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SHORT COMMUNICATION

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

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During seabird censuses performed as part of scientific research looking into seabird bycatch onboard industrial pelagic longline vessels targeting swordfish (*Xiphias gladius*) we made the first documented records of black petrel (*Procellaria parkinsoni*) in the pelagic waters of northern Chile, considerably extending the species' range southward. These observations were made during hauling operations in the austral winters of 2008, 2009 and 2010 between 23°00'S and 32°49'S. Black petrels were observed in 9.6% of censuses and a total of 10 birds were recorded. Despite the fact that this species fed upon discards and wastes generated during fishing, no incidental mortality was observed. Our results are relevant to the conservation of the black petrel in the south-eastern Pacific marine ecosystem, as they provide new information on species range and interactions with pelagic fisheries.

Keywords: black petrel; Parkinson's petrel; *Procellaria parkinsoni*; eastern South Pacific; non-breeding distribution; discards; swordfish; pelagic fisheries

Introduction

The black petrel (*Procellaria parkinsoni*), sometimes referred to as Parkinson's petrel, breeds on Great and Little Barrier Islands in northern New Zealand, with less than 2000 breeding pairs. The population is currently considered stable (Imber 1987; Bell et al. 2009; BirdLife International 2010). However, this species is listed as vulnerable by the IUCN (2010), given its limited breeding range and the potential threat of introduced predators (BirdLife International 2010). Furthermore, recent studies suggest the black petrel is the seabird species most at risk from fisheries interactions in New Zealand waters (Richard et al. 2011), whereas limited information is available elsewhere.

Following breeding, black petrels migrate to the eastern tropical Pacific where they remain between June and September (Brooke 2004; Spear et al. 2005). The non-breeding distribution along the American Pacific coast extends across a large latitudinal range from Mexico (15°N) through Central America (Jehl 1974; Stiles & Smith 1977; Pitman & Ballance 1992; Spear & Ainley 1999; Spear et al. 2005; Estela et al. 2007) to the northern reaches of the Humboldt Current (14°S) (Imber et al. 2003; Spear et al. 2005). At the equator, the species has also been recorded in the vicinity of the Galapagos Islands (Murphy 1936; Pitman &

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Ballance 1992; Smith & Hyrenbach 2003; Spear et al. 2005). The coasts of Ecuador and northern Peru (i.e. northern extent of the Humboldt Current) support the highest densities of non-breeding black petrel during the austral winter (Imber et al. 2003, Spear et al. 2005). Onley & Scofield (2007) suggest that the black petrel is present on the continental slope or in deep water, usually alone or in small mixed-species flocks.

Apart from a recent sighting of a solitary individual near the mainland coast of northern Chile (23°S) (Schmitt 2010), there are no documented sightings south of 14°S. Similarly, information regarding bycatch or fisheries interactions off the eastern South Pacific is very limited (Imber et al. 2003; Robertson et al. 2003). This species has shown a propensity to feed on offal and fishery discards in addition to stealing bait in New Zealand fisheries (Imber 1976; Robertson et al. 2003; Thompson 2010a,b), and incidental mortality associated with trawl and longline fisheries (including pelagic longline) has been well documented throughout its foraging range during the breeding season (i.e. northern New Zealand to the Tasman Sea) (Conservation Services Programme 2008; Waugh et al. 2008; Thompson 2009, Thompson 2010a,b; Richard et al. 2011). Here we document the first sightings of black petrel in pelagic waters off northern Chile and provide information regarding interactions with the Chilean pelagic longline fleet.

Materials and methods

Observations of black petrel were recorded by trained scientific observers who are instructors from BirdLife International's Albatross Task Force during three at-sea trips onboard industrial pelagic longline vessels targeting swordfish (*Xiphias gladius*) in the austral winter (July 2008, July–October 2009 and August 2010). Two of these trips were part of a project to monitor the progress of the National Plan of Action to reduce the incidental bycatch of seabirds in Chilean longline fisheries (Azocar et al. 2010). The third trip was conducted to investigate modifications to existing mitigation measures. All trips were conducted in deep waters (2000–4500 m) and in the proximity of Chilean oceanic islands (i.e. Desventuradas Islands 26°19'S, 79°59'W, and Juan Fernández Archipelago 33°43'S, 79°52'W; Fig. 1). Species composition and abundance counts were conducted during daylight hauling operations. Following Moreno et al. (2003) and modified from Weimerskirch et al. (2000), the seabird censuses included an area of 600×600 m around the vessel (i.e. a radius of 360°). Environmental variables (wind direction and intensity, sea state, cloud cover, visibility and sea surface temperature) and operational data (velocity and course) were recorded for each fishing operation. Visual records were obtained (i.e. digital photos) for all black petrel sightings. However, only the highest quality photographs are provided as evidence for identification. We followed the descriptions of Onley & Scofield (2007) and Howell (2006) as supportive criteria for positive identification of black petrel. To distinguish this species from Westland petrel, *Procellaria westlandica*, a similar congener species that was not recorded in this study, both at sea and in the subsequent examination of photographs, five external morphological features were considered: size and colour of the bill, head shape, overall size, wing projection beyond the tail (when resting on the sea surface) and visual evidence of moult. The latter was also used to identify age classes.

Results and discussion

A total of 38 seabird species were identified around vessels during the 94 hauling operations sampled. Black petrel were observed in 9.6% ($n = 9$) of the abundance counts and a total of 10 individuals were recorded (0.05% of all birds recorded; Table 1). A large proportion of observations were from July 2008 with fewer sightings in early September 2009 and August 2010, despite the fact that a greater number of counts were conducted over the last two

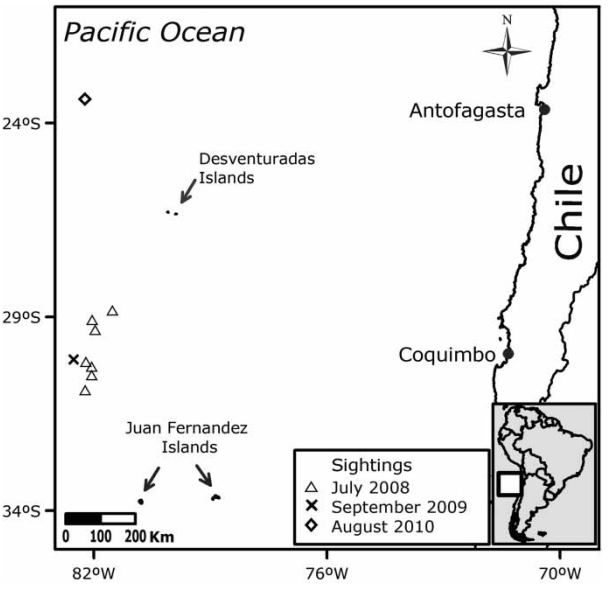

Figure 1 Locations of black petrel (*Procellaria parkinsoni*) sightings in relation to the northern Chilean coast, Desventuradas islands and Juan Fernández islands.

periods (Fig. 2). Black petrels were observed between 23°00'S and 32°49'S with the majority of observations occurring between 28° and 30°S (Fig. 1). All black petrels had bill, head and body size comparatively smaller than that of white-chinned petrels (*Procellaria aequinoctialis*) that were invariably present in the vicinity of the ships (*P. aequinoctialis* is similar to *P. westlandica* in body appearance and size) (Fig. 3A). It was also possible to note the dark (in the most distal part) and pale yellowish (in the basis) pattern of the ungues, more rounded shape of the head and longer wing projection beyond the tail (Fig. 3A–D), which are considered diagnostic features of this species (Howell 2006). All registered individuals showed a pattern of worn plumage, similar to the two-tone description by Onley & Scofield (2007); brown coverts (of variable extent) contrasted with darker flight feathers (Fig. 3C). There were no signs of moulting in any of the birds, suggesting

Table 1 Locations, dates and number of black petrels (*Procellaria parkinsoni*) sighted off northern Chile.

Date (dd-mm-yyyy)	Abundance	Latitude (S)	Longitude (W)	SST (°C)	Observer[a]
15-07-2008	1	30°12.12'	82°12.35'	17.45	JR
16-07-2008	1	30°19.50'	82°03.55'	17.85	JR
18-07-2008	2	30°55.90'	82°13.69'	17.30	JR
19-07-2008	1	30°32.64'	82°03.66'	17.20	JR
23-07-2008	1	29°06.99'	82°02.87'	17.69	JR
24-07-2008	1	29°22.41'	81°58.23'	17.58	JR
25-07-2008	1	28°52.18'	81°31.28'	17.83	JR
05-09-2009	1	30°05.98'	82°31.27'	17.52	LAC
29-08-2010	1	23°22.69'	82°13.96'	17.38	LAC

Sea surface temperature (SST) recorded during sightings is included. [a]JR, Jorge Ruiz; LAC, Luis A. Cabezas.

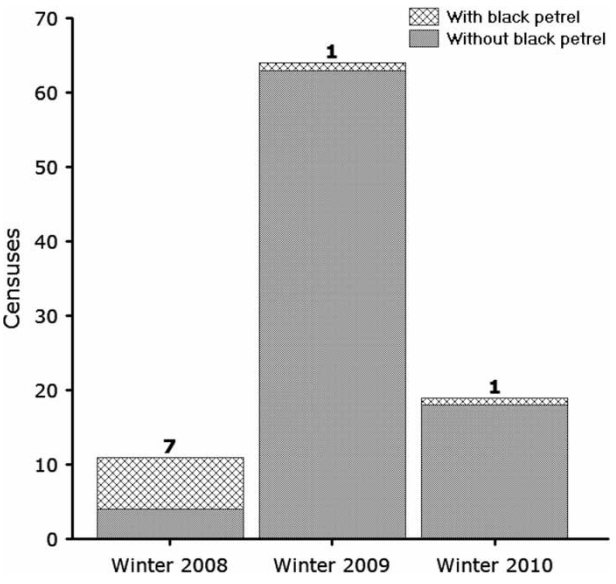

Figure 2 Seabird census counts per winter seasons/year during the hauling operations sampled. In bold, the number of counts in 'With black petrel' category.

the possibility that the observed individuals were not post-breeding adults.

Black petrel breed from October to June with a few individuals not leaving until late July (Imber 1987; Bell et al. 2009), so greater presence of adults and fledglings of this species can be expected at sea and probably in the eastern Pacific from June to September (i.e. austral winter or non-breeding season) (Spear et al. 2005). Brooke (2004) points out that the moult occurs during the non-breeding season, when the birds largely remain in the eastern tropical Pacific. Howell (2006) suggests that black petrels moult the primaries between March and August and that, in general, juveniles of *Procellaria* petrels begin the moult 1 or 2 months before breeding adults. Nevertheless, juveniles do not begin the first moult of wing feathers until almost a year of age (Howell 2006). Wing moult, particularly primary feathers, for species of the genus *Procellaria* would last between 3 and 5 months (Marchant & Higgins 1990; Bridge 2006). Therefore the dates of our sightings (July–early September) fall within the period where post-breeding adults (with at least some evidence of moult in the primaries), non-breeding and young birds are expected to be present along the eastern Pacific. From our observations and photographic records, we suggest that black petrels recorded in this study are juveniles of at least 1 year old. The absence of moulting primaries (all primaries were a darker colour, suggesting a completed moult, Fig. 3C) and the worn appearance of body and coverts can be compared with the only specimen (a banded female 1 year of age) examined in detail by Imber et al. (2003), who found the moult of the primaries to be almost complete in May (austral autumn) off the coast of Ecuador (2°S, 81°W).

Black petrels were sighted in association with other seabirds, the most common of which was the cape petrel (*Daption capense*; which made up 37% of all birds recorded), white-chinned petrel (*P. aequinoctialis*; 22%) and black-browed albatross (*Thalassarche melanophrys*; 4%). All seabird species observed were attracted to discards and waste from fishing operations. Black petrel behaviour included actively competing with other seabirds

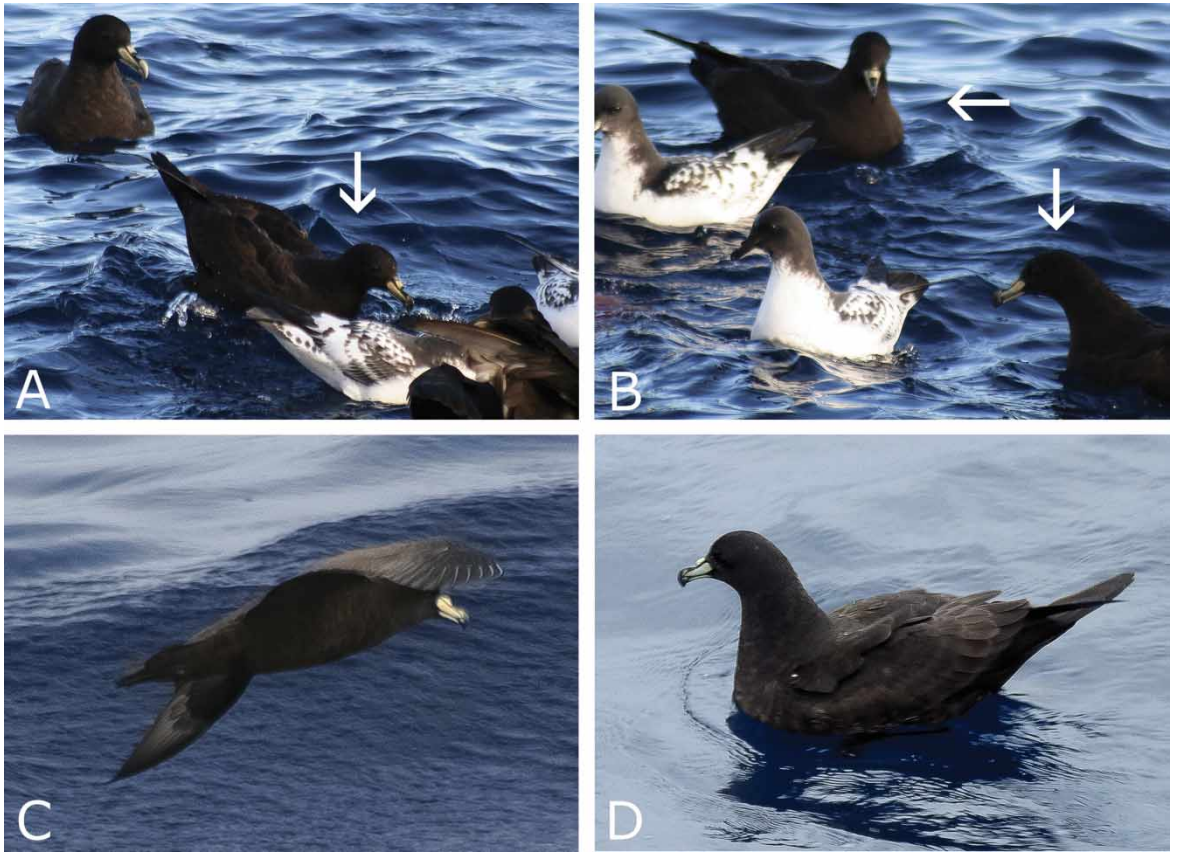

Figure 3 The black petrel (*Procellaria parkinsoni*) off northern Chile. **A,** Black petrel recorded along with a white-chinned petrel (July 2008). **B,** Two black petrels with cape petrels (July 2008). **C,** Black petrel in flight (July 2008). **D,** Black petrel resting on the sea (August 2010). Arrows indicate the black petrels in A and B. Photographs A, B and C by Jorge Ruiz; photography D by Luis A. Cabezas.

for discards in the vicinity of the hauling bay (on the starboard side of the ships) or to the stern, and conducting flights of short duration behind the vessel during hauling operations. Although the black petrel was repeatedly observed feeding upon fish offal a few metres from the vessel, no incidental mortality or non-lethal interaction between this species and fishing gear was observed. There was a low occurrence of black petrel mixed within large flocks of white-chinned petrels. The low representation of this species in mixed flocks of seabirds has also been documented elsewhere along the eastern tropical Pacific, where it was noted as being more conspicuous and numerous when associated with dolphin species (Pitman & Ballance 1992). In the same area of the Pacific, the species has also been registered as attending ships and scavenging bait and offal discarded from fishing vessels (Pitman & Ballance 1992).

We find that black petrel is present during the winter seasons in pelagic waters off northern Chile to at least 31°S. All sightings in this study were related with sea surface temperatures from 17 to 18 °C (Table 1), however this may not necessarily reflect the habitat preference of this species, since this study was limited by the operational dynamics of the fishing fleet. Spear et al. (2005) recorded this petrel as far south as 14°S and found its highest abundance between 3°S and 14°S during March–August on the Pacific coast of South America. These authors indicated the black petrel was mainly associated with the slope and continental shelf, with an average sea surface temperature of 22.9±4.0 °C. This suggests that the warmer, more coastal lower latitude waters are preferred by this petrel. The Humboldt Current System, which flows along much of the coast of Chile and Peru, is characterised by colder waters related to upwelling zones (Acha et al. 2004), whereas the oceanographic characteristics of the eastern tropical Pacific are the result of different currents and water masses, a number of which are superficial and warm (Wyrtki 1967; Fiedler & Talley 2006). We consider it likely that this species also occurs along the slope and continental shelf of southern Peru and northern Chile. The recent sighting of a solitary black petrel near the mainland coast of northern Chile (23°S, off the Antofagasta Region; Fig. 1) (Schmitt 2010), confirms the presence of this species on the Chilean continental shelf. Low observation efforts and the difficult detection of this species at sea, because of confusion with a similar and more abundant counterpart (i.e. white-chinned petrel), are likely factors responsible for the apparent rarity of black petrels in the coastal areas of northern Chile.

Our results demonstrate the importance of including seabird data collection protocols in joint fishery observer programmes and support the need for adoption of best practice mitigation measures through National Plans of Action to reduce the incidental bycatch of seabirds in longline fisheries (NPOA-SEABIRDS) (FAO 1999; Gobierno de Chile-Subsecretaria de Pesca 2007). Such efforts are required to increase our understanding of seabird distribution, and reduce the impact of fisheries on vulnerable seabird species, especially given the limited information currently available on incidental capture and fishing practices in this area of the south-eastern Pacific (Robertson et al. 2003). Independent tracking studies of black petrel during the non-breeding season would help clarify species range.

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