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SHORT NOTE

Black petrel (*Procellaria parkinsoni*) congregations at sea off Perú during the Austral summer

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The black or Parkinson's petrel (*Procellaria parkinsoni*) is an endemic medium-sized procellariform breeding only on two islands in sub-tropical areas of northern New Zealand: Great Barrier Island (Aotea; 36°12'S, 175°25'E) with ~2,750 breeding pairs (Richard & Abrahams 2015) and Little Barrier Island (Te Hauturu-o-Toi; 36°12'S, 175°05'E) with ~600 breeding pairs (Bell *et al*. 2016). Their breeding cycle ends in June (ACAP 2009) and then the birds migrate to the Eastern Tropical Pacific (Pitman & Balance 1992; Bell *et al*. 2007). Black petrels have been recorded from California (USA) (Jehl 1974) to northern Chile (Cabezas *et al*. 2012). The areas of highest concentration of black petrels are distributed from southern Mexico (~15°N) to northern Perú (~5°S) and around the Galápagos Islands (~0°20'S) (Pitman & Balance 1992; Gaskin *et al*. 2016). Despite reports of black petrels off Perú, data on the specific geographical positions are sparse (Pitman & Balance 1992; Spear *et al*. 2005; Spear & Ainley 2008). Individuals have been reported off Perú. In February 1983, during a strong El Niño event one was found dead on a beach near Lurin (12°16'S), ~15 km south of Lima (Pitman & Balance 1992). In December 1991 a by-catch individual was reported ~40 km offshore from Paita (05°00'S, 81°05'W) (Imber *et al*. 2003). More recently, in October 2018, two individuals were photographed off northern Perú, one 26 km offshore from Tumbes (03°33'S, 80°56'W) and one 20 km offshore from northern Piura (04°05'S, 81°18'W) (eBird 2020). There are 22 other sightings in eBird between 1998 and 2019 without photographs, between 03°30'S and 08°30'S, with the highest concentration of sightings between 03°S and 06°S. The majority (>86%) of the sightings were reported between 2016 and 2019. The distribution of black petrels in these areas reflects the quality of food availability in the Northern Humboldt Current System, one of the most productive habitats in the world.

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The Peruvian Marine Research Institute ran a pelagic research cruise from 2 February to 24 March 2020 completing 50 uniformly parallel survey tracks, each separated by 15 nautical miles (nm). The geographic sampling coverage was between the Ecuador (03°23′S) and Chile (18°20′S) boundaries, and from the coastline to 80 nm offshore. The sampling intensity allowed us to assess black petrel habitat use during a short time period, i.e. a snapshot of their distribution in the middle of the austral summer. The seabird sightings were carried out by two observers working simultaneously on the bridge, one on the port and one on the starboard sides of the vessel. Continuous strip-transects were conducted from dawn to dusk while underway with sightings stopped at oceanographic stations or during pelagic trawl operations systematically performed during the whole survey. Transects over the whole cruise were partitioned into seven-minute intervals (equivalent to one nautical mile) at a cruising speed of 10 knots. All bird species were recorded within a 90° quadrant. During these surveys, we counted black petrels in Peruvian waters and categorized the habitat birds where encountered. For each sighting we observed behaviour as follows: flying, resting on the water, feeding or scavenging, and associated species. Ship position and course, water depth (m), sea-surface temperature (°C), salinity (ppt), and wind speed (m/s) were also recorded. Zooplankton trawl tows using Hensen (n = 200) and Bongo nets (n = 20) were also carried out. Zooplankton and fishing operations were used to quantify biodiversity and to determine potential prey for top predators.

A total of 47 black petrels were recorded during our surveys (Fig. 1). Of these records, 96% occurred between 03°40′S and 06°40′S (Fig. 2). Two records were located further south at 10°44′S and 13°46′S. Most birds (94.7%) were recorded on the continental slope, with a mean depth of 2,073 m (Table 1). In contrast, few black petrels were recorded over the continental shelf, the Perú trench and the pelagic seabed (Table 1). Areas with the most black petrel records were characterized by two oceanographic processes: a southward intrusion of low salinity (<34.5 PSU, Practical Salinity Unit) Equatorial Superficial Waters (ESW) from Ecuador, reaching up to Paita (05°S) and a mix of ESW with Subtropical Superficial Waters (SSW) to 08°S. This area was also characterized by shelf-break fronts and upwelling fronts formed by the convergence of waters masses of different densities, providing mechanical energy that contributes to the trophic energy, concentrating zooplankton and promoting secondary production (Acha *et al*. 2015). These areas are frequently used by albatrosses and petrels that may travel thousands of kilometres to feed on zooplankton, fishes or squids which concentrate at these fronts (Nevitt 1999).

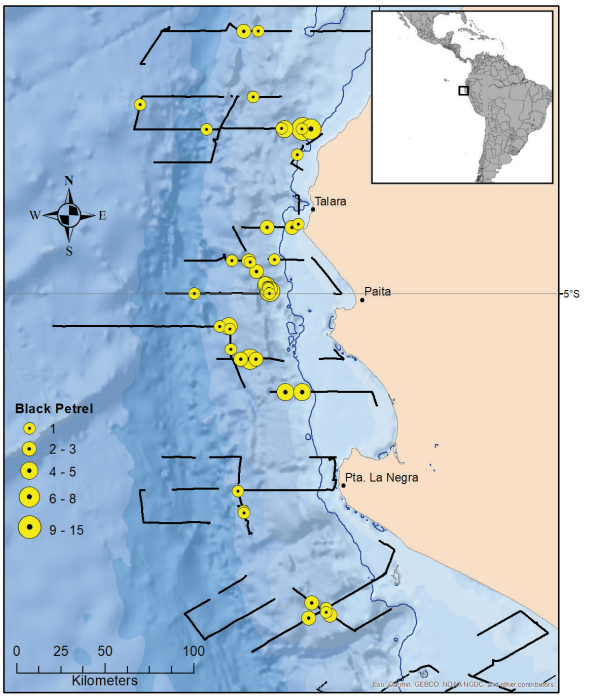

Figure 1. Distribution of black petrels (*Procellaria parkinsoni*) off northern Perú in February–March 2020. Two other sightings at 10°44′S and 13°45′S were excluded. Black lines represent the sighting transects. Continuous blue line represents the shelf break (200 m isobath).

Figure 2. Parkinson's petrels photographed at sea off Northern Perú during February 2020.

Table 1. Habitat use of black petrels (*Procellaria parkinsoni*) recorded off Perú.

Habitat	Depth mean (m)	Depth ranges (m)	Number of birds (%)
Continental Shelf	72 (n = 3)	21–129	3 (2.7)
Continental Slope	2,073 (n = 41)	498–4,347	107 (94.7)
Perú Trench	4,889 (n = 2)	4,617–5,160	2 (1.8)
Pelagic Sea Bed	3,431 (n = 1)	-	1 (0.9)

The surveyed area was characterized by high concentrations of zooplankton bio-volumes (>10 ml/sample) and up to 100 ml/sample, mainly represented by copepods *Centropages furcatus* (a bio-indicator of ESW) and *Acartia danae* and *Oncaea conifer* (both bio-indicators of SSW). Possible prey sources were recorded in areas with high numbers of black petrel records. Specifically, several species of small cephalopods, including small bioluminescent squids (*Abraliopsis* sp.) and paper nautiluses (*Argonauta nouryi*) were caught in the trawls. Both species were recorded at higher abundances over the continental slope and the Perú trench from 04°S to 07°S. Another possible prey species that was recorded regularly (70% of the 220 trawls) was the Panama lightfish larvae (*Vinciguerria lucetia*). The area along the continental shelf break and continental slope (06–14°S) in northern Perú, where black petrels were also recorded during these surveys (Fig. 2), was characterized by concentrations of paralarvae of *Argonauta* and *Abraliopsis* (Orosco 2016). Squid larval distribution is presumed to be a proxy for the adult distribution in the same area, since paralarvae and adults were captured in shelf-break areas. Analyses of black petrel diet during the breeding season showed it was dominated by squid (particularly Ommastrephidae, Histioteuthidae, and Cranchidae) and supplemented by fish, tunicates, crustaceans, and cyclostomes (Imber 1976). These squid species are characterized by their bioluminescence and Imber (1976) inferred that black petrels obtain most of their food at night. Dive depth analysis over the 2013 and 2014 breeding seasons showed that over 90% of black petrel foraging occurred during the day (Bell 2016), which suggests that black petrels have multiple foraging strategies including in the day targeting fish or other prey species, in association with cetaceans or following fishing vessels, and at night targeting bioluminescent squid (Imber 1976; Pitman & Balance 1992; Bell 2016).

Seabird/cetacean assemblages where seabirds take live prey forced to the surface by dolphins were reported from the Eastern Pacific (Au & Pitman 1986; Pitman & Balance 1992). Four such black petrel/cetacean associations were recorded during our research surveys. All records were on the continental slope. Black petrels were recorded associating with 250–300 short-beaked common dolphin (*Delphinus delphis*; 04°50′S; ~40 km offshore Paita), two sperm whales (*Physeter catodon*; 04°56′S; 35 km offshore), and 75 short-beaked common dolphins (06°37′S; ~30 km southwest of Lobos de Tierra Island). The associations recorded in this study differed from those previously reported (Pitman & Balance 1992) where associations occurred with other species: the melon-headed whale (*Peponocephalu electra*) and the false killer whale (*Pseudorca crassidens*). Given the data suggesting multiple foraging strategies during the breeding season within New Zealand waters (Imber 1976; Bell 2016), it appears that black petrels may also utilize different feeding strategies in the eastern Pacific: diving at the surface to feed on live prey, composed mostly by small cephalopods and fish, and associating with cetaceans targeting prey forced to the surface and scavenging food remains.

We present new information showing that black petrels were recorded regularly on the continental slope, north of Perú during the peak of the austral summer (February/March). As most adult black petrel are nesting in New Zealand during this period, it is evident that part of the population at different age classes is spending their summers in northern Perú. These birds are likely to be affected by different levels of risk associated with human-induced factors including fisheries bycatch, pollution events and climate change compared to those birds that migrate to breed in New Zealand. Management measures such as the creation of a Marine Important Bird Area in the highly productive waters of Northern Perú and introducing mitigation measures to fisheries vessels could help protect this vulnerable New Zealand species whenever they are present in the region.

LITERATURE CITED

ACAP. 2009. Species assessments: Black Petrel *Procellaria parkinsoni*. http://www.acap.aq. Accessed: 14 April 2020.

Acha, E.M.; Piola, A.; Iribarne, O.; Mianzan, H. 2015. *Ecological Processes at Marine Fronts: Oases in the Ocean*. Heidelberg, New York, Dordrecht, London, Springer Cham. 66 pp.

Au, D.W.K.; Pitman, R.L. 1986. Seabird interactions with dolphins and tuna in the eastern tropical Pacific. *Condor 88*: 304–317.

Bell, E.A.; Mischler, C.P.; MacArthur, N.; Sim, J.L. 2016. Black petrel (*Procellaria parkinsoni*) population study on Hauturu-o-Toi/Little Barrier Island, 2015/16. Report to the Conservation Services Programme, Department

of Conservation. Wellington, New Zealand. 22 pp. https://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2015-01-black-petrel-lbi-final.pdf Accessed: 14 April 2020.

Bell, E.A. 2016. Diving behaviour of black petrels (*Procellaria parkinsoni*) in New Zealand waters and its relevance to fisheries interaction. *Notornis 63*: 57–65.

Bell, E.A.; Sim, J.L.; Scofield, R.P. 2007. Demographic parameters of the black petrels (*Procellaria parkinsoni*). *DOC Research and Development Series 273*. Wellington, Department of Conservation.

Cabezas, L.A.; Ruiz, J.; Yates, O.; Bernal, M. 2012. The black petrel (*Procellaria parkinsoni*) in pelagic waters off northern Chile: a southern extension to the known distribution and interactions with the pelagic longline fishery. *New Zealand Journal of Marine and Freshwater Research 46*: 537–544.

eBird. 2020. *eBird: An online database of bird distribution and abundance* [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: https://ebird.org/peru/species/parpet1/PE Accessed: 15 April 2020.

Gaskin, C.P.; Harrison, P.; Baird, K.A.; Cunninghame, F.; Ismar, S.M.; Bell, E.A. 2016. An opportunistic sighting of a flock of Black Petrels (*Procellaria parkinsoni*) at the Galapagos Islands, Ecuador. *Notornis 63*: 54–56.

Imber, M.J.; McFadden, I.; Bell, E.A.; Scofield, R.P. 2003. Post-fledging migration, age of first return and recruitment, and results of inter-colony translocation of black petrels (*Procellaria parkinsoni*). *Notornis 50*: 183–190.

Imber, M.J. 1976. Comparison of prey of the black *Procellaria* petrels of New Zealand. *New Zealand Journal of Marine and Freshwater Research 10*: 119–130.

Jehl, J.R. 1974. The nearshore avifauna of the Middle American west coast. *Auk 91*: 681–699.

Nevitt, G. 1999. Olfactory foraging in Antarctic seabirds: a species-specific attraction to krill odours. *Marine Ecology Progress Series 177*: 235–241.

Orosco, X. 2016. *Variabilidad espacio-temporal de paralarvas de cefalópodos en el mar peruano entre los años 2013 y 2014*, Tesis Facultad de Ciencias Biológicas, Universidad Ricardo palma, 89 pp. http://biblioimarpe.imarpe.gob.pe/handle/123456789/3029 Accessed: 15 April 2020.

Pitman, R.L.; Ballance, L.T. 1992. Parkinson Petrel distribution and foraging ecology in the Eastern Pacific – aspects of an exclusive feeding relationship with dolphins. *Condor 94*: 825–835.

Richard, Y.; Abraham, E.R. 2015. Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006–07 to 2012–13. *New Zealand Aquatic Environment and Biodiversity Report 162*. Wellington, New Zealand, Ministry for Primary Industries. 85 pp.

Spear, L.B.; Ainley, D.G.; Webb, S.W. 2005. Distribution, abundance, habitat use and behaviour of three *Procellaria* petrels off South America. *Notornis 52*: 88–105.

Spear, L.B.; Ainley, D.G. 2008. The seabird community of the Perú Current, 1980–1995, with comparisons to other eastern boundary currents. *Marine Ornithology 36*: 125–144.

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