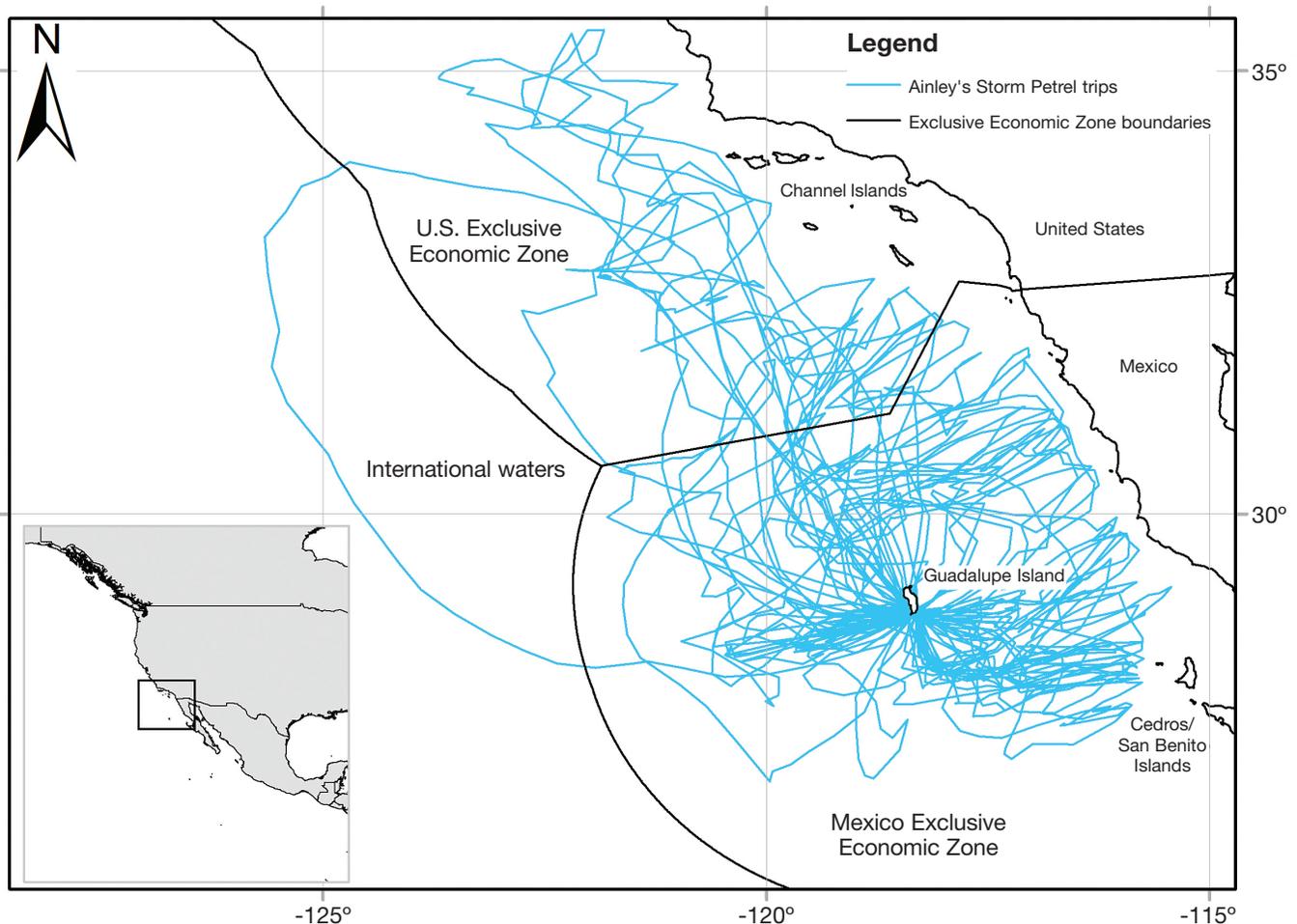


Fig. 1. Areas visited by adult, breeding Ainley's Storm Petrels *Hydrobates cheimomnestes* tracked from their breeding site at Guadalupe Island, Mexico, December 2021–February 2022.

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