NOTES ON THE BREEDING POPULATION OF THE POLYNESIAN STORM PETREL *NESOFREGETTA FULIGINOSA* ON MOTU MOTIRO HIVA (SALAS Y GÓMEZ ISLAND), EASTERN SOUTH PACIFIC

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ABSTRACT

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The Polynesian Storm Petrel is an endangered seabird found in the tropical Pacific Ocean. Despite its critical conservation status, little is known about its population, its breeding biology, and the threats facing it. We provide information about its reproductive status, nesting areas, and plastic ingestion on the remote island of Motu Motiro Hiva. In seven visits between 2012 and 2024, we found breeding activity to occur from August to November, with nesting cavities located primarily on the rocky areas of the east and southeast sectors of the island. We found an extremely high incidence of plastic ingestion in the 15 stomachs collected (100%). Our study provides relevant information on the reproductive biology of this species in an active colony and shows an abundance of marine debris at the site, indicating an urgent need to stop the entry of this debris into the ocean.

Key words: endangered species, Polynesian Storm Petrel, plastic ingestion, Salas y Gómez Island, Southeast Pacific

INTRODUCTION

The Polynesian Storm Petrel *Nesofregetta fuliginosa* is a tropical seabird, considered endangered due to its small and declining population (BirdLife International, 2018). The species is restricted to the tropical Pacific Ocean, with breeding colonies throughout Polynesia, including New Caledonia; Kiribati (including the Line and Phoenix Islands); the Austral, Society, Marquesas, and Gambier Islands (French Polynesia); Jarvis Island and American Samoa (US); and Motu Motiro Hiva (also known as Salas y Gómez Island; Chile) (Carboneras et al., 2020). Our current knowledge of its breeding ecology is limited due to logistical difficulties in conducting surveys at these remote locations. For instance, the population size is still under debate. BirdLife International (2018) reported that the global population size may be as low as 250–999 mature individuals (i.e., breeders), while Thibault and Cibois (2017) reported a much larger population of 2,000–3,000 individuals just in eastern Polynesia. Moreover, while Brooke (2004) estimated a world population of 10,000 individuals, Spear and Ainley (2007), on the basis of at-sea surveys, estimated seasonal abundances in the eastern Pacific ranging from 20,800 to 52,300 individuals (including all status classes: adult breeders, failed breeders, subadult prebreeders, and juveniles). The main global threats to this species are alien invasive species, the harvesting of birds and eggs for human consumption, guano mining, and military activities (BirdLife International, 2018). In addition, there have been reports of plastic ingestion (Spear et al., 1995, but only among associated species) and the use of plastic debris as nesting material, which could cause injury or mortality due to entanglement (Hidalgo-Ruz et al., 2021; Luna-Jorquera et al., 2019; Miranda-Urbina et al., 2015; Thiel et al., 2018). Little is known, however, about the importance of this threat.

Motu Motiro Hiva (26°28′19.6″S, 105°21′45.3″W) is an uninhabited (by humans) small island (0.17 km^2) located ~400 km northeast of Rapa Nui in the eastern South Pacific (Fig. 1A). This island is an emerged seamount in the Salas y Gómez Ridge that spans ~2,900 km and is considered a marine biodiversity hotspot (Gaymer et al., 2025; Wagner et al., 2021). The island is an important breeding site for at least 12 seabird species (Flores et al., 2014; Luna-Jorquera et al., 2019), and the Motu Motiro Hiva Marine Park protects the surrounding waters. Herein, we summarize observations about reproductive status, nesting areas, and plastic ingestion for the Polynesian Storm Petrel population on this island.

METHODS

We visited Motu Motiro Hiva on seven occasions between 2012 and 2024. Surveys were conducted at different times of the year: November 2012, September 2014, late June 2015, September 2015, early June 2017, late August 2018, and November 2024. During these surveys, we recorded the reproductive status of the storm petrel, and we mapped and characterized breeding colonies; however, due to time limitations, we could not survey the entire island and thus we could not calculate the total number of breeding pairs.

We collected 15 stomachs from mummified carcasses found around colonies in 2012 (n = 8), 2014 (n = 1), and 2015 (n = 6), which were analyzed for plastic ingestion. Once in the laboratory, we followed standardized protocols (van Franeker, 2004). We extracted stomach contents, which were visually inspected for anthropogenic litter, removing items of natural origin (e.g., pumice, squid beaks, shells). Plastic items visible to the naked eye were removed, rinsed in

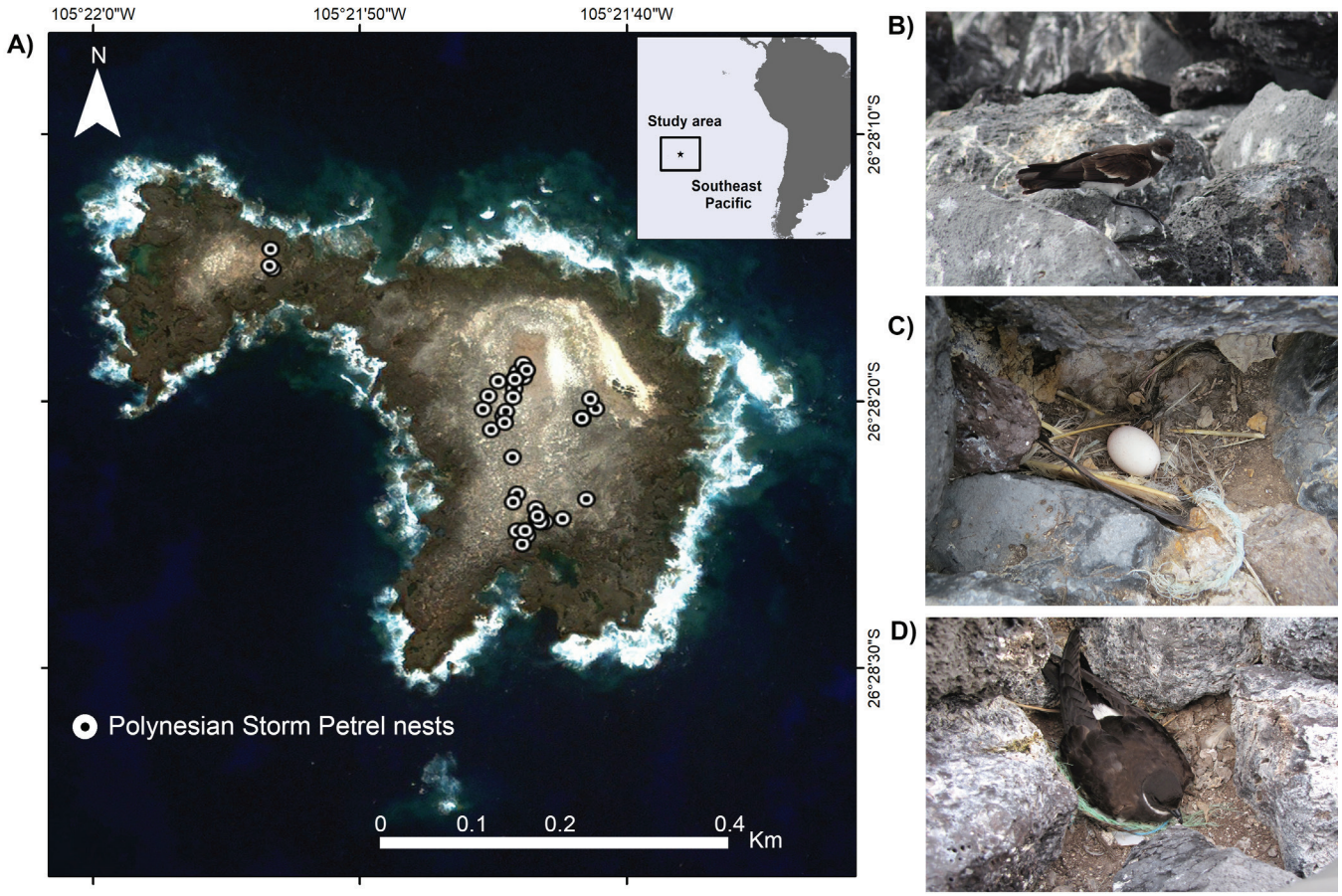

Fig. 1. Motu Motiro Hiva, showing nesting areas (A); breeding habitat (B); and nesting materials (C and D) of the Polynesian Storm Petrel *Nesofregetta fuliginosa*. Photos by Matías Portflitt-Toro

distilled water, and air-dried. The plastic contents of each individual stomach were separated by type: fishing line, pellets, and fragments (we did not find foam or sheets). Plastic fragments and pellets were classified into the following color groups: white (including clear and cream), yellow, blue/purple, red/orange, green, and brown/black. The presence of plastic items in the crop, proventriculus, and gizzard could not be determined due to the mummified state of the carcasses. Plastic items (i.e., fragments, pellets, and lines) were quantified as the number of total items per individual.

RESULTS AND DISCUSSION

Breeding status

Signs of breeding activity (eggs or chicks) were found on visits in August and September (austral winter) and in November (spring). During our visits in June (early winter and autumn), no eggs or chicks were found. This result contrasts with previous studies from other islands (e.g., in Kiribati and the Australs) where breeding occurs throughout the year (Onley & Scofield, 2007; Pierce et al., 2020). Nesting cavities were found primarily in the rocky areas of the east and southeast parts of the island (Fig. 1A). Four studies have previously reported breeding birds on Motu Motiro Hiva. Schlatter (1984) suggested that the species might nest on the island but did not specify any nest counts. Harrison and Jehl (1988) reported two nearly fledged chicks but did not report any other signs of breeding. Vilina and Gazitua (1999) conducted the most exhaustive study to date, estimating 100 breeding pairs in early December, and reported the presence of nests in the same areas as our study. Finally, Lazo (2011) mentioned that no eggs or chicks were observed in February but reported the presence of breeding birds in September (but did no nest count). On the basis of this background, we infer that breeding activity (presence of eggs and chicks) typically occurs at least between August and December. During our most recent visit to the island in November 2024, we identified 20 active nests. However, in previous years we recorded at least 75 adult individuals in flight, so we believe the population is larger.

It has been reported that the Polynesian Storm Petrel can build nests in different environments and substrates, such as in small caves, under rocks covered by vegetation, in burrows dug by the birds themselves, and inside tussocks of grasses (Pierce et al., 2020; Thibault & Cibois, 2017). We found nests situated in volcanic rock fields with almost no adjacent vegetation and built within cavities and crevices. The nests contained feathers, dry seaweeds, and marine litter, such as ropes, fishing nets, and plastic fragments (Fig. 1B, C, and D). The presence of plastic in Polynesian Storm Petrel nests raises concerns about the possibility of injury and entanglement in this synthetic nesting substrate.

Plastic ingestion

Plastic debris was present in every stomach examined (n = 15). The mean number of debris items per bird was

79.7 (range = 7–486). Fragments (72.7%) were the dominant type of ingested plastic, followed by lines (26.2%) and pellets (1.1%) (Table 1, Fig. 2). The predominant color of fragments and pellets was white (48.7%), followed by yellow (31.8%) (Fig. 3). Similar results have been reported in Tristram's Storm Petrel *Hydrobates tristrami* and Swinhoe's Storm Petrel *H. monorhis*, with large numbers of pieces per individual and high proportions of fragments and light colors (Kim et al., 2023; Youngren et al., 2018). Even though the number of individuals we analyzed was small, the 100% prevalence of plastic ingestion is alarming. Spear et al. (1995) analyzed 14 Polynesian Storm

TABLE 1
Sample sizes of birds and types and counts of plastic debris ingested by Polynesian Storm Petrels *Nesofregetta fuliginosa* on Motu Motiro Hiva

Year	Birds (*n*)	Fragments	Pellets	Lines
2012	8	150	1	136
2014	1	61	0	39
2015	6	659	12	138
Total	15	870	13	313

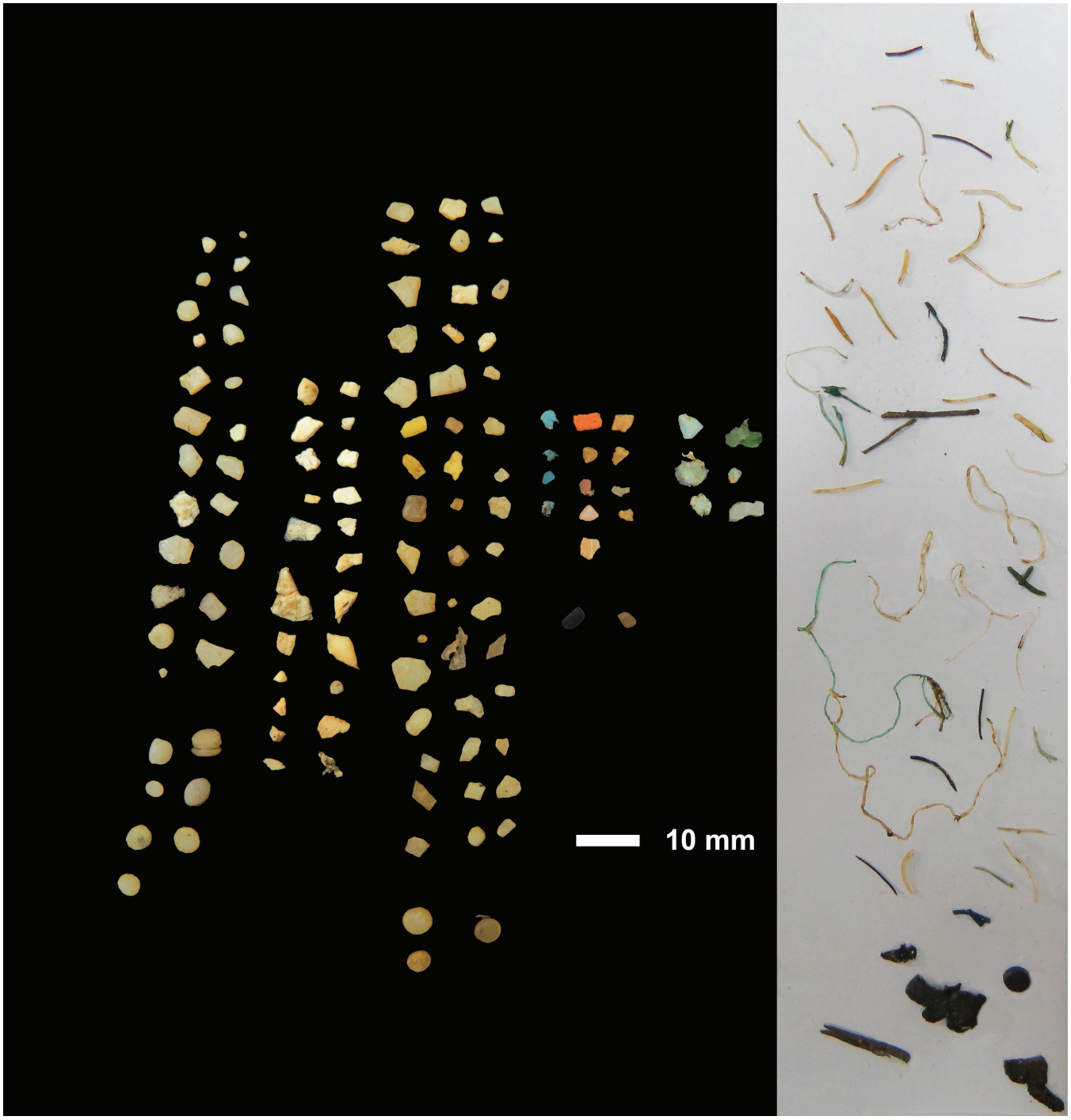

Fig. 2. Types of ingested plastic debris found in one Polynesian Storm Petrel *Nesofregetta fuliginosa* individual on Motu Motiro Hiva (Salas y Gómez Island). Photo credit: Matías Portflitt-Toro

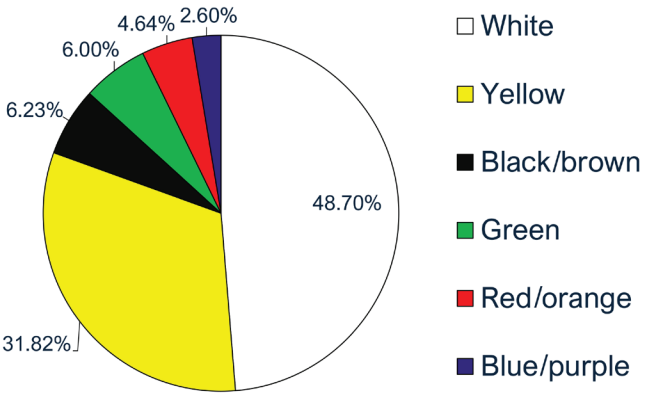

Fig. 3. Percent composition by color of plastic debris ingested by Polynesian Storm Petrels *Nesofregetta fuliginosa* sampled on Motu Motiro Hiva.

Petrel individuals collected in the tropical Pacific and did not find plastic in stomachs, which could indicate that plastic pollution is a new threat to this species or specific to our study area. However, they did find ingestion among co-occurring seabird species. Recent studies show that storm petrels are one of the groups most susceptible to marine debris ingestion, especially those that forage in or near marine debris hotspots (Roman et al., 2019; Spear et al., 1995). The high concentration of marine debris in the waters surrounding Motu Motiro Hiva (Thiel et al., 2018; van Gennip et al., 2019) poses a significant threat to Polynesian Storm Petrels nesting on Motu Motiro Hiva because of the deleterious effects plastic ingestion can have on seabirds (Charlton-Howard et al., 2023; Lavers et al., 2014; Senko et al., 2020). Indeed, Spear et al. (1995) found that White-faced Storm Petrels *Pelagodroma marina* that had high loads of ingested plastic were of low body weight.

Although the island has no invasive species preying on birds or eggs, plastic pollution is an emerging threat in need of attention. Quantifying the risk posed by plastic pollution to this endangered species would undoubtedly be useful, alongside increased monitoring of their breeding status and population size. Although Motu Motiro Hiva is situated in the Motu Motiro Hiva Marine Park, it receives a substantial amount of plastic litter from the coast of South America and the fishing industry (Luna-Jorquera et al., 2019). There is an urgent need to prevent marine litter from entering the ocean and to generate a global plastics treaty, as proposed by some Pacific island nations threatened by plastic pollution (Eriksen et al., 2023; Norris et al., 2024).

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AUTHOR CONTRIBUTIONS

MPT and JS: Conceptualization, fieldwork, data curation, visualization, and writing of the original draft. GLJ: Data curation, writing—review & editing, and project administration. KDH: Writing—review & editing.

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