Agreement on the Conservation of Albatrosses and Petrels

Joint Eleventh Meeting of the Seabird Bycatch Working Group and Seventh Meeting of the Population and Conservation Status Working Group

Edinburgh, United Kingdom, 18 May 2023

Combining tracking with at-sea surveys to improve occurrence and distribution estimates of two threatened seabirds in Peru

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Fischer, J.H, Bose, SB., Romero, C., Charteris, M., Crowe, P., Parker, G.C., Ray, S., Rexer-Huber, K., Sagar, P.M., Thompson, D.R., Bell, E., Debski, I., and Quiñones, J. 2023. Combining Tracking with at-sea surveys to improve occurrence and distribution estimates of two threatened seabirds in Peru. Bird Conservation International 33: e41: https://doi.org/10.1017/S0959270922000442.

SUMMARY

Seabirds are highly threatened, including by fisheries bycatch. Accurate understanding of offshore distribution of seabirds is crucial to address this threat. Tracking technologies revolutionised insights into seabird distributions but tracking data may contain a variety of biases.

We tracked two threatened seabirds (Salvin's Albatross *Thalassarche salvini n* = 60 and Black Petrel *Procellaria parkinsoni n* = 46) from their breeding colonies in Aotearoa (New Zealand) to their non-breeding grounds in South America, including Peru, while simultaneously completing seven surveys in Peruvian waters. We then used species distribution models to predict occurrence and distribution using either data source alone, and both data sources combined.

Results showed seasonal differences between estimates of occurrence and distribution when using data sources independently. Combining data resulted in more balanced insights into occurrence and distributions, and reduced uncertainty. Most notably, both species were predicted to occur in Peruvian waters during all four annual quarters. Salvin's Albatross occurrence in Peru was centred around the Humboldt upwelling system and the continental slope, peaking during Apr-Jun and decreasing over in Jul-Dec to a low during

Jan-Mar. Black Petrel occurrence in Peru was centred in the Peru basin and northern continental shelf waters, increasing during Oct-Jun and peaking in Jul-Sep.

Our results highlighted that relying on a single data source may introduce biases into distribution estimates. Our tracking data might have contained ontogenic and/or colony-related biases (e.g., only breeding adults from one colony were tracked), while our survey data might have contained spatiotemporal biases (e.g., surveys were limited to waters <200 nm from the coast).

We recommend combining data sources wherever possible (e.g., through international collaborations such as ours) to refine predictions of species distributions, which ultimately will improve fisheries bycatch management through better spatiotemporal understanding of risks.