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Update on bycatch risks to seabirds in the Western Pacific

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Igor Debski[1], Kath Walker[2], Graeme Elliott[2] & Samhita Bose[1]

[1] Department of Conservation, New Zealand
[2] Albatross Research, New Zealand

Abstract

Bycatch in pelagic longline fisheries is one of the greatest threats to seabirds, particularly albatrosses and petrels. In this paper we provide a brief update on some of the New Zealand breeding species most vulnerable to bycatch in the Western Pacific.

The Antipodean wandering albatross is endemic to New Zealand. The Antipodes Island population was identified as a priority population for conservation management in September 2017 by the Agreement on Conservation of Albatrosses and Petrels. A series of pest eradications have eliminated known and potential human-induced threats at their main breeding sites, and fisheries bycatch is now the main focus of efforts to recover this population. We present new foraging distributional data that confirms the expansion in foraging areas to the north and east of New Zealand reported previously to SC.

The bycatch risk to Antipodean wandering albatross and other threatened seabirds posed by fisheries in the WCPFC area underlines the urgent need to ensure adequate measures are in place to mitigate bycatch. This includes the specification and spatial extent of measures required in the Commission's Conservation and Management Measure to mitigate the impact of fishing for highly migratory fish stocks on seabirds, as well as data collection and reporting on seabird bycatch.

1. Introduction

Seabirds, particularly albatrosses and petrels, are recognised as some of the most threatened bird species globally (Croxall et al 2012), and bycatch in pelagic longline fishing poses a major risk (Anderson et al 2011). New Zealand has the highest global diversity of albatross and petrel species, and addressing fisheries bycatch risks to these species is a high priority. The Commission's Conservation and Management Measure to mitigate the impact of fishing for highly migratory fish stocks on seabirds (CMM2017-06) requires, amongst other matters, the use of seabird bycatch mitigation by all longline vessels fishing south of 30°S.

The SC has previously considered evidence on the distribution of seabirds vulnerable and at risk of bycatch across the WCPFC area. This has included an analysis by Baird et al (2015) of the distribution of five threatened albatross species and two threatened petrel species, as well as a summary of the most relevant and updated distributional information for New Zealand breeding seabird species identified as at highest risk from fisheries bycatch by Debski et al (2016).

Based on the evidence presented by Debski et al (2016), the SC made recommendations to the Commission including that the main area of distribution of New Zealand's vulnerable seabirds, especially the Antipodean albatross and the black petrel, is south of 25°S; and that the use of effective bycatch mitigation measures across the full range of at-risk seabirds should enhance conservation of those seabirds.

In this paper we provide an update on the conservation status and distribution of New Zealand breeding seabirds at-risk of fisheries bycatch in the WCPFC area, with a particular focus on Antipodean wandering albatross. This incudes an assessment of the latest Antipodean wandering albatross tracking data collected in early 2018 in relation to bycatch risk posed by fishing effort in the area between 25° and 30°S.

2. Antipodean albatross

The Antipodean wandering albatross (*Diomedea antipodensis antipodensis*) is endemic to the Antipodes Islands, New Zealand. The conservation concern for this albatross has already been noted to SC13 (Walker & Elliott 2017). Since 2004 this population has declined: males at 6% per annum and females at 12%. The population of breeding females is now only 25% of its 2004 level. Alongside this decline, there has been a reduction in nesting success. At the current rate of decline the Antipodean wandering albatross will be functionally extinct in 20 years. Based on this information the Agreement on the Conservation of Albatrosses and Petrels (ACAP) has recognised the Antipodean albatross as one of nine global priority populations of conservation concern (ACAP 2017).

As already reported to SC13 by Walker & Elliott (2017), the rapid decline of Antipodean wandering albatross has coincided with an expansion of their foraging range further north and east into the WCPFC area. Further collection of tracking data has been a key research focus to better understand the factors causing the observed decline, and in particular to identify which fishing operations may be posing bycatch risk. Here we assess the latest data collected in early 2018 from birds tracked over the preceding one or two years (Antipodean wandering albatross are a biennially breeding species so their full combined breeding and non-breeding period lasts for two years, though failed breeders may return to attempt to breed the following year). In particular we assessed for differences in foraging areas between male and female birds to investigate whether this may be driving the higher observed mortality in female birds.

2.1 Methods

The locations from GLS tags were plotted using an iterative forward step selection probability algorithm in the probGLS package (Merkel 2016) in R (Core Team 2015). The algorithm uses light temperature and activity (dry/wet) data recorded by the loggers to predict the probable location of the birds. For this process, we first identified the twilight events from raw light intensities using twilightCalc function in the GeoLight package (Lisovski and Hahn 2012).

The at-sea distribution of the tracked birds was mapped using fixed kernel density estimate (Worton 1989). We chose to use a reference bandwidth smoothing parameter (h_{ref}) to avoid type II error (failing to capture area in the estimate that was part of the birds' distribution range; Kie 2013) due to the uncertainty associated with deriving locations from GLS tags. Kernel density isopleth was set to display the top 95% of spatial use to define the overall range use of Antipodean albatrosses. Additional 75% and 50% isopleths were drawn to define the core areas frequented by the birds. To understand the sex-specific variation in the at-sea distribution of Antipodean albatrosses, kernel density estimates were then calculated separately for the male (n=3) and female (n=6) birds. 95% isopleth was derived from the density surface to delineate the distribution of male and female Antipodean albatrosses between January 2016 to January 2018. Sex-specific core ranges for the same period were then identified by drawing additional 75% and 50% isopleths.

Presence of commercial fishing vessels and fishing effort in the South Pacific region was extracted from the Global Fishing Watch data (GFW; http://globalfishingwatch.org, Accessed 11th July, 2018) using Google Earth Engine. GFW is an open source platform sponsored by Google, Oceana and SkyTruth that allows public access to commercial fishing data from around the world. For this study, we used vessel presence and fishing data for 2016 for the South Pacific region derived as hours spent/fished in 1km x 1km grid cells (Kroodsma et al. 2018).

2.2 Results

Figure 1 shows the combined distribution of all nine Antipodean wandering albatrosses tracked in this analysis, overlaid with fishing effort data. This clearly shows that the full range of Antipodean wandering albatrosses extends north of 25°S, and that the 75% contour, representing a core area in which three quarters of the positions obtained occur, extends north of 30°S. The fishing effort data shows substantial fishing effort in the area north of 30°S, with the great majority in the high seas. The black rectangle in Figure 1 approximates the portion of the WCPFC area overlapping Antipodean wandering albatross foraging distribution where no bycatch mitigation is required currently and where bycatch risk would be reduced by moving the southern boundary of mitigation requirement to 25°S. Clearly there is a substantial overlap of fishing effort and Antipodean wandering albatross foraging range, and whilst the birds do occasionally forage even further north, providing protection from bycatch in all areas south of 25°S will represent a substantial conservation improvement for the species.

In Figure 2 the distributions of female and male birds have been plotted separately. Considering the female-only distribution, the importance of northern foraging areas is even more important than for the sexes combined, with the core range represented by the 75% contour extending north to approximately 25°S, particularly in the waters to the north of New Zealand. This contrasts to the male-only distribution, where the 75% contour does not extend north to 25°S, though it does extend north of 30°S, particularly in more eastern waters. Whilst sample sizes are small, this data does represent our most recent best available information on the distribution of the species, and the overlay of male and female distributions identifies one key area of importance to females that is of less importance to males. This area is highlighted by the red shape in Figure 2, and covering waters to the north-northeast of New Zealand, up to 25°S, including areas of high seas with substantial fishing effort. This fishing activity may be posing additional bycatch risks to female birds and may be one explanatory reason for the higher female mortality observed. A large proportion of the high seas fishing effort falls within that area where no bycatch mitigation is required currently and where bycatch risk would be reduced by moving the southern boundary of mitigation requirement to 25°S.

While recognising that our sample sizes of birds tracked is small, and that our analysis of overlap with fishing effort is based on the GFW data set, which is based on vessels using AIS and thus may underestimate the true distribution of pelagic longline fishing activity, we consider that this evidence combined further supports the previous conclusions of SC that extending the requirement for use of seabird bycatch mitigation to 25°S will provide enhanced conservation for Antipodean wandering albatross.

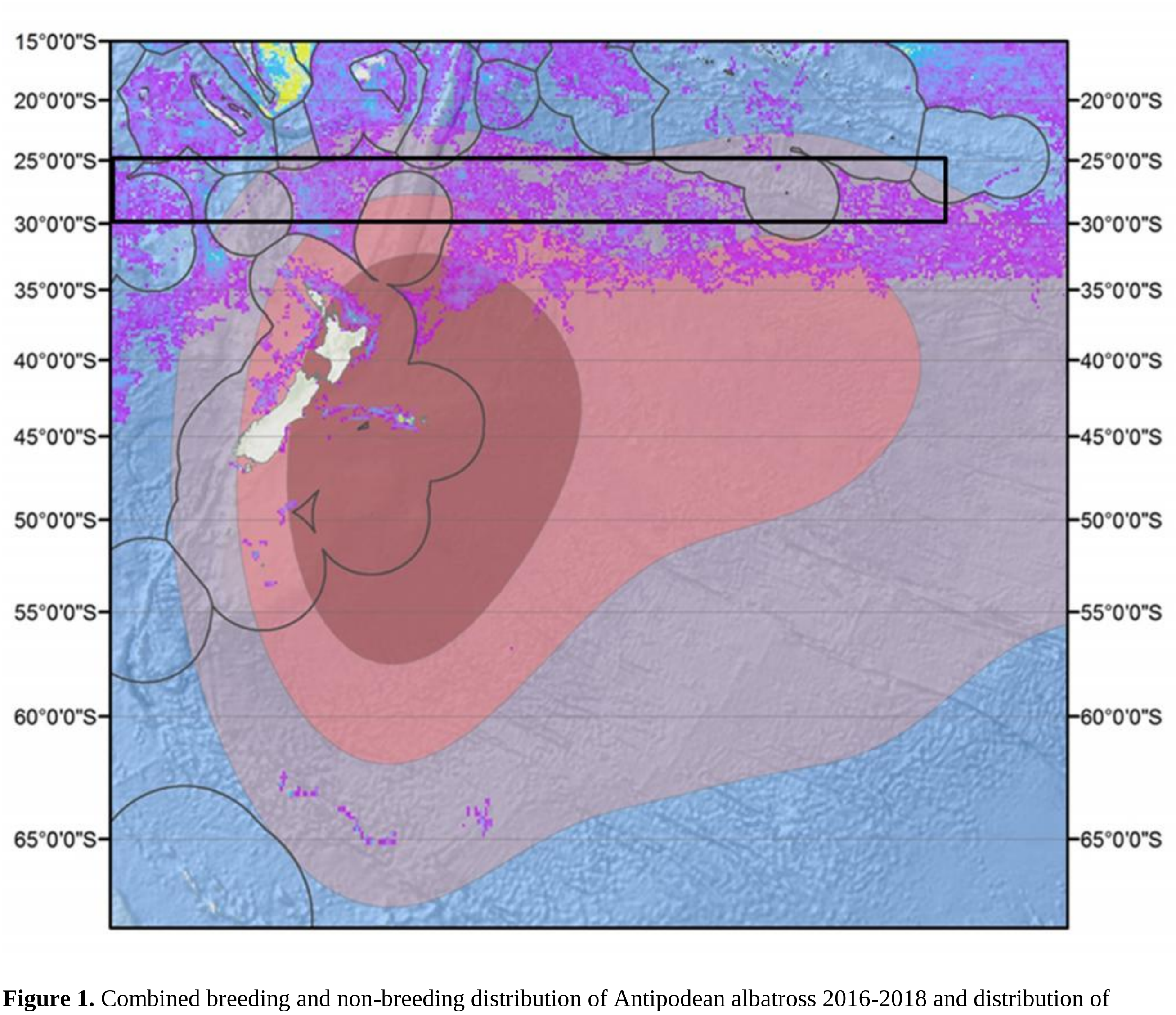

Figure 1. Combined breeding and non-breeding distribution of Antipodean albatross 2016-2018 and distribution of drifting longline fishing effort. Kernel density plots showing 50% (dark red), 75% (mid red) and 95% (light red) contours representing the proportion of time spent by birds within these areas. Fishing effort (purple) is for the 2016 calendar year. See methods section for further details. The black rectangle approximates the WCPFC area where no bycatch mitigation is required currently and where bycatch risk would be reduced by moving the southern boundary of mitigation requirement to 25°S.

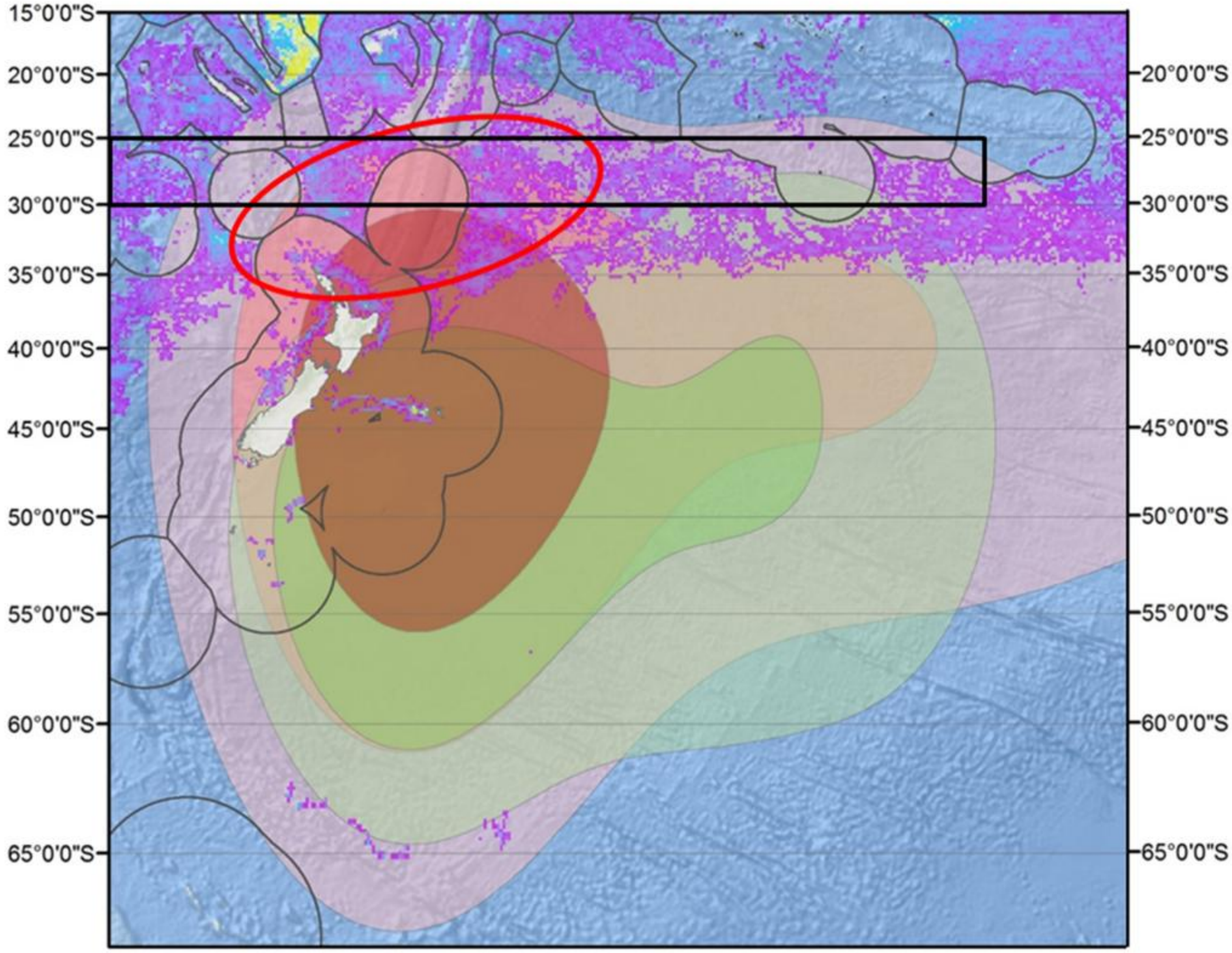

Figure 2. Distribution of female (red shading) and male (green shading) Antipodean albatross. Kernel densities showing 50%, 75% and 95% contours for females and 50% and 75% for males representing the proportion of time spent by birds within these areas. The red shape highlights the most important area used by females but not males. Fishing effort (purple) is for the 2016 calendar year. See methods section for further details. The black rectangle approximates the WCPFC area where no bycatch mitigation is required currently and where bycatch risk would be reduced by moving the southern boundary of mitigation requirement to 25°S.

3. Other New Zealand seabirds at risk

Debski et al (2016) reported on relevant distributional information for three other New Zealand breeding seabird species identified as at highest risk from fisheries bycatch, that foraged in waters of the WCPFC area north of 30°S: black petrel (*Procellaria parkinsoni*), flesh-footed shearwater (*Ardenna carneipes*) and Campbell Island mollymawk (*Thalassarche impavida*). These species all remain conservation priorities, and research programmes are continuing (black petrel and flesh-footed shearwater) or planned (Campbell Island mollymawk) to further investigate their population status and identify fishing operations posing most bycatch risk.

4. Recommendations

Recalling the advice from SC12 to the Commission that seabird densities extend to waters to the North of 30°S, with Antipodean albatross and black petrel extending to 25°S, and that bycatch mitigation measures across the full range of at-risk seabirds should enhance conservation of those seabirds, we propose that SC recommend that the Commission:

- note that the most recent data on Antipodean albatross, a priority population of conservation concern, confirms the extent of foraging to waters North of 25° S.
- note that substantial fishing effort occurs in waters of the WCPFC area between 30°S and 25°S where Antipodean albatross forage.
- note that as CMM2017-06 does not require the use of seabird mitigation in the WCPFC area between 30°S and 25°S, this fishing effort poses a bycatch risk to Antipodean wandering albatross and other species foraging in the area.
- note that implementation of seabird mitigation measures south of 25°S will reduce the bycatch risks faced by Antipodean albatross and other seabirds.
- note the above information from SC14 and other relevant information when discussing seabird mitigation measures and requests that the TCC consider reviewing the 30ºS boundary of the seabird CMM further north.

5. References

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