

Year-round distribution and foraging behaviour of Icelandic Leach's and European Storm-petrel populations revealed

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Introduction

- Two storm-petrel species breed sympatrically in Iceland in the southern Vestmannaeyjar archipelago. Research suggests the globally red-listed Leach's Storm-petrel (*Hydrobates leucorhous*; LSP; Fig. 1) population is in decline (decreasing 40 - 49% locally since 1991¹), while European Storm-petrel (*Hydrobates pelagicus*; ESP; Fig. 2) appears stable.
- With an apparent lack of population-level threat on-land in Iceland, there is urgent need to understand exposure to risks at sea. However, the at-sea distribution of Icelandic populations of both species is poorly known.
- Thus, for Icelandic LSP and ESP we aim to:
 1. identify year-round at-sea distribution
 2. gain first insights into foraging behaviour



Figure 1. Leach's Storm-petrel



Figure 2. European Storm-petrel

Methods

- GPS loggers (<1g, set to 2h resolution; Fig. 3) were deployed for 10 days on both species during incubation. Following retrieval, foraging trip metrics were calculated and compared between species and Hidden Markov Models used to classify behavioural states (intensive foraging, extensive foraging, transit²) based on step length and turning angle.
- GLS (global location sensor) light-level loggers (Fig. 4) were deployed year-round for both species (<0.5g, positional data gathered twice daily). Locations were generated and, for LSP, kernel densities used to estimate winter utilization distributions (50, 75 and 90%).



Figure 3. GPS tail-deployment on ESP



Figure 4. GLS prior to deployment on LSP

Results

- In 2022-23, GPS were retrieved from 39 LSP and 21 ESP. Positional data (Fig. 5) for individual trips and trip characteristics for both species (Table 1) were obtained and areas of intensive foraging identified (Figs. 6 and 7).

Table 1. LSP and ESP foraging trip characteristics during incubation.

	LSP	ESP
Trip Duration	1.7 ± 1.1 days	2.4 ± 1.1 days
Max Distance	171 ± 121 km	193 ± 116 km
Total Distance	551 ± 410 km	588 ± 354 km

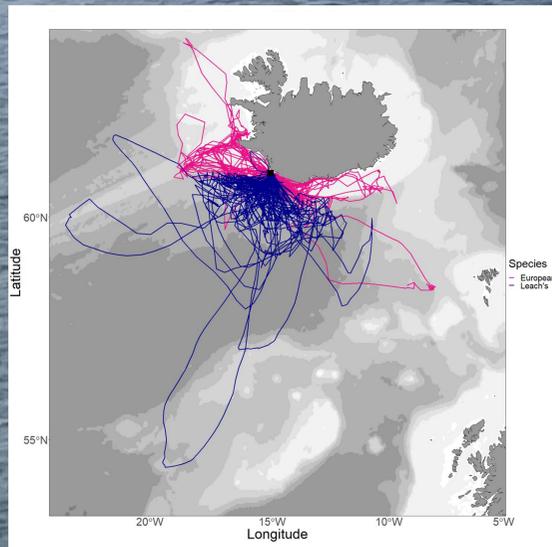


Figure 5. LSP (blue) and ESP (pink) GPS tracks compared.

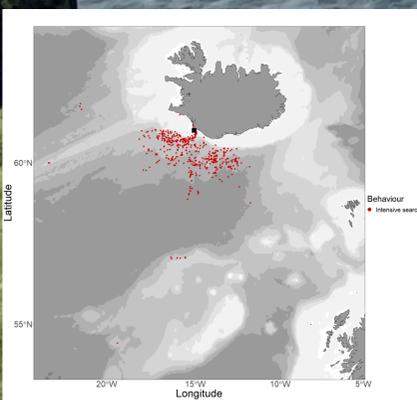


Figure 6. Areas of intensive foraging for LSP.

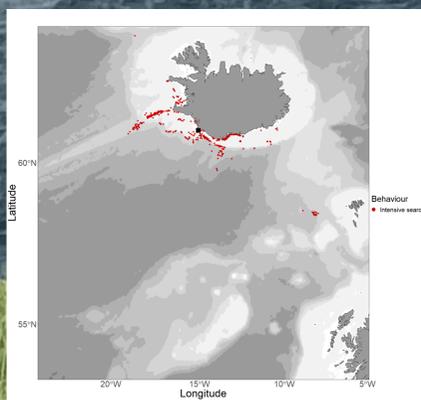


Figure 7. Areas of intensive foraging for ESP.

- GLS were retrieved for 26 LSP from 2020 to 2023 and for two ESP in 2023. Winter utilization distributions (November to February) for LSP show areas of core use in pelagic waters off western and southern Africa (Fig. 8). Initial raw positional data for two ESP indicates wintering sites off coastal South Africa and Namibia (Figs. 9 and 10).

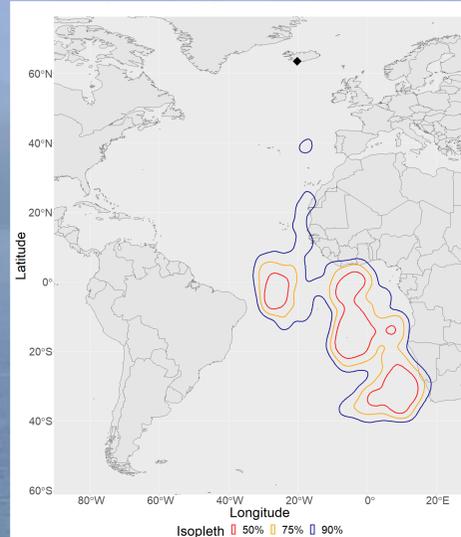


Figure 8. Areas of core use for LSP in winter (kernel density estimates).

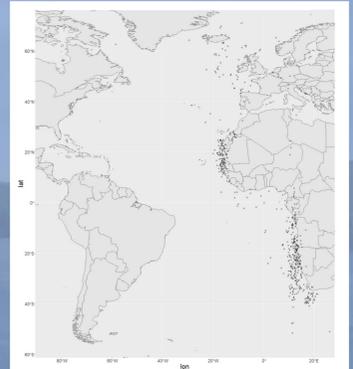


Figure 9. Year-round raw positional data for ESP CH334, indicating winter foraging off coastal Namibia and South Africa.



Figure 10. Year-round raw positional data for ESP CH301, indicating winter foraging off coastal Namibia and South Africa.

Discussion

- The at-sea habitat use and core foraging areas of Icelandic LSP and ESP are identified for the first time, revealing notable segregation.
- In summer, Icelandic LSP forage primarily in pelagic waters off the continental shelf, mirroring movements of Canadian populations of LSP that feed on mesopelagic fish, such as Myctophids³, during breeding. In contrast, ESP forage in more shallow, coastal areas within the continental shelf, such as the Reykjanes Ridge, a productive area with abundant zooplankton⁴.
- Though current GLS data for ESP relates to two individuals (c.f. 26 for LSP), initial findings suggest that segregation between LSP and ESP (favouring deeper and more shallow waters respectively) appears to continue year-round, through breeding, migration and over winter.
- Work is ongoing to analyse diet as a possible driver of at-sea distribution, through conventional analysis of regurgitates and DNA metabarcoding of faecal samples for summer diet and Stable Isotope Analysis (SIA) of feather samples for winter. GPS and GLS tracking of both species remains ongoing, with GPS and GLS devices deployed this summer.
- Greater understanding of at-sea distribution and foraging ecology will benefit future assessment of at-sea risk for both species, helping conserve populations of LSP and ESP in Iceland and throughout their Atlantic range.

Acknowledgements

- Many thanks to our boat captain, Haraldur Geir "Alligator" Hlökkversonn, for getting us to the islands and always keeping us safe. Thanks, too, to the small army of dedicated field assistants and volunteers without whom it would not have been possible to gather this data: Rosanne Baukeboom, Mónica Madrigal Beckford, Solenn Boucher, Rodrigo A. Martínez Catalan, Uéline Courcoux-Caro, Piotr K Eljasik, Björg Harðardóttir, Servane Kiss, Alejandra Luzon, Crys Moosman, and Sylwia Zbijewska.
- We would also like to express our gratitude to the following organizations for helping fund this work: Rannís (the Icelandic Centre for Research), Náttúrustofa Suðurlands (the South Iceland Nature Research Centre), Environment and Climate Change Canada, Seatrack and the Seabird Group.
- Lastly, sincere thanks to Bart Verduyck for providing the beautiful photos of storm-petrels at night (Figs. 1 and 2).

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