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Distribution of albatrosses and petrels in the WCPFC Convention Area and overlap with WCPFC longline fishing effort

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BirdLife International[1]

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ABSTRACT

This paper presents an analysis of the distribution of albatrosses and petrels in the area under the jurisdiction of the Western and Central Pacific Fisheries Commission (WCPFC), using data from the BirdLife Global *Procellariiform* Tracking Database.

- The WCPFC area includes 41% of the global breeding distribution of albatrosses and petrels.
- Albatross distribution is concentrated north of 20ºN and south of 30ºS.
- WCPFC longline fisheries set approximately 100 million hooks each year north of 20ºN and below 30ºS, representing 16% of WCPFC's total longline fishing effort.
- Some species spend a significant proportion (>40%) of their time in high seas areas. Key high seas areas include the Tasman Sea and areas north of the Hawaiian Islands. The distribution in high seas areas emphasises the importance of WCPFC in bringing about a collaborative approach to reducing seabird bycatch.
- Few tracking data are available for giant-petrels, petrels and shearwaters in the WCPFC area. Range maps indicate that several, including species known to be vulnerable to bycatch, have ranges that span the tropical Pacific.

In light of these results, the WCPFC Ecosystem and Bycatch Group is invited to:

- **Consider the importance of the WCPFC area for albatross and petrel distribution**
- **Use the albatross and petrel tracking data to inform and assist in designing effective bycatch mitigation measures**
- **Consider the urgent need for collection of seabird bycatch data, especially north of 20ºN and south of 30ºS, but also in tropical areas, and including high seas areas (where few seabird bycatch data are currently available)**
- **Work with BirdLife International to extend the analysis in this paper to consider temporal and spatial overlap at a finer scale**

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1. INTRODUCTION

Albatrosses and petrels that forage by diving are some of the most vulnerable species to bycatch in fisheries (Wooller *et al.* 1992; Brothers *et al.* 1999). Birds are attracted to baited hooks, particularly during setting, dive on the hooks, become caught and drown. BirdLife International estimates that 300,000 seabirds are killed each year in this way, including 100,000 albatrosses. These species are long-lived, have delayed sexual maturity, small clutches and long generation times, resulting in populations that are highly sensitive to changes in adult mortality. Nineteen of the world's 21 albatross species are now globally threatened with extinction (IUCN 2004, BirdLife 2004a), and incidental catch in fisheries, especially longline fisheries, is recognised as one of the principal threats to many of these species (Brothers 1991, Robertson & Gales 1998; Croxall *et al*. 1998; Baker *et al*. 2002).

The interaction of seabirds with fisheries is an international issue, as demonstrated by the establishment of the International Plan of Action for reducing the incidental catch of seabirds in longline fisheries (FAO 1999); work being undertaken by the multilateral Agreement on the Conservation of Albatrosses and Petrels (ACAP); the resolutions by numerous regional fishery management organizations (RFMOs) (e.g. the Commission for the Conservation of Antarctic Marine Living Resources, CCAMLR, the Inter-American Tropical Tuna Commission, IATTC, the International Commission for the Conservation of Atlantic Tunas, ICCAT, the Indian Ocean Tuna Commission, IOTC, and WCPFC); and mitigation requirements established by some RFMOs (CCAMLR, CCSBT, IOTC). In 2005, WCPFC passed Resolution 2005-01 on seabirds, establishing that it will consider measures for bycatch mitigation at its annual meeting in 2006 (WCPFC 2005).

Solutions to seabird bycatch are greatly assisted by accurate knowledge of the distributions of albatrosses and petrels, which can be used to identify the areas and seasons in which there is high risk of seabird bycatch. This paper explores the distribution of albatrosses and petrels in the area managed by the Western and Central Pacific Fisheries Commission (WCPFC) using data from the Global *Procellariiform* Tracking Database. This database has been established through a unique collaboration between scientists from around the world, coordinated by BirdLife International.

2. METHODS

2.1 Albatross and petrel remote tracking data

Albatross and petrel tracking studies are conducted using satellite tracking devices (c. 30g in weight, and attached to a bird's back), geolocators (smaller, attached to a bird's leg) or more recently, GPS (Global Positioning System) devices. Over 90% of existing albatross and petrel tracking data have been submitted to the Global *Procellariiform* Tracking Database, representing 19 of the 21 species of albatross, both giant-petrel species, and several smaller petrels and shearwaters. Results of initial analysis of this database have been published in *Tracking Ocean Wanderers* (BirdLife 2004b).

Albatrosses and petrels found in the Western and Central Pacific and which are known to be vulnerable to bycatch, are listed in **Table 1**. The Global *Procellariiform* Tracking Database

includes breeding distribution data for Pacific populations of 14 of the 16 albatross species that breed in the region. Fewer data exist for birds during the non-breeding season, with the database holding data for 10 albatross species. Few tracking data are available for giant-petrels, petrel and shearwater species in the region. Data contributors for this report are listed on page (ii).

The remote tracking data contributed to the database were processed using standardised methods for data validation and derivation of density distributions, agreed among the data-holders (BirdLife 2004b). Population sizes of albatross species vary greatly: there are over 500,000 annual breeding pairs of Black-browed and Laysan Albatross, whereas three albatross species found in the Pacific region have less than 5,000 annual breeding pairs. For this reason, the multi-species maps were calculated with all species weighted equally, to avoid domination of the maps by the few species with large populations. The bird distributions are represented on maps by the 50, 75 and 95% utility distributions (UDs), which indicate the areas within which birds spent 50, 75 and 95% of their at-sea time. For full details on methods used, see BirdLife 2004b.

2.2 Overlap with the WCPFC Convention Area and WCPFC longline fishing effort

For each albatross and petrel species, calculations were made of the % at-sea time spent within the WCPFC Convention Area. The seabird distributions were then overlain with a map of the distribution of longline fishing effort within the WCPFC area from 2000-2003 (SPC 2005), and calculations were made of the % at-sea time spent within the 5x5 degree grid squares in which longline fishing effort took place. In addition, calculations were made of seabird distribution within EEZs compared to high seas areas.

3. RESULTS

3.1 Importance of the WCPFC area

The WCPFC Convention Area overlaps with 41% of the global breeding distribution of the 23 species of albatross and petrel for which there are data in the Global *Procellariiform* Tracking Database (**Table 2**). This makes it one of the most important RFMOs for albatross distribution (Small 2005).

Albatross and petrel breeding distribution in the WCPFC area is concentrated south of 30ºS (mostly below 35ºS) and north of 20ºN, as shown in **Figure 1**. This map is conservative in relation to the true extent of albatross and petrel distribution since in some species non-breeding birds disperse much more widely than breeding birds, being unconstrained by the need to return to breeding colonies to feed chicks. Data for a selection of New Zealand and Australian albatrosses and petrels are compared in **Figure 2**, which shows the distribution of non-breeders to the north of breeding birds, as well as the wider east-west spread.

The distributions of each species of albatross and petrel are summarized by species in **Table 2** (breeding distribution) and **Table 3** (non-breeding distribution). These data are shown divided by colony in **Table 4**. Maps illustrating the distribution of each species, in relation to the WCPFC area and WCPFC longline fishing effort, are shown in the **Appendix (Figures A1 to A16)**.

Species varied greatly in the extent to which they were distributed in EEZs versus the high seas. **Table 5** indicates the proportion of time that species spent in each.

Figure 1. Combined breeding distribution of the 23 species of albatross, giant-petrel, petrel and shearwater represented in the BirdLife International Global *Procellariiform* Tracking Database, and overlap with the WCPFC Convention Area. Utilisation Distributions (UDs) indicate the areas within which birds spend 50, 75 and 95% of their at-sea time. Each species has been given equal weighting.

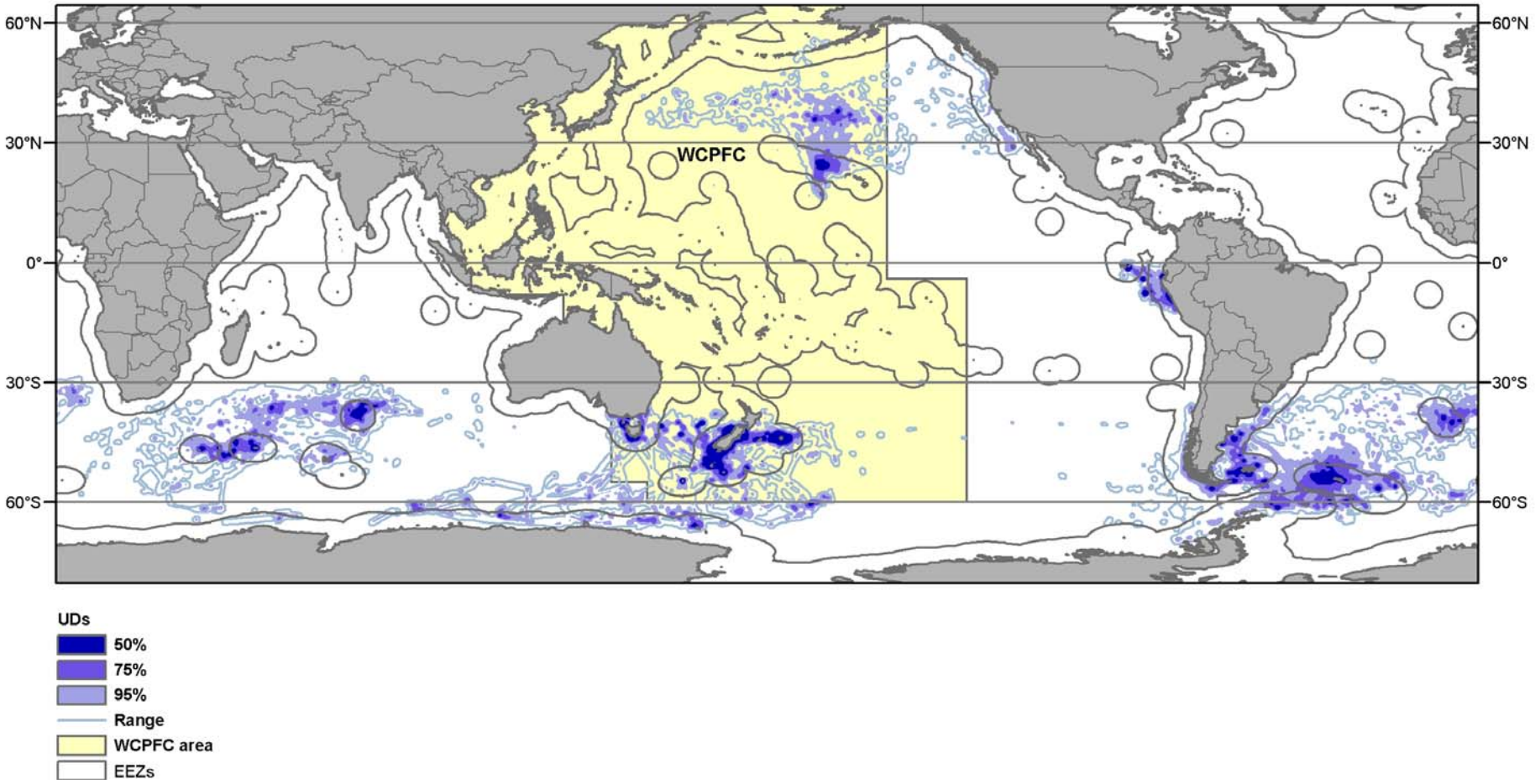
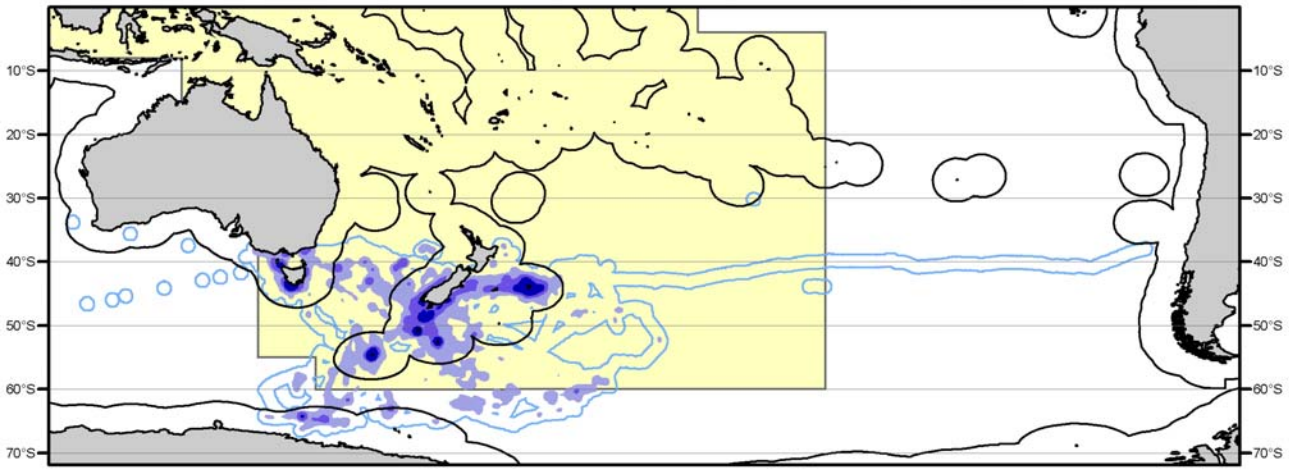
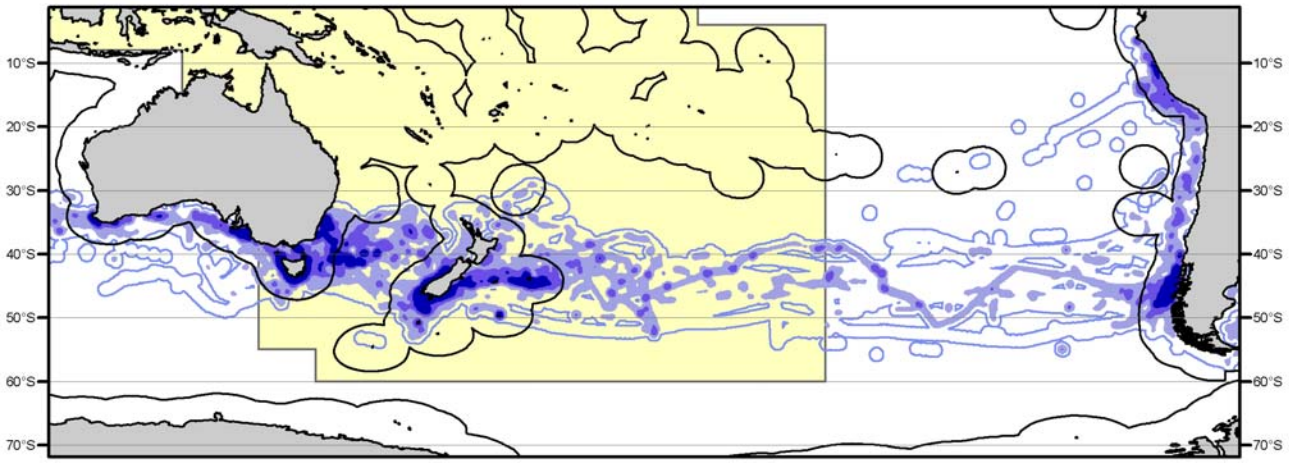


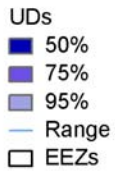
Figure 2. Comparison of (A) breeding and (B) non-breeding distributions of albatross and petrel species from New Zealand and Australia, and relation to the WCPFC area and EEZs. The breeding distribution map combines data from populations of 9 species breeding in sites in New Zealand and Australia. The non-breeding map combines data from 7 of these species. The combined maps were created by giving each species equal weighting. Utilisation Distributions (UDs) indicate the areas within which birds spend 50, 75 and 95% of their at-sea time.

A. Breeding distribution



B. Non-breeding distribution





3.2 Southwest Pacific

The WCPFC area overlaps with over 75% of the breeding distribution of almost all populations of albatrosses breeding in New Zealand and Australia (Table 4).

The breeding distribution of some species (Buller's, Chatham, Northern Royal, Shy and Southern Royal Albatross and Westland Petrel) were mostly distributed within EEZs during the breeding season (Table 5 and Appendix), highlighting the importance of the vicinity of breeding grounds as major foraging areas while breeding (Brothers *et al* 1998, Robertson & Nicholls 2000, Stahl & Sagar 2000 a&b, Waugh *et al*. 2002).

However, other species had a higher proportion (>40%) of their breeding distribution on the high seas, including high seas areas southeast of Macquarie and Campbell Islands (Campbell and Grey-headed Albatross from Campbell Is, Light-mantled Albatross from Macquarie, Black-browed Albatross from Macquarie) (Figures A5, A7, & A9) and the Tasman Sea between 40-46ºS (Antipodean Albatross, Wandering Albatross, and also Buller's Albatross, to a lesser extent) (Figures A1, A14 & A4). For these species, the extent of their distribution on the high seas in areas overlapping with WCPFC longline fishing effort means that reduction of risk of being killed as incidental mortality in fisheries will depend to a high degree on action taken by WCPFC.

Non-breeding birds have a much wider distribution in the South Pacific, with several albatross species from New Zealand and Australia migrating to the coast of South America during the non-breeding season (Figures A1, A6 & A10). The WCPFC area is also used by non-breeding albatrosses migrating in from other regions, such as Black-browed Albatross from Chile (Figure A2), and Grey-headed and Wandering Albatross from South Georgia (Table 4&5, Figures A7 & A14). This emphasises the fact that Figure 1 (which shows breeding distribution only) represents a minimum extent of albatross distribution.

In addition, few tracking data are yet available for Pacific petrel and shearwater populations. While available data indicate that while most of these species have distributions below 30ºS, the distributions of Black Petrel, Flesh-footed Shearwater and Short-tailed Shearwater also include tropical latitudes (Harrison 1990, Robertson *et al* 2003). A species which has been tracked is the Sooty Shearwater (Shaffer *et al* 2006) (data submitted to, but not yet integrated into the database). These data give a clear indication of the north/south migration of some Pacific seabirds. In this study, birds were recorded as having rapid north-south migrations between high latitude foraging areas, and few foraging dives in tropical waters.

3.3 Northwest Pacific

A very high proportion of the breeding distribution of Laysan and Black-footed Albatross is within the WCPFC area (>90%) (Figures A3 & A8). Both species are wide-ranging, distributed from the sub-Arctic waters (50-60ºN) to tropical waters in the south (15-20ºN). As a result, both species have a high proportion of their distribution in high seas areas, even during the breeding season (64% and 47%, respectively).

Data in the database on distribution during the non-breeding season come from birds which have been tagged at sea (not from colonies). These data cannot be assumed to be representative of the

species as a whole as they are likely to be biased towards the deployment locations. However, the available data again indicate the wide-ranging nature of these species. Further non-breeding data are currently being collected from colonies by the Tagging of Pacific Pelagics Project and will submitted to the database shortly (Scott Shaffer pers comm.).

No breeding distribution data are currently in the database for Short-tailed Albatross, but tracking studies are currently being undertaken by by Oregon State University and the U.S. Fish and Wildlife Service. Data collected from breeding birds are shown in Figure A11a, reproduced with permission from the data-holders. Both breeding and non-breeding data (Figure A11b) illustrate the concentration of Short-tailed Albatross distribution within EEZ waters in the North Pacific. However, c.10% of the distribution is over the high seas.

3.4 Overlap with WCPFC pelagic longline fisheries

Data from SPC databases indicate that WCPFC longline fisheries set around 600-700 million hooks per year, of which 100-110 million hooks are set south of 30ºS or north of 20ºN, corresponding to the area overlapping with albatross distribution (**Table 6**). Fishing effort extends as far as 50ºN and 50ºS (particularly around Tasmania, as shown in Figure A1). However more than 99% of the 100 million hooks are concentrated between 20-45ºN or 30-45ºS. Principle fish caught within these areas are albacore, swordfish and bigeye tuna (also southern bluefin tuna in the South Pacific, managed by the Commission for the Conservation of Southern Bluefin Tuna, CCSBT).

Of the 15 albatross and petrel species for which there were breeding distribution data in the region, 9 had a high degree of overlap with WCPFC longline fishing effort (Table 2).

Albatross species breeding on islands south of 50ºS (Auckland Is, Campbell Is and Macquarie Is) are the exceptions: their distributions have a high degree of overlap with the WCPFC area, but low overlap with WCPFC longline fishing effort. Short-tailed Albatross distribution has a high degree of overlap with WCPFC longline fishing effort in the Northwest Pacific, but distribution around the Aleutian Islands is north of the WCPFC fisheries.

In the North Pacific, WCPFC longline fishing effort above 20ºN (total c. 60 million hooks) is highest in the first and fourth quarters of each year (i.e. Oct-March). This corresponds to the pre-breeding/incubation/early chick-rearing periods for Black-footed Albatross and Laysan Albatross (**Table 7**). In the South Pacific, WCPFC longline fishing effort below 30ºS (total 30-40 million hooks) is highest in the second quarter (April-June). This coincides with the chick-rearing period for Antipodean, Buller's, Northern Royal and Southern Royal, Albatross, and the non-breeding period for Campbell, Chatham, Light-mantled, Salvin's and Shy Albatross.

4. DISCUSSION

Tracking data reveal the importance of the WCPFC Convention Area for global albatross and petrel distribution. Albatross distribution is concentrated below 30ºS and above 20ºN. WCPFC longline fisheries set c.100 million hooks each year in these areas. Given that albatrosses are known to be vulnerable to bycatch, it must be considered likely that seabird bycatch is occurring in this area. While seabird bycatch data have been collected within US, New Zealand and

Australian EEZs, currently few seabird bycatch data exist for WCPFC longline fisheries in high seas areas in the Northwest or Southwest Pacific (above 20ºN or below 30ºS) (Molony 2005). This emphasises the urgent need for the collection of seabird bycatch data by WCPFC through its regional observer program. High quality bycatch data combined with seabird distribution data from tracking studies will allow bycatch mitigation strategies to be effectively targeted in areas and in seasons where they are needed, benefiting both fishermen and albatross conservation. CCAMLR's experience has demonstrated the importance of developing standardised methodologies for recording seabird bycatch.

Tracking data show that few albatrosses are distributed in tropical and sub-tropical latitudes of the WCPFC area (20ºN to 30ºS). However, there are several smaller species of petrel and shearwater which have been recorded as seabird bycatch, and whose ranges extend across the tropical and sub-tropical areas of the WCPFC area (Robertson *et al* 2003; Waugh 2006). Of these smaller species, a number (Black Petrel, Flesh-footed Shearwater and Sooty Shearwater) are annual migrants (Shaffer *et al* 2006). Watling (2002) commented on the uncertainty of whether these birds were foraging on their journey, or merely passing rapidly through. There are currently no tracking data available to provide an answer to this question using tracking data. Based on available observer data and interviews, Watling (2002) and Molony (2005) concluded that seabird bycatch in the tropical Pacific may be an infrequent occurrence, but that the observer data (<1% coverage of fishing effort) were not sufficient to determine whether or not the bycatch rates may still be having an impact on seabird populations. Given this, it is recommended that WCPFC undertake an assessment of seabird bycatch in tropical and sub-tropical areas (20ºN to 30ºS). This could follow CCAMLR's approach, using a high level of observer coverage (e.g. 20%) over a short timeframe (e.g. 2 years), after which results would be examined and used to assess the need for mitigation measures and for continued collection of observer data.

It would also be valuable to extend the analysis presented in this paper to assess seasonal as well as spatial overlap between longline fishing effort and albatross and petrel distribution: identifying overlap by year quarter (Jan-March, Apr-June, July-Sept, Oct-Dec) and, if fishing effort data can be made available, by 1 degree grid square.

5. RECOMMENDATIONS

- Urgent collection of seabird bycatch data as part of WCPFC observer programmes, especially in fishing effort south of 30ºS and north of 20ºN, but also in tropical areas
- Develop standardised methodology for collection of these seabird bycatch data by the WCPFC observer programs
- Extend the analysis presented in this paper by assessing the overlap between satellite tracking data and fishing effort data by year quarter and, if fishing effort data can be made available, by 1 degree grid square
- Use the albatross and petrel distribution data to inform and help design effective bycatch mitigation measures.

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Table 1. Albatross and petrel species breeding in the Pacific region which have been recorded as seabird bycatch (Robertson *et al* 2003), their threat status (IUCN 2004), and summary of tracking data held in the Global Procellariiform Tracking Database.

Common name	Scientific name	IUCN Threat status	Tracking data held in the Global Procellariiform Tracking Database [1]
Albatrosses			
Antipodean Albatross	*Diomedea antipodensis*	Vulnerable	B, N
Black-browed Albatross	*Thalassarche melanophrys*	Endangered	B, N
Black-footed Albatross	*Phoebastria nigripes*	Endangered	B, N
Buller's Albatross	*Thalassarche bulleri*	Vulnerable	B
Campbell Albatross	*Thalassarche impavida*	Vulnerable	B
Chatham Albatross	*Thalassarche eremita*	Critically Endangered	B, N
Grey-headed Albatross	*Thalassarche chrysostoma*	Vulnerable	B, N
Laysan Albatross	*Phoebastria immutabilis*	Vulnerable	B, N
Light-mantled Albatross	*Phoebetria palpebrata*	Near Threatened	B
Northern Royal Albatross	*Diomedea sanfordi*	Endangered	
Salvin's Albatross	*Thalassarche salvini*	Vulnerable	NO DATA
Short-tailed Albatross	*Phoebastria albatrus*	Vulnerable	N
Shy Albatross	*Thalassarche cauta*	Near Threatened	B, N
Southern Royal Albatross	*Diomedea epomophora*	Vulnerable	B
Wandering Albatross	*Diomedea exulans*	Vulnerable	B, N (not Pacific population)
Waved Albatross	*Phoebastria irrorata*	Vulnerable	B
Giant-petrels, Petrels & Shearwaters			
Northern Giant-petrel	*Macronectes halli*	Near Threatened	B, N (not Pacific populations)
Southern Giant-petrel	*Macronecties giganteus*	Vulnerable	B, N (not Pacific populations)
Black Petrel	*Procellaria parkinsoni*	Vulnerable	NO DATA
Great-winged Petrel	*Pterodroma macroptera*	Least Concern	NO DATA
Grey Petrel	*Procellaria cinerea*	Near Threatened	NO DATA
Westland Petrel	*Procellaria westlandica*	Vulnerable	B
White-chinned Petrel	*Procellaria aequinoctialis*	Vulnerable	B, N (not Pacific populations)
Buller's Shearwater	*Puffinus bulleri*	Vulnerable	NO DATA
Flesh-footed Shearwater	*Puffinus carneipes*	Least Concern	NO DATA
Short-tailed Shearwater	*Puffinus tenuirostris*	Least Concern	B
Sooty Shearwater	*Puffinus griseus*	Near Threatened	Data submitted
Wedge-tailed Shearwater	*Puffinus pacificus*	Least Concern	NO DATA

Notes
1. Tracking data: B=Breeding, NB=Non-breeding, Shaded cells =No data.

Table 2. BREEDING distribution of albatrosses, petrels and shearwaters (% at-sea distribution) and overlap with the WCPFC Convention Area and 5° grid squares in which there was WCPFC pelagic longline fishing effort 2000-2003. Albatross and petrel distribution data from the Global *Procellariiform* Tracking Database (GPTD). Longline fishing effort data from SPC 2005. Shaded blank cells indicate no tracking data.

Species	Population represented by tracking data in the GPTD (%)	Overlap with WCPFC area (%)	Overlap with WCPFC longline fishing effort 2000-2003 (%)
Albatrosses			
Antipodean Albatross	59[1]	98	56
Black-browed Albatross	99	0	0
Black-footed Albatross	97	93	93
Buller's Albatross	100	90	90
Campbell Albatross	100	77	18
Chatham Albatross	100	99	85
Grey-headed Albatross	100	6	0
Laysan Albatross	100	99	87
Light-mantled Albatross	37[2]	13	0
Northern Royal Albatross	99	98	95
Salvin's Albatross			
Short-tailed Albatross[3]			
Shy Albatross	14[4]	83	77
Southern Royal Albatross	99	99	72
Wandering Albatross	99.9	0[5]	
Waved Albatross	100	0	0
Giant-petrels			
Northern Giant-petrel			
Southern Giant-petrel			
Other petrels, shearwaters			
Westland Petrel	100	87	87
Short-tailed Shearwater	<1%	16	12
COMBINED global breeding distribution of 23 species for which there are breeding distribution data in the Global Procellariiform tracking Database[6]		**41%**	

Notes:
1. Antipodean Albatross data are from the Auckland Islands, representing the sub-species Gibson's Albatross. No breeding distribution data available for Antipodean Albatross from the Antipodes Is or Campbell Is.
2. Light-mantled Albatross data from Macquarie Island (9%) and South Georgia (27%). No data available for Pacific populations from Auckland Islands (27%), Campbell Island (7%) or Antipodes Islands (1%).
3. No breeding distribution data are yet held in the GPTD, but preliminary results have been made available to this report by the Albatross Tracking Project.
4. Shy Albatross data are from Tasmania. No breeding distribution tracking data available for Shy Albatross from the Antipodes Is or Auckland Is, which represent the sub-species of White-capped Albatross.
5. No tracking data from the small population breeding on Macquarie Island, but this represents c. 0.1% of the global breeding population of Wandering Albatross.
6. In addition to the species shown in the table, breeding distribution data used for this calculation were from Amsterdam, Indian Yellow-nosed, Sooty, Tristan and Wandering albatrosses, White-chinned Petrel (populations outside the Pacific), and Northern and Southern Giant-petrel. The breeding distributions of these additional 8 species do not overlap with the WCPFC area.

Table 3. NON-BREEDING distribution of albatrosses, petrels and shearwaters (% at-sea distribution) and overlap with the WCPFC Convention Area and 5° grid squares in which there was WCPFC pelagic longline fishing effort 2000-2003. Albatross and petrel distribution data from the Global *Procellariiform* Tracking Database (GPTD). Longline fishing effort data from SPC 2005. Shaded blank cells indicate no tracking data.

Species	Population represented by tracking data in the GPTD (%)	Overlap with WCPFC area (%)	Overlap with WCPFC longline fishing effort 2000-2003 (%)
Albatrosses			
Antipodean Albatross	100	77	69
Black-browed Albatross	99	3	3
Black-footed Albatross	At sea[1]	(54)	(21)
Buller's Albatross			
Campbell Albatross			
Chatham Albatross	100	48	39
Grey-headed Albatross	70	3	2
Laysan Albatross	At sea[1]	(98)	(5)
Light-mantled Albatross			
Northern Royal Albatross	100	18	17
Salvin's Albatross			
Short-tailed Albatross	95	98	47
Shy Albatross	14[2]	40	38
Southern Royal Albatross			
Wandering Albatross	100[3]	41	40
Waved Albatross			
Giant-petrels			
Northern Giant-petrel			
Southern Giant-petrel			

Notes:
1. Laysan and Black-footed Albatross distribution data during the non-breeding season are from birds tagged at-sea.
2. Shy Albatross data are from Tasmania. No breeding distribution tracking data available for Shy Albatross from the Antipodes Is or Auckland Is, which represent the sub-species of White-capped Albatross.
3. No tracking data from the small population breeding on Macquarie Island, but this represents c. 0.1% of the global breeding population of Wandering Albatross.

Table 4. Overlap between the WCPFC area and the distribution of albatrosses and petrels BY COLONY (% at-sea distribution). Albatross and Petrel distribution data from the Global *Procellariiform* Tracking Database (GPTD).

Species	Site	Percent of global population (%)	Overlap with WCPFC area (%)
BREEDING			
Antipodean (Gibson's) Albatross	Auckland Islands	59	98
Black-browed Albatross	Chile	20	0
	Macquarie Island	<1	97
Black-footed Albatross	Hawaiian Islands	97	93
Buller's Albatross	Snares Islands	27	94
	Solander Islands	15	83
Campbell Albatross	Campbell Island	100	77
Chatham Albatross	Chatham Islands	100	99
Grey-headed Albatross	Campbell Island	6	83
	Chile	15	0
	Macquarie Island	<1	94
Laysan Albatross	Isla de Guadalupe	<1	3
	Hawaiian Islands	100	100
Light-mantled Albatross	Macquarie Island	9	55
Northern Royal Albatross	Chatham Islands	99	98
	Taiaroa Head	1	77
Shy Albatross	Tasmania	14	83
Southern Royal Albatross	Campbell Island	99	99
Waved Albatross	Isla Española	100	0
Westland Petrel	Punakaiki	100	87
NON-BREEDING			
Antipodean Albatross	Antipodes	100	45
Antipodean (Gibson's) Albatross	Auckland Islands	59	99
Black-browed Albatross	Chile	20	13
Chatham Albatross	Chatham Islands	100	48
Grey-headed Albatross	South Georgia	58	4
Northern Royal Albatross	Chatham Islands	99	18
	Taiaroa Head	1	18
Short-tailed Albatross	Izu Shoto	95	98
Shy Albatross	Tasmania	14	40

Table 5. Distribution of albatrosses and petrels within Exclusive Economic Zones (EEZs) and on the high seas. Albatross and petrel distribution data from the Global *Procellariiform* Tracking Database (GPTD).

Species	Population represented by tracking data in the GPTD (%)	Time in EEZs (%)	Time in High Seas (%)
Breeding			
Antipodean Albatross	59	60	40
Black-browed Albatross	99	85	15
Black-footed Albatross	97	53	47
Buller's Albatross	100	82	18
Campbell Albatross	100	58	42
Chatham Albatross	100	98	2
Grey-headed Albatross	100	39	61
Laysan Albatross	100	36	64
Light-mantled Albatross (Macquarie Island)	37	50	50
Northern Royal Albatross	99	99	1
Shy Albatross	14	84	16
Southern Royal Albatross	99	99	1
Westland Petrel	100	88	12
Short-tailed Shearwater	<1%	10	90
Non-breeding			
Antipodean Albatross	100	44	56
Black-footed Albatross	At sea[1]	(65)	(35)
Chatham Albatross	100	74	26
Laysan Albatross	At sea[1]	(81)	(19)
Northern Royal Albatross	100	84	16
Short-tailed Albatross	95	90	10
Shy Albatross	14	82	82
Wandering Albatross	99.9	48	52

Notes:
1. Laysan and Black-footed Albatross distribution data during the non-breeding season are from birds tagged at-sea.

Table 6. Longline fishing effort (millions of hooks) within the WCPFC Convention Area and areas overlapping with albatross distribution (north of 20°N and south of 30°S). Fishing effort shown is the average number of hooks set per year in each region, based on data from 2000-2003 (SPC 2005).

Year	Total WCPFC longline effort	Longline effort north of 20°N	Longline effort south of 30°S	Longline effort north of 20°N or south of 30°S	% Total
2000	581.1	61.6	41.3	102.9	17.7
2001	601.5	56.8	45.9	102.7	17.1
2002	768.2	58.3	53.4	111.7	14.5
2003	699.7	66.1	51.8	117.9	16.8
Average	662.6	60.7	48.1	108.8	16.5

Table 7. WCPFC longline fishing effort (millions of hooks) north of 20°N or south of 30°S, divided by year quarter. Fishing effort shown is the average number of hooks set per year based on data from 2000-2003 (SPC 2005). Peak fishing periods are shown in bold type.

	Jan-March	April-June	July-Sept	Oct-Dec	Total
North of 20ºN	**17.7**	9.8	11.3	**21.8**	60.7
South of 30ºS	4.3	**30.2**	10.4	3.2	48.1
Total	22.0	40.1	21.7	25.0	108.8

Distribution of Albatross and petrels in the WCPFC Convention Area and overlap with WCPFC longline fishing effort

Prepared by: BirdLife International
for the Agreement on the Conservation of Albatrosses and Petrels

APPENDIX:

Maps of albatross and petrel distribution in the WCPFC area

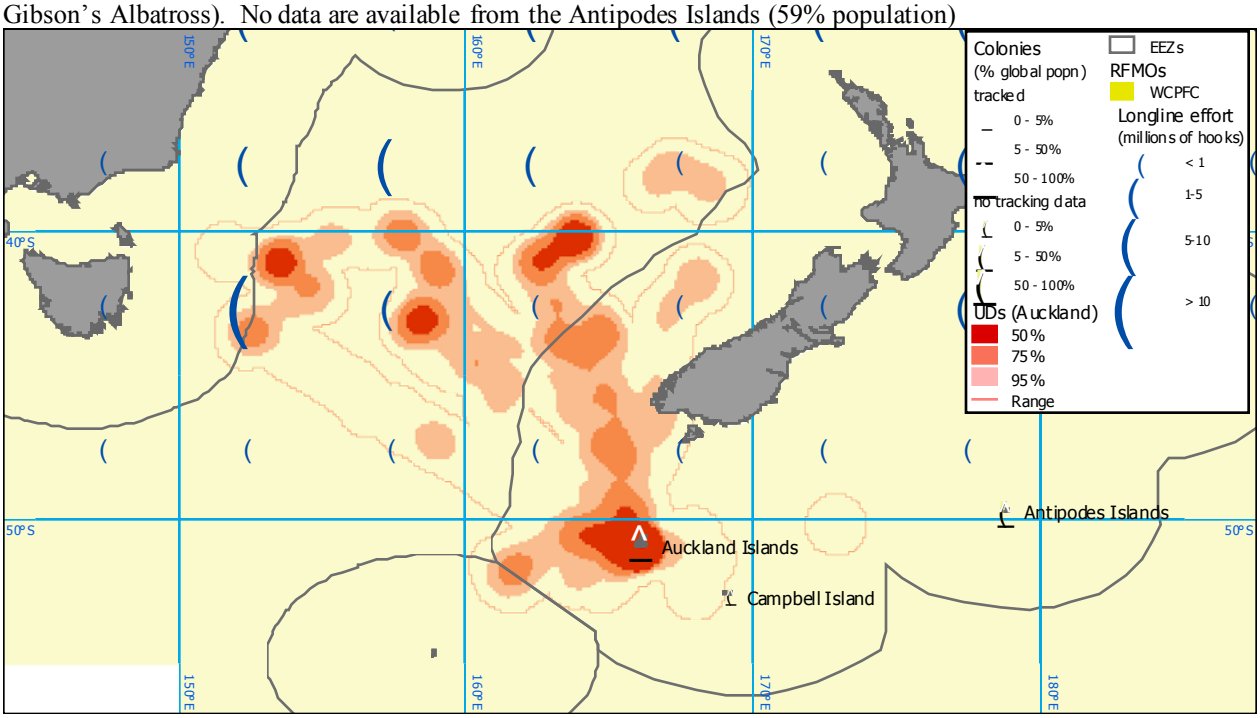
Figures

Note on depiction of EEZs on maps:
Several disputes exist worldwide regarding delimitation of boundaries between the EEZs of different States. The EEZs in maps in this document are therefore presented without boundaries between countries. The exceptions are for the maps that are zoomed in to focus on the New Zealand EEZ, for which the boundary with the Australian EEZ around Macquarie Island has been included, for sake of clarity. The EEZs presented here are for illustrative purposes only and do not imply the expression of any opinion whatsoever on the part of BirdLife International concerning the legal status of any country, territory or area, or concerning the delimitation of its boundaries.

Figure A1. Distribution of Antipodean Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from D.G. Nicholls, M.D. Murray E.C. Butcher, K. Walker, G. Elliott and Department of Conservation, New Zealand. Birds tracked from the Auckland Islands (41% of the global population, and representing the sub-species of Gibson's Albatross). No data are available from the Antipodes Islands (59% population)



B. NON-BREEDING DISTRIBUTION

Data from D.G. Nicholls, M.D. Murray E.C. Butcher, K. Walker, G. Elliott and Department of Conservation, New Zealand. Data available from the Antipodes Islands and Auckland Islands, representing >99% of the population.

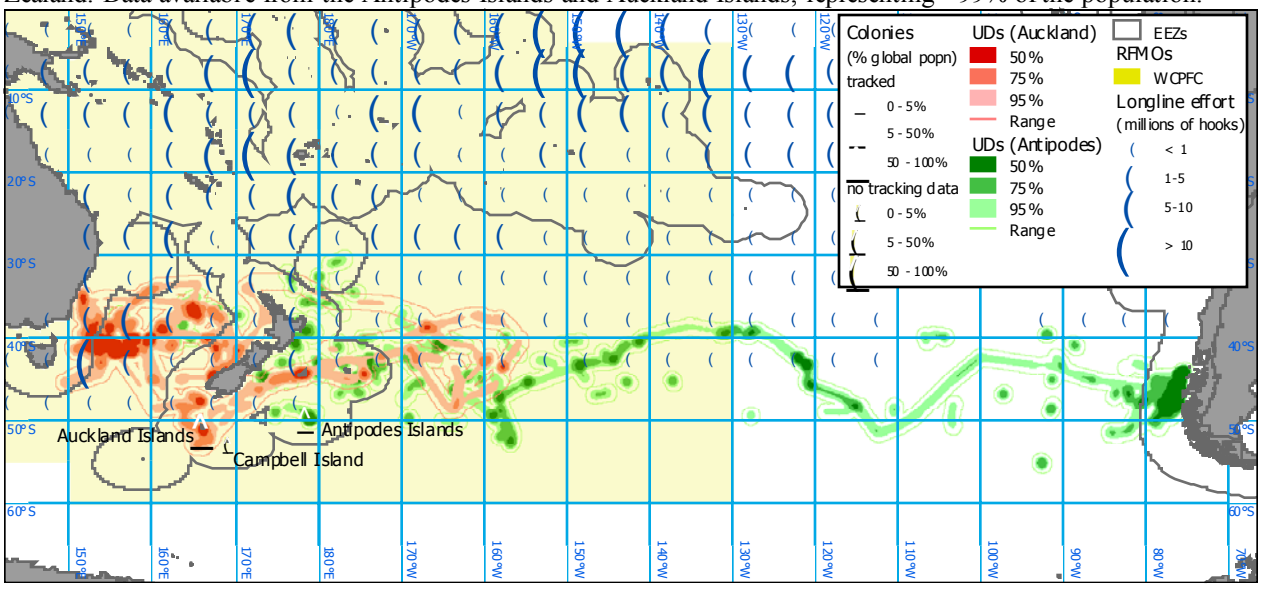


Figure A2. Distribution of Black-browed Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Overlap <1%.

No tracking data from Antipodes, Campbell Island, Snares, although together these represent<1% global population.

B. NON-BREEDING DISTRIBUTION

Data from J. Croxall, J. Silk, British Antarctic Survey and J. Arata, Universidad Austral de Chile. No tracking data from Antipodes, Campbell Island, Snares, although together these represent<1% global population.

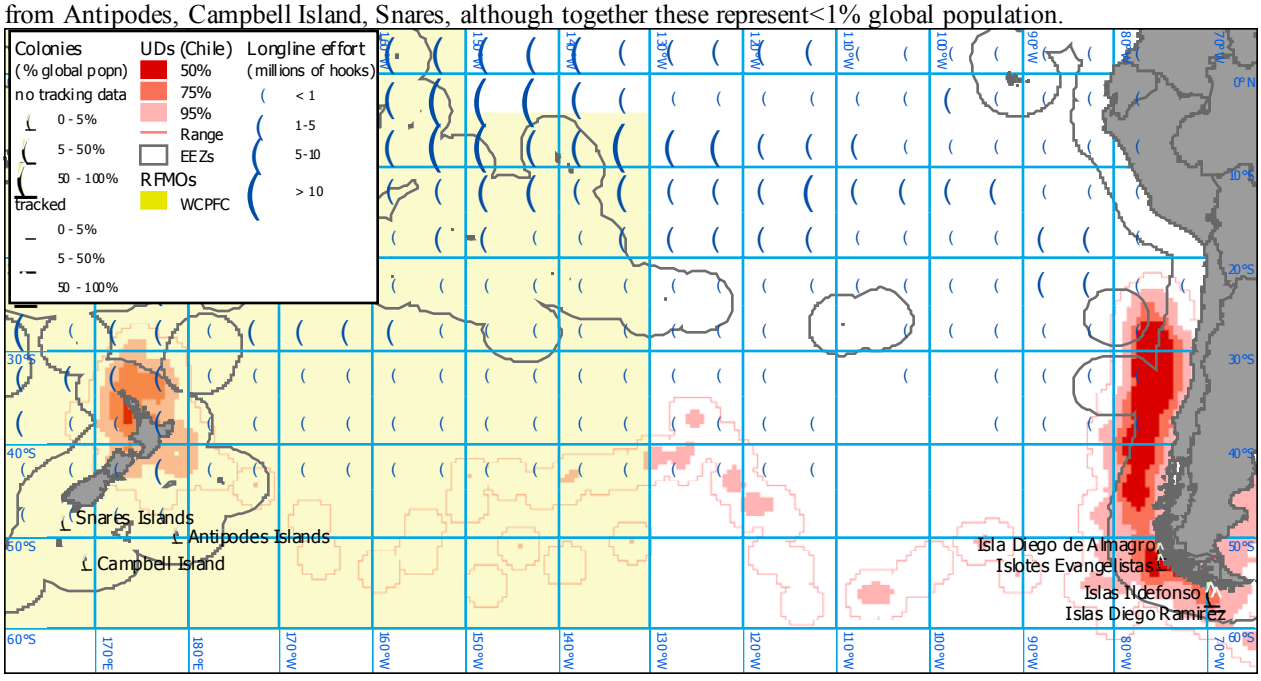
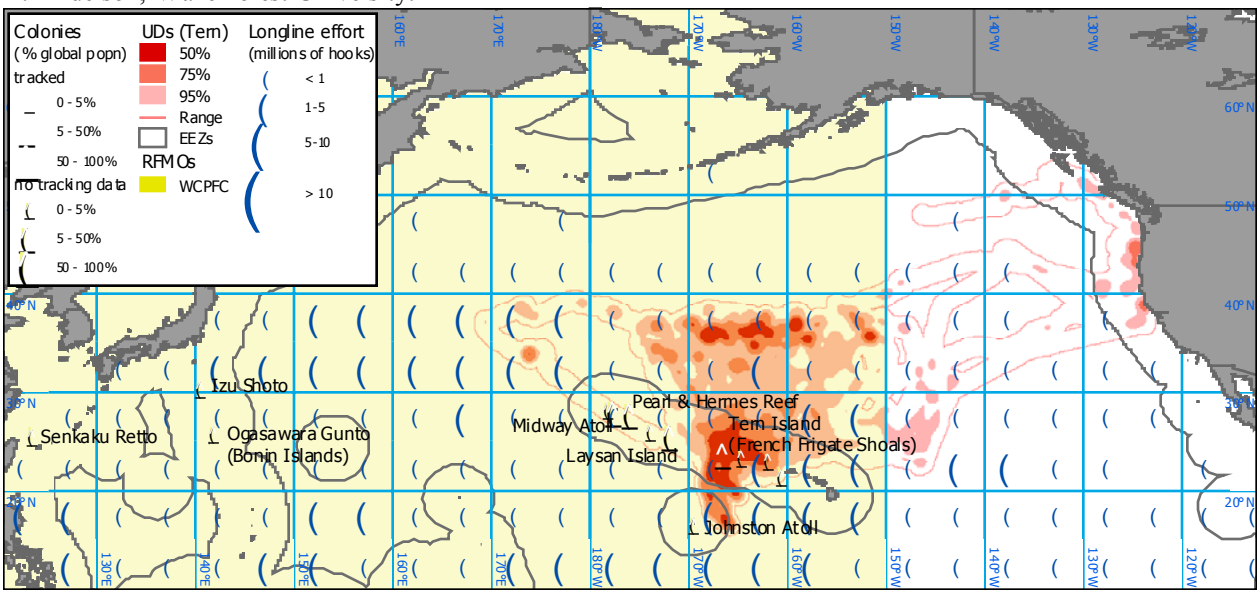


Figure A3. Distribution of Black-footed Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from S. Shaffer, Y. Tremblay, D.P. Costa, M. Antolos, University of California Santa Cruz and J. Awkerman, D. Anderson, Wake Forest University.



B. NON-BREEDING DISTRIBUTION

Data from D. Hyrenbach, U.C. San Diego; Rob Suryan, K. Fischer, Hatfield Marine Science Center; Greg Balogh, USFWS. Birds tracked after capture at-sea (deployment locations shown with white stars). The birds tagged in California remained east of 130°W while the 10 birds tracked from the Aleutian Islands ranged across much of the northern Pacific.

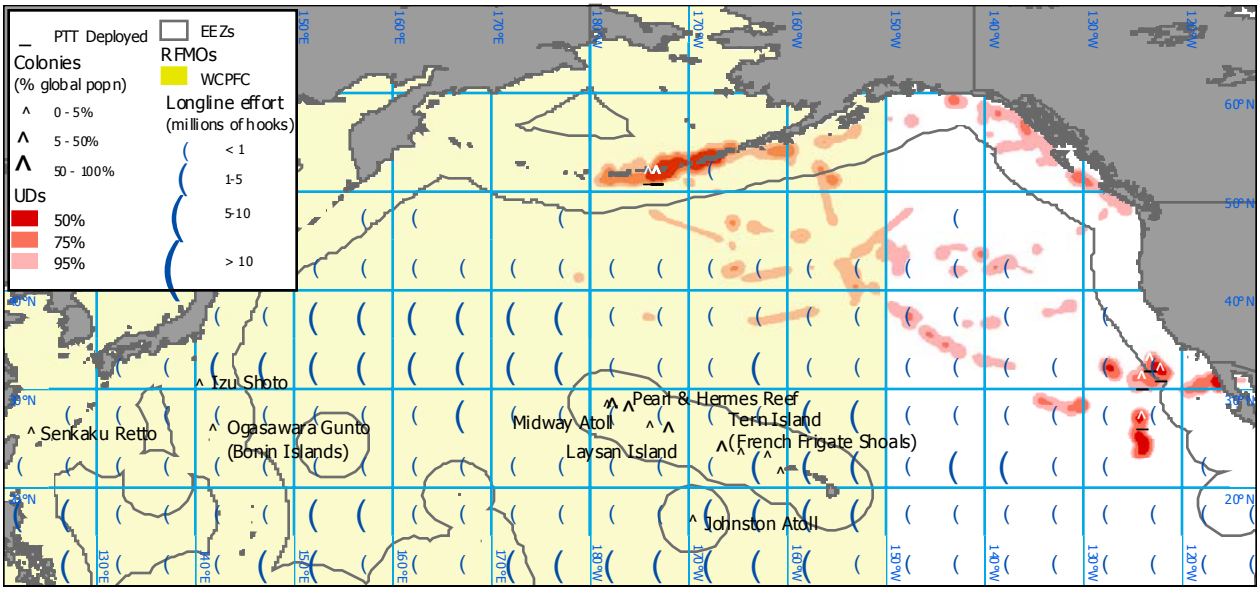
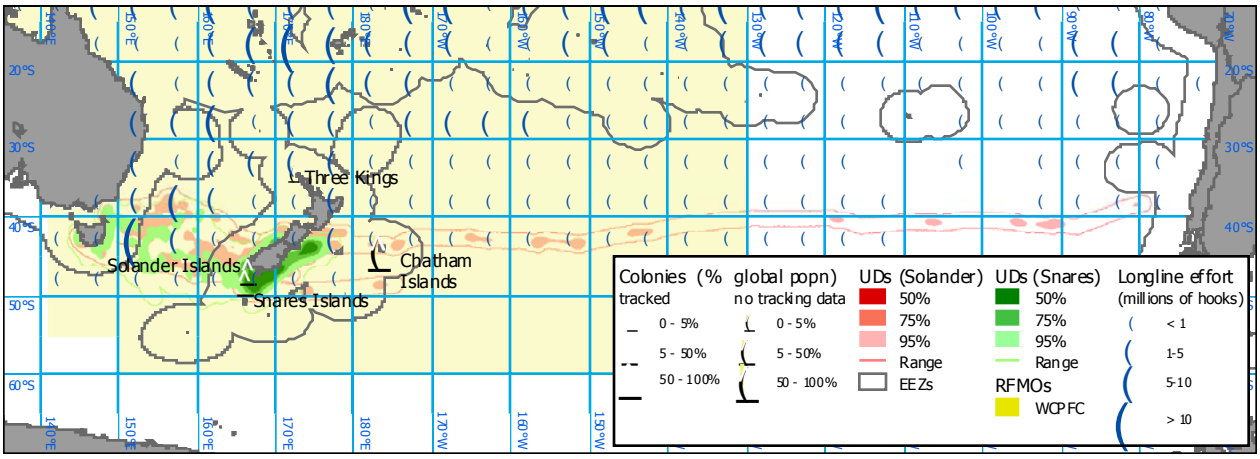


Figure A4. Distribution of Buller's Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from J.C. Stahl, Museum of New Zealand and Paul Sagar, NIWA, New Zealand. Birds tracked from Solander and Snares Islands. No tracking data available from Chatham Islands (58% global population)



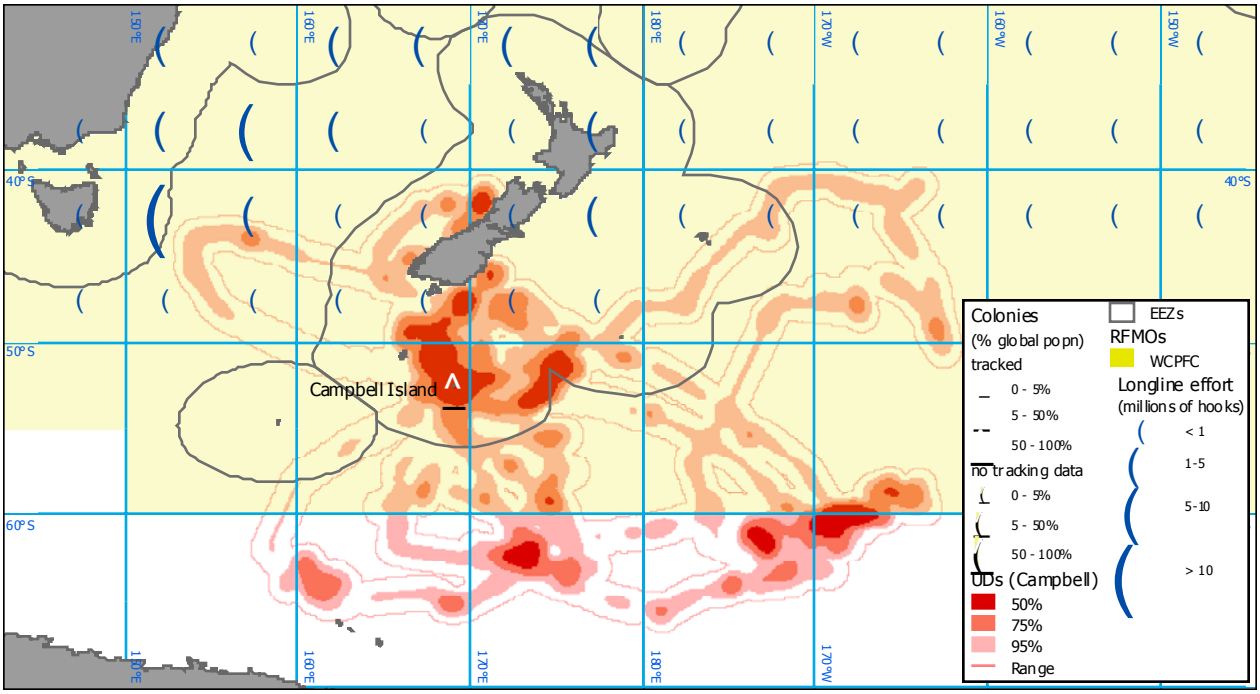
B. NON-BREEDING DISTRIBUTION

No tracking data available for birds during the non-breeding season

Figure A5. Distribution of Campbell Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from H. Weimerskirch, Centre d'Etudes Biologiques de Chizé, CNRS, France.



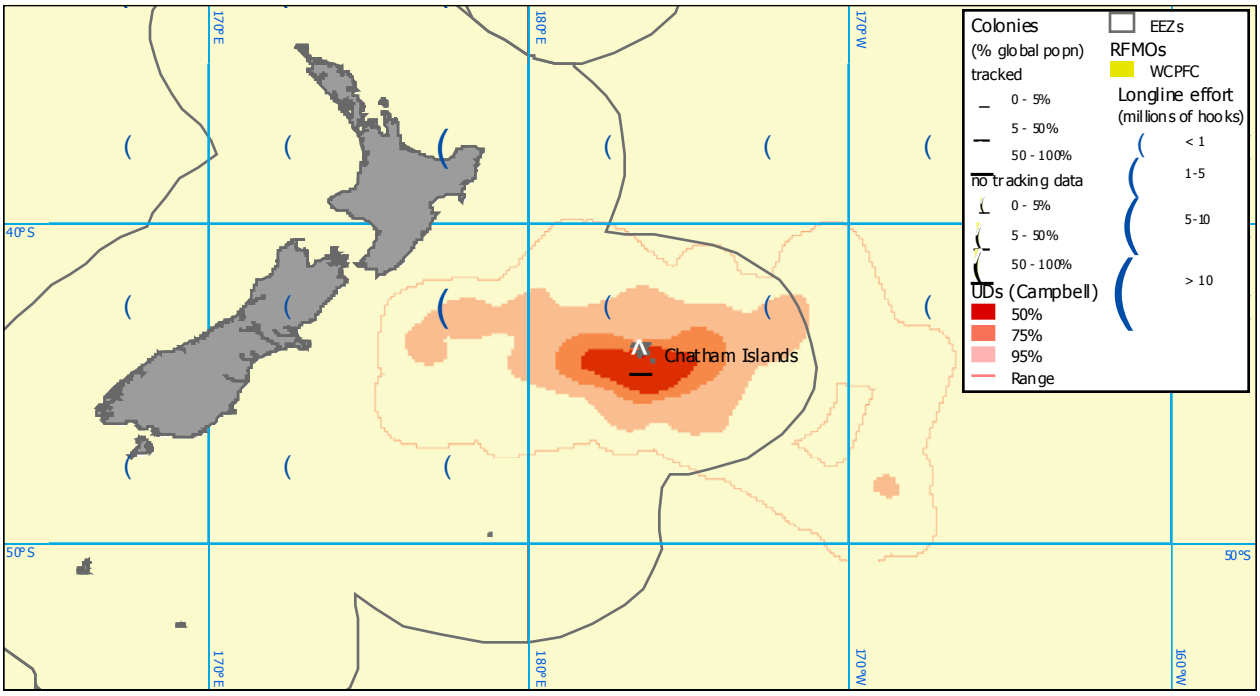
B. NON-BREEDING DISTRIBUTION

No tracking data available

Figure A6. Distribution of Chatham Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square).

A. BREEDING DISTRIBUTION

Data from D.G. Nicholls, M.D. Murray and C.J.R. Robertson, Department of Conservation, New Zealand



B. NON-BREEDING DISTRIBUTION

Data from D.G. Nicholls, M.D. Murray and C.J.R. Robertson, Department of Conservation, New Zealand

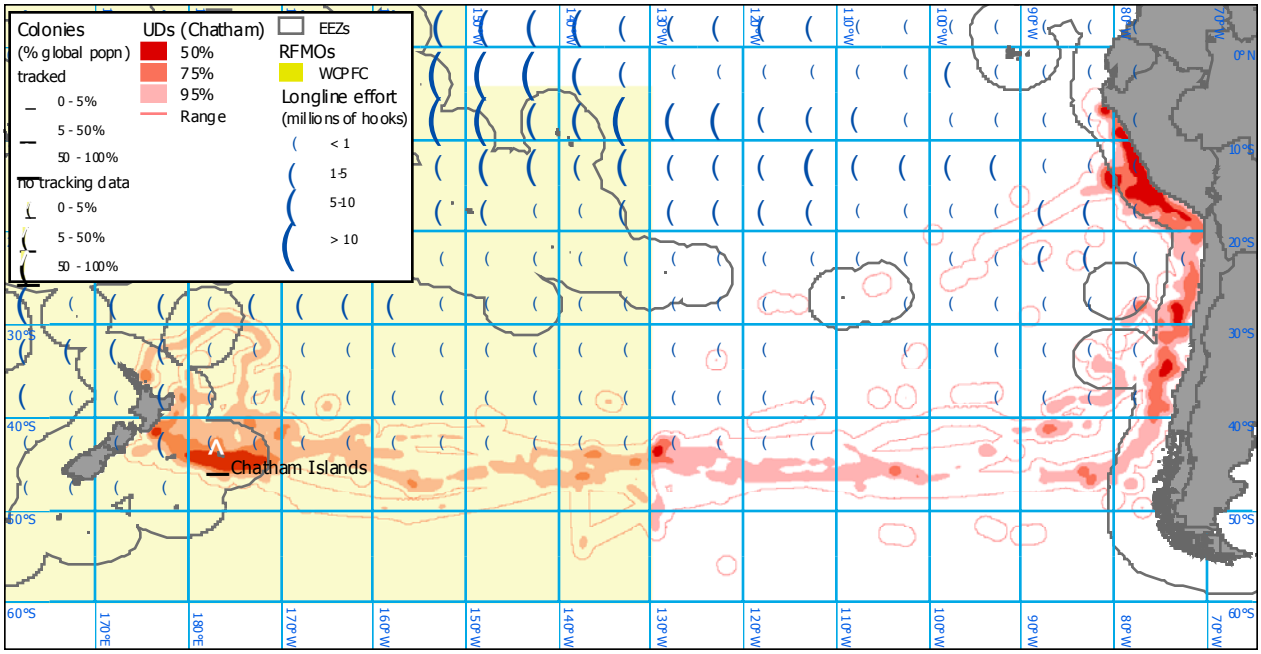
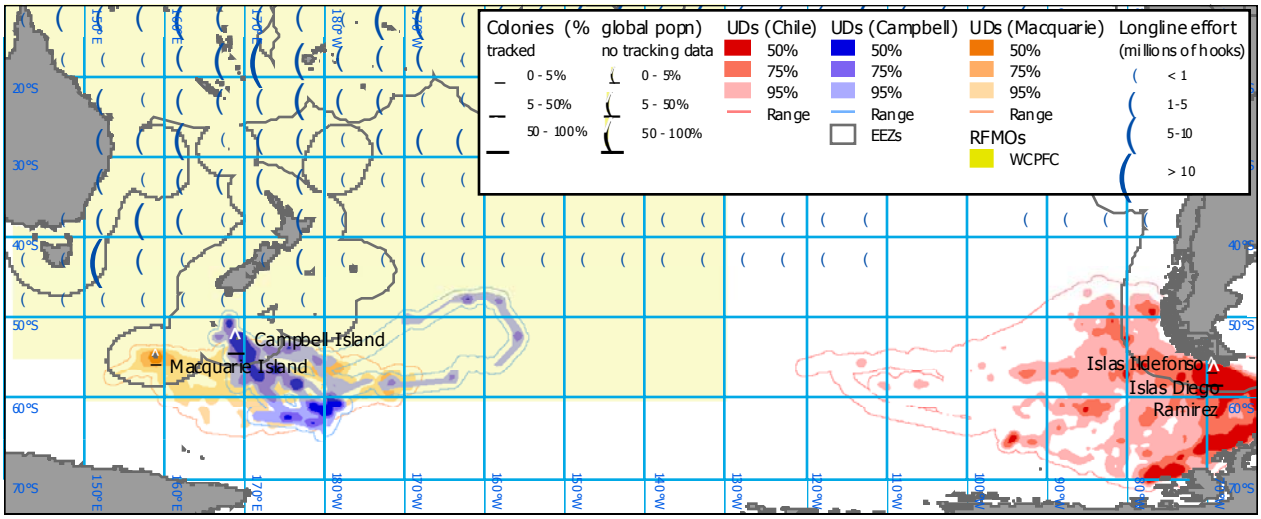


Figure A7. Distribution of Grey-headed Albatross and overlap with the WCPFC Convention Area and with WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from G. Robertson, Australian Antarctic Division; J. Arata, Universidad Austral de Chile; H. Weimerskirch, Centre d'Etudes Biologiques de Chizé, CNRS, France; N. Brothers, A. Hedd, R. Gales, A Terauds, DPIWE, Tasmania. Birds tracked from Macquarie Island, Campbell Island, and two Chilean islands, representing <1%, 7% and 18% of the global population, respectively.



B. NON-BREEDING DISTRIBUTION

Data from J. Croxall, R. Phillips, A. Wood, J. Silk, D. Briggs, British Antarctic Survey; G. Robertson, Australian Antarctic Division; J. Arata, Universidad Austral de Chile. Birds tracked from Chile and South Georgia, together representing 70% of the global population. No tracking data from Macquarie Island or Campbell Island, representing <1% and 7% of population, respectively.

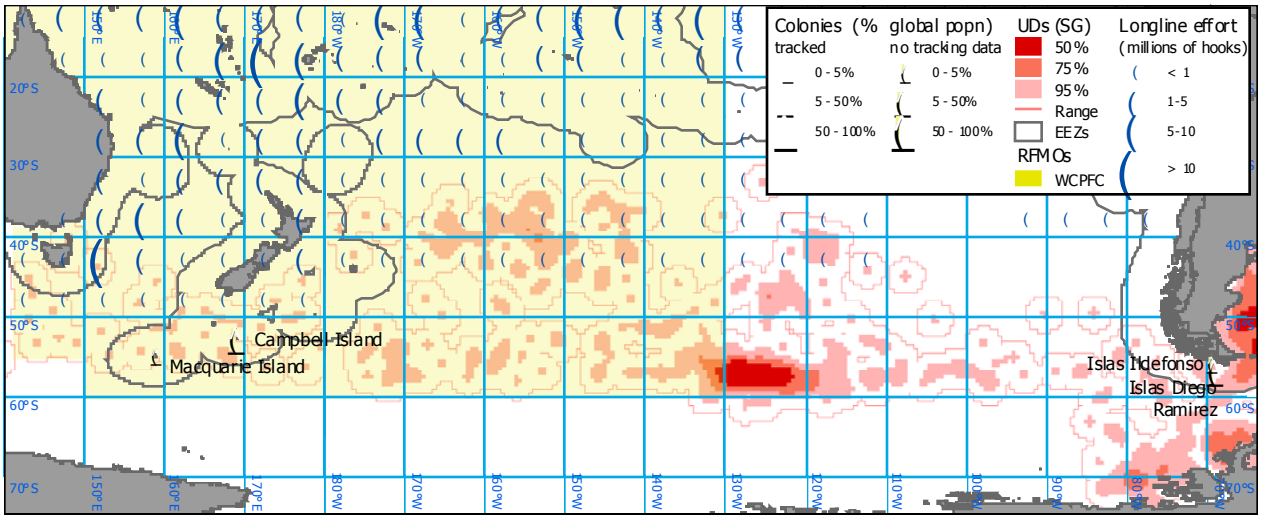
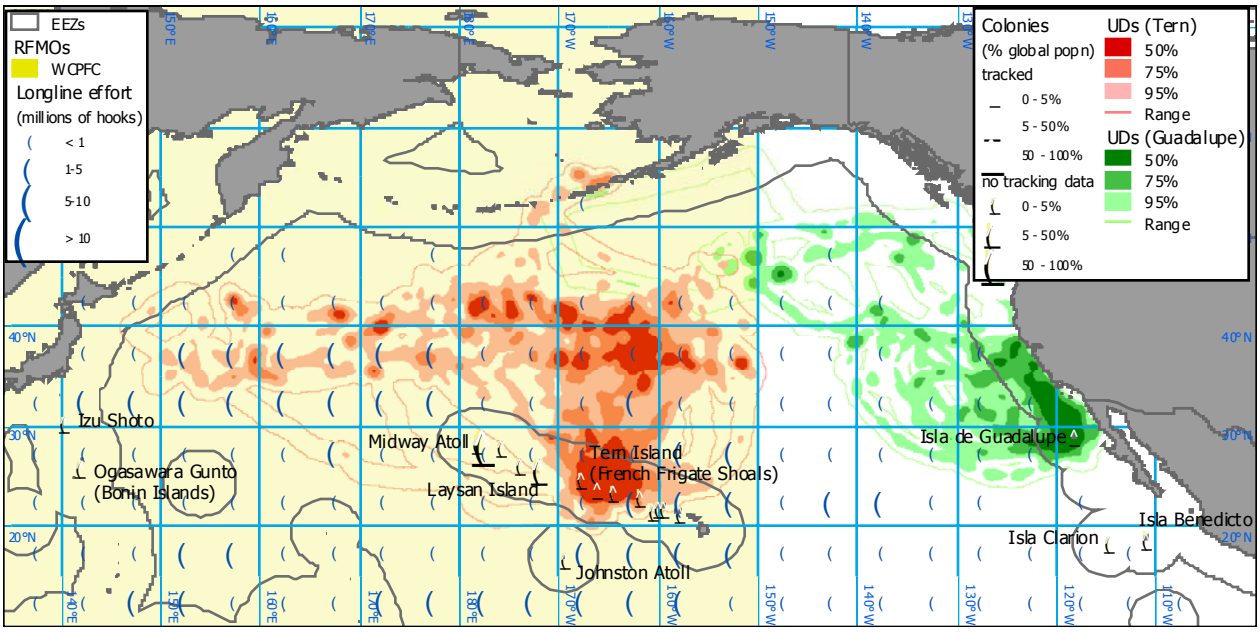


Figure A8. Distribution of Laysan Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from S. Shaffer, Y. Tremblay, D.P. Costa, B. Henry, D.A. Croll, M. Antolos, University of California Santa Cruz; J. Awkerman, D. Anderson, Wake Forest University.



B. NON-BREEDING DISTRIBUTION

Data from Rob Suryan, Karen Fischer, Hatfield Marine Science Center; Greg Balogh, USFWS. Ten birds tracked after capture at sea near the Aleutian Islands (deployment locations shown with white stars).

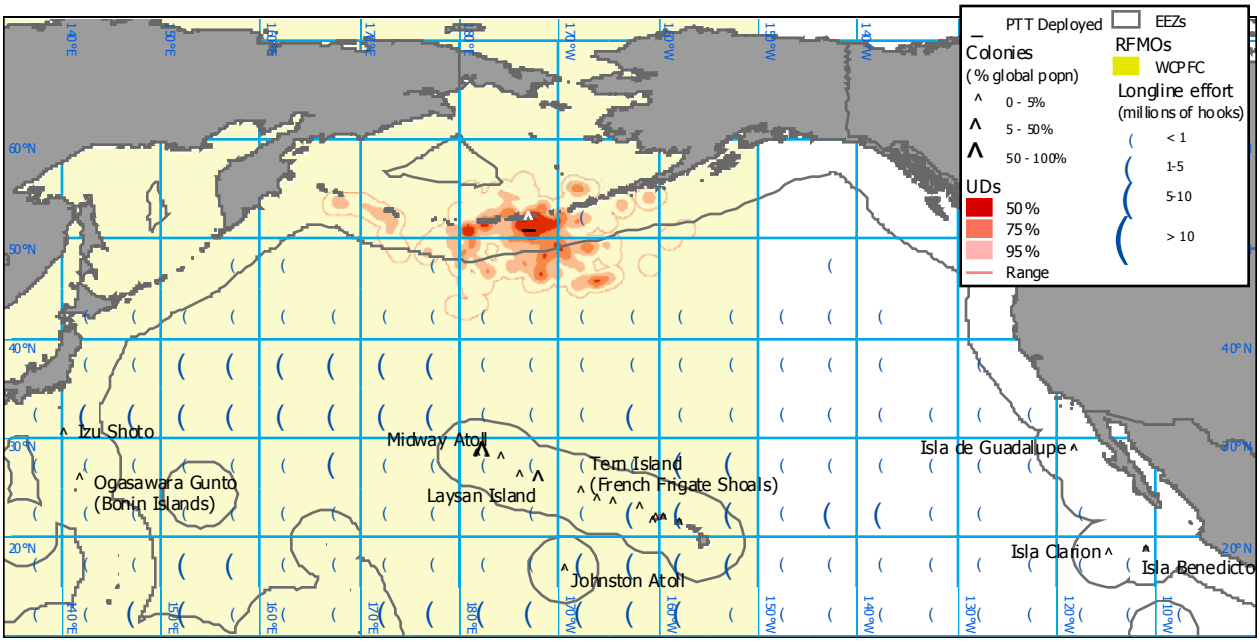
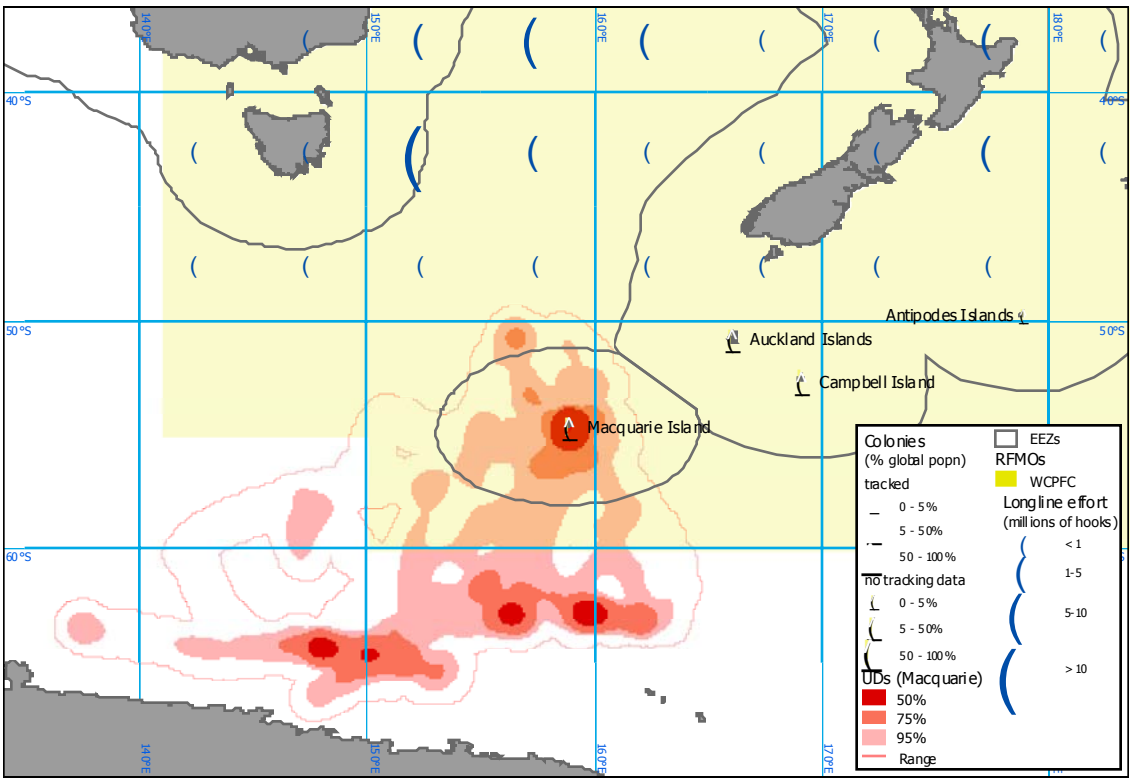


Figure A9. Distribution of Light-mantled Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from N. Brothers, A. Hedd, R. Gales, A Terauds, DPIWE, Tasmania. Data from birds tracked from Macquarie Island (9% global population). No tracking data from Auckland Islands, Campbell Island, Antipodes Islands, representing 23%, 7% and 1% of the global population, respectively.



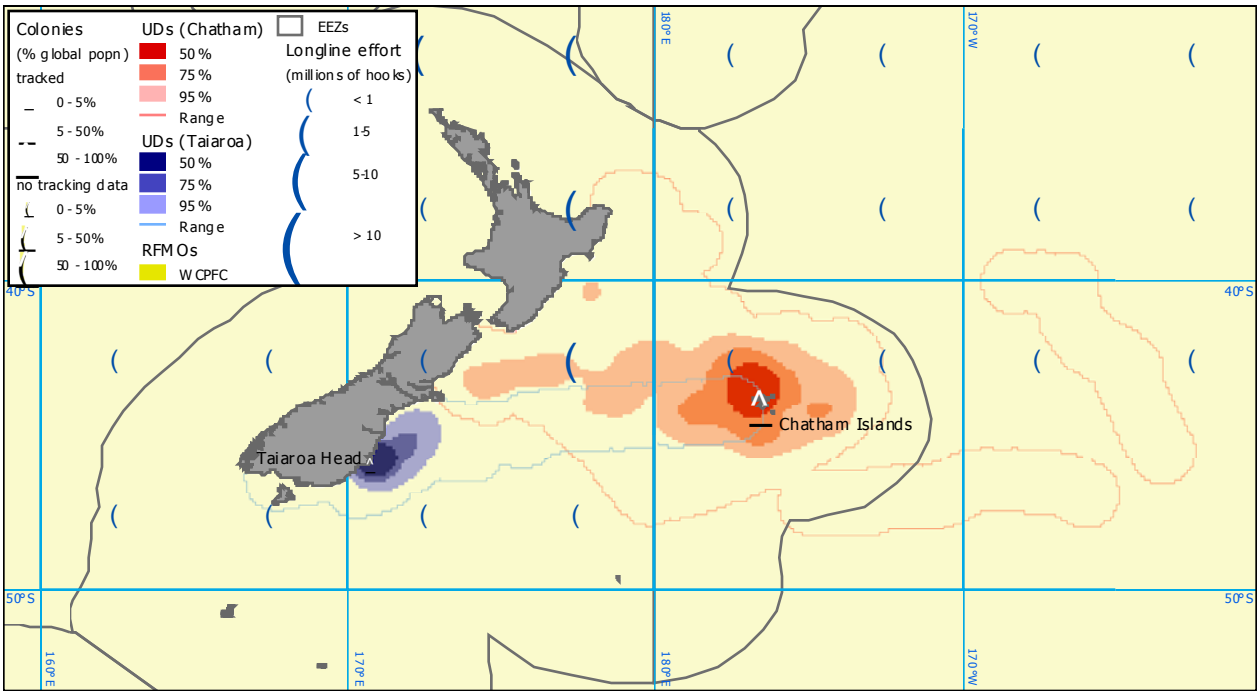
B. NON-BREEDING DISTRIBUTION

No tracking data available

Figure A10. Distribution of Northern Royal Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year). The Chatham Islands and Taiaroa Head populations represent 99% and 1% of the global population, respectively.

A. BREEDING DISTRIBUTION

Data from C.J.R. Robertson, M.D. Murray and D.G. Nicholls, New Zealand.



B. NON-BREEDING DISTRIBUTION

Data from C.J.R. Robertson, D.G. Nicholls and M.D. Murray, New Zealand.

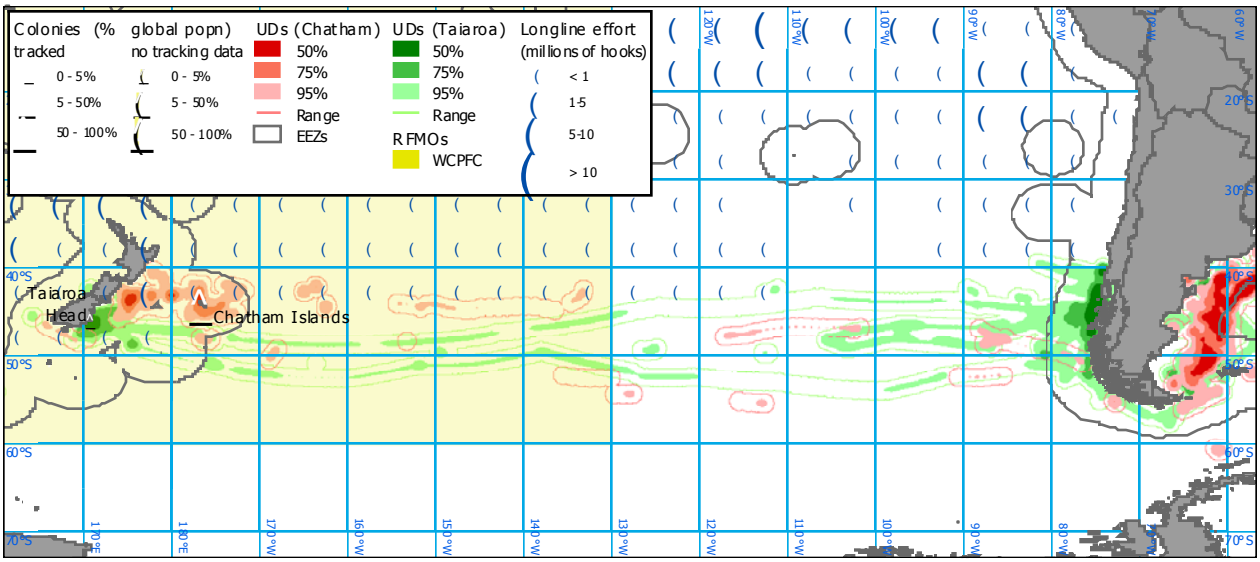
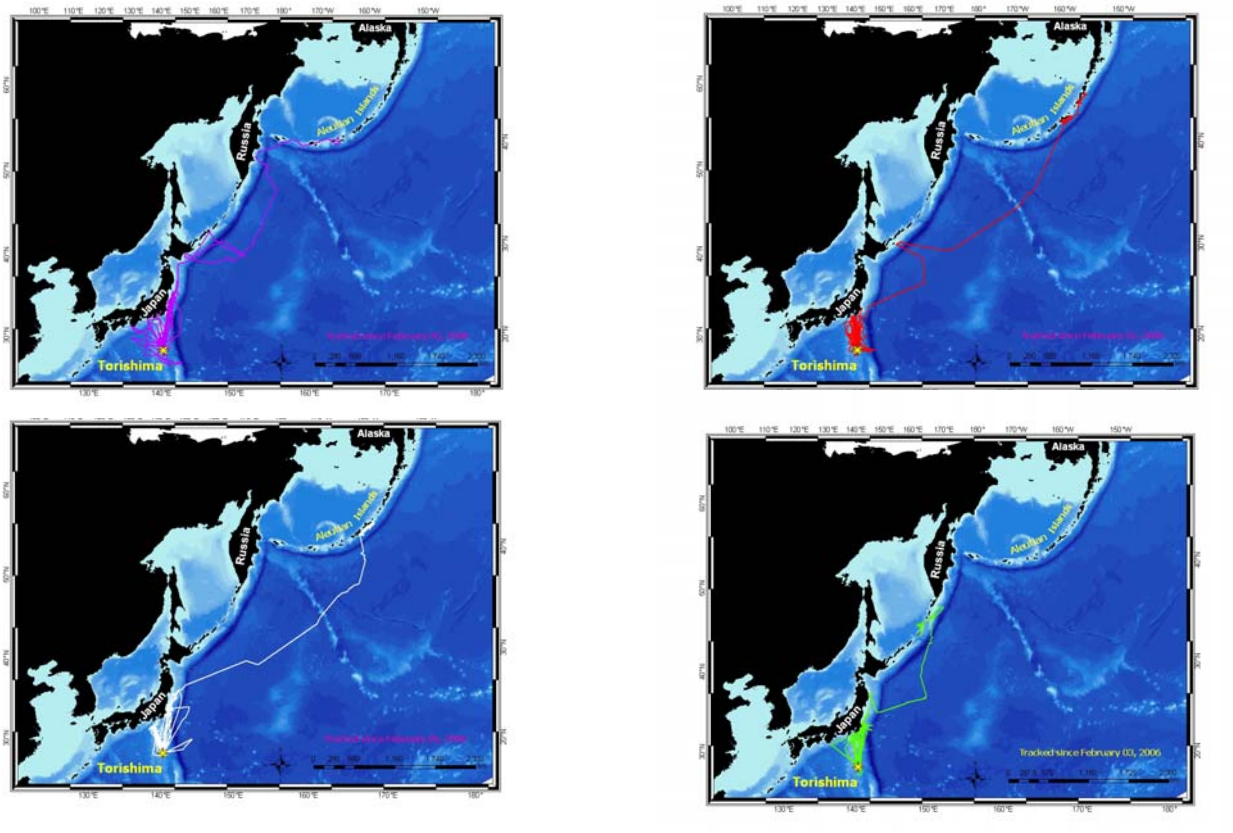


Figure A11. Distribution of Short-tailed Albatross in the WCPFC area.

A. BREEDING DISTRIBUTION

Four Short-tailed Albatross tracked from Izu Shoto (Torishima) by the Albatross Project, Wake Forest University (tracking still in progress). Maps reproduced with kind permission from the data holders: Rob Suryan, Greg Balogh, Paul Sievert and David Anderson. (http://www.wfu.edu/biology/albatross)



B. NON-BREEDING DISTRIBUTION

Data from R. Suryan, Hatfield Marine Science Center, G. Balogh, USFWS, K. Ozaki & F. Sato, Yamashina Institute, and S. Kanie, Ministry of Environment, Japan. Birds tracked from Izu Shoto. Map indicates overlap with WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

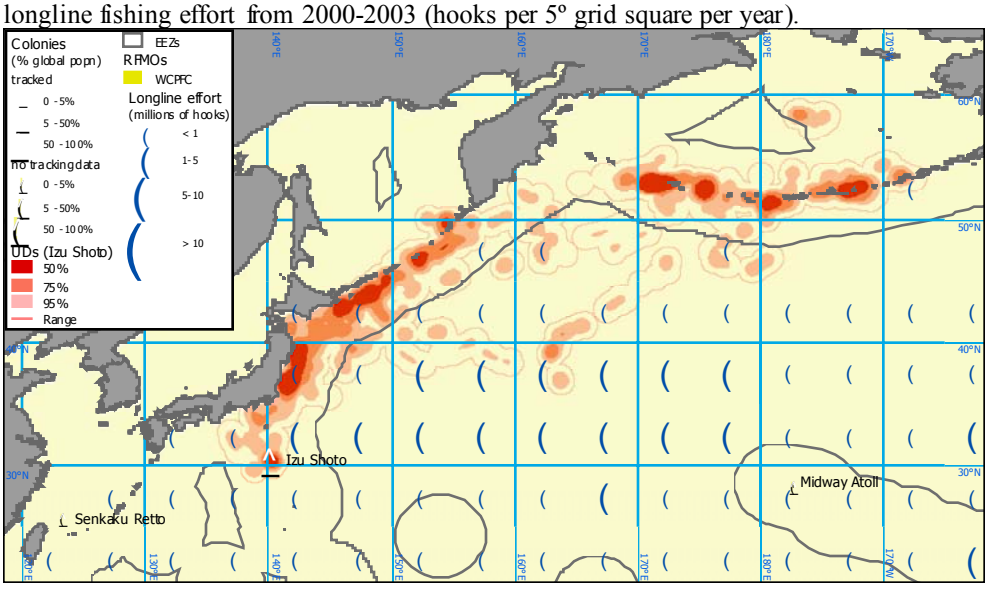
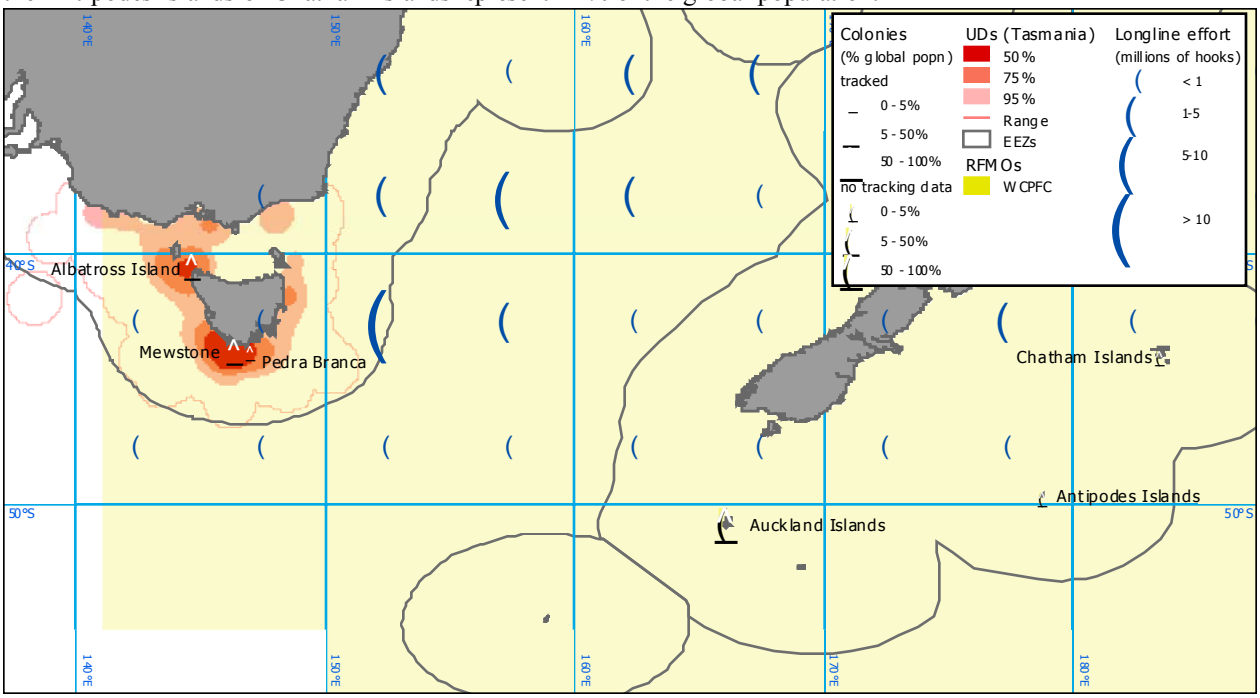


Figure A12. Distribution of Shy Albatross and overlap with the WCPFC Convention Area and with WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from N. Brothers, A. Hedd, R. Gales, A Terauds, DPIWE, Tasmania. No data available from the Auckland Islands (85% global population), which represents the White-capped Albatross sub-species. Populations breeding on the Antipodes Islands or Chatham Islands represent <1% of the global population.



B. NON-BREEDING DISTRIBUTION

Data from N. Brothers, A. Hedd, R. Gales, A Terauds, DPIWE, Tasmania. No data available from the Auckland Islands (85% global population), which represents the White-capped Albatross sub-species. Populations breeding on the Antipodes Islands or Chatham Islands represent <1% of the global population.

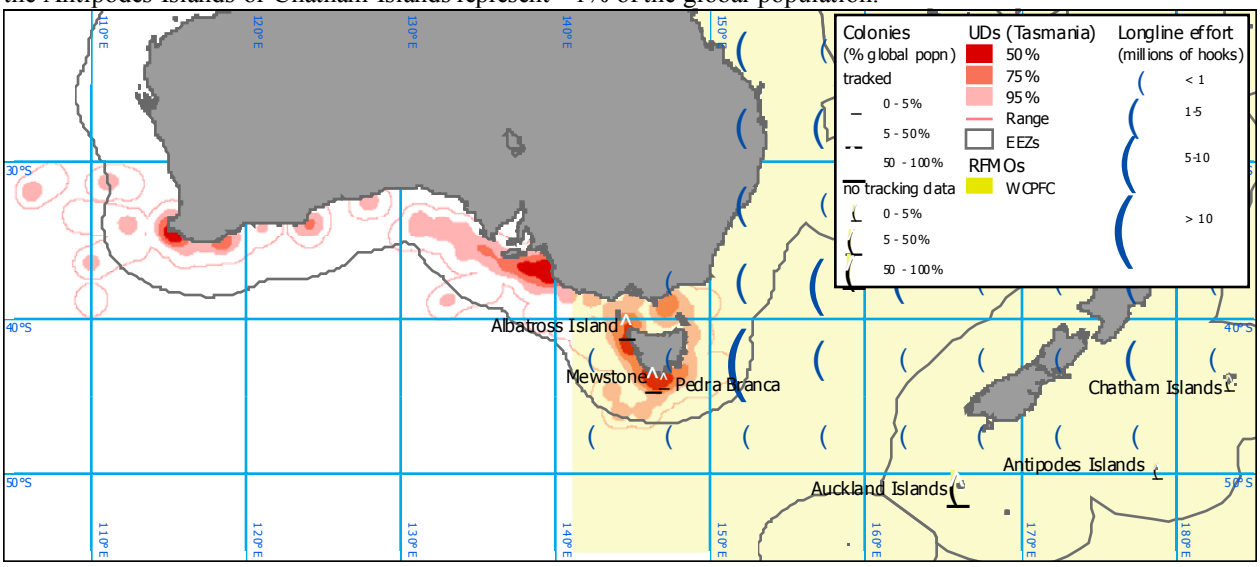
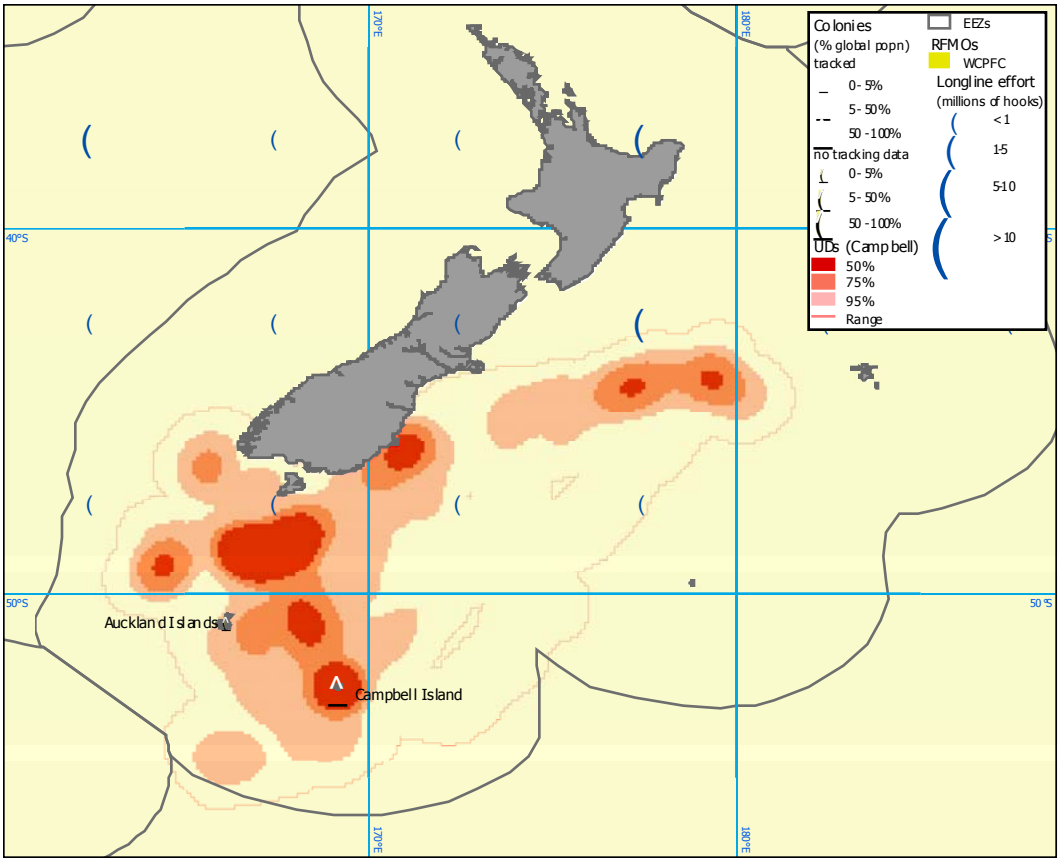


Figure A13. Distribution of Southern Royal Albatross and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

Data from H. Weimerskirch, Centre d'Etudes Biologiques de Chizé , CNRS, France.



B. NON-BREEDING DISTRIBUTION

No tracking data available

Figure A14. Distribution of Wandering Albatross and overlap with the WCPFC Convention Area, and WCPFC longline fishing effort from 2000-2003 (hooks per 5º grid square per year).

A. BREEDING DISTRIBUTION

No overlap with WCPFC area (although no tracking data available from Macquarie Island which represents <1% of the global Wandering Albatross population).

B. NON-BREEDING DISTRIBUTION

Data from J Croxall, R. Phillips, A. Wood, British Antarctic Survey; D. Nel, P. Ryan, University of Cape Town; D.G. Nicholls, M.D. Murray, E.C. Butcher, New Zealand. Birds tracked from Prince Edward Islands, Iles Crozet, South Georgia, representing 36%, 28% and 21% of the global population, respectively.

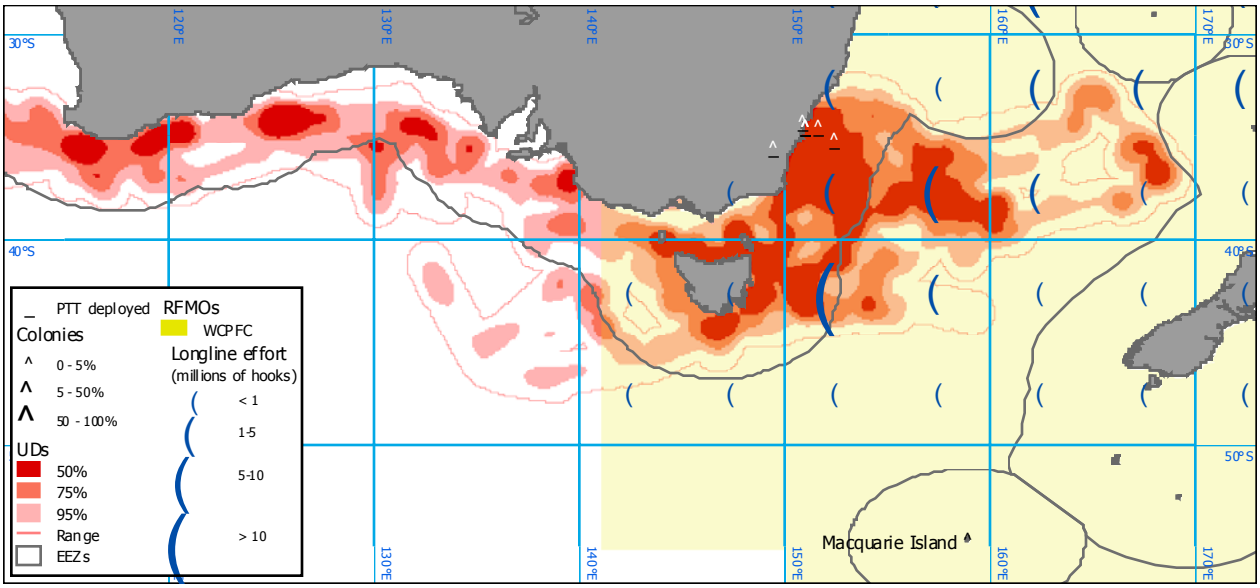
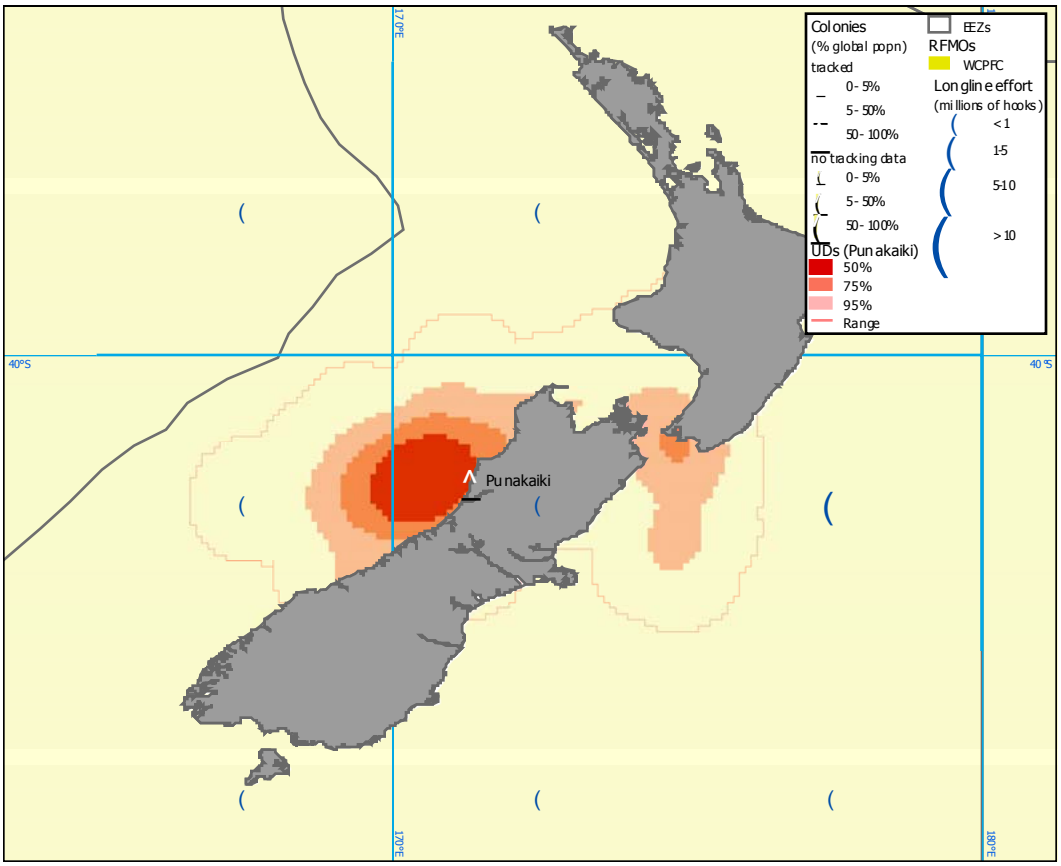


Figure A15. Distribution of Westland Petrels tracked from Punakaiki and overlap with the WCPFC Convention Area and with WCPFC longline fishing effort from 2000-2003 (hooks per 5° grid square per year).

A. BREEDING DISTRIBUTION

Data from A.Freeman, K-J Wilson, Lincoln University; J.A. Bartle Museum of New Zealand; D.G. Nicholls.



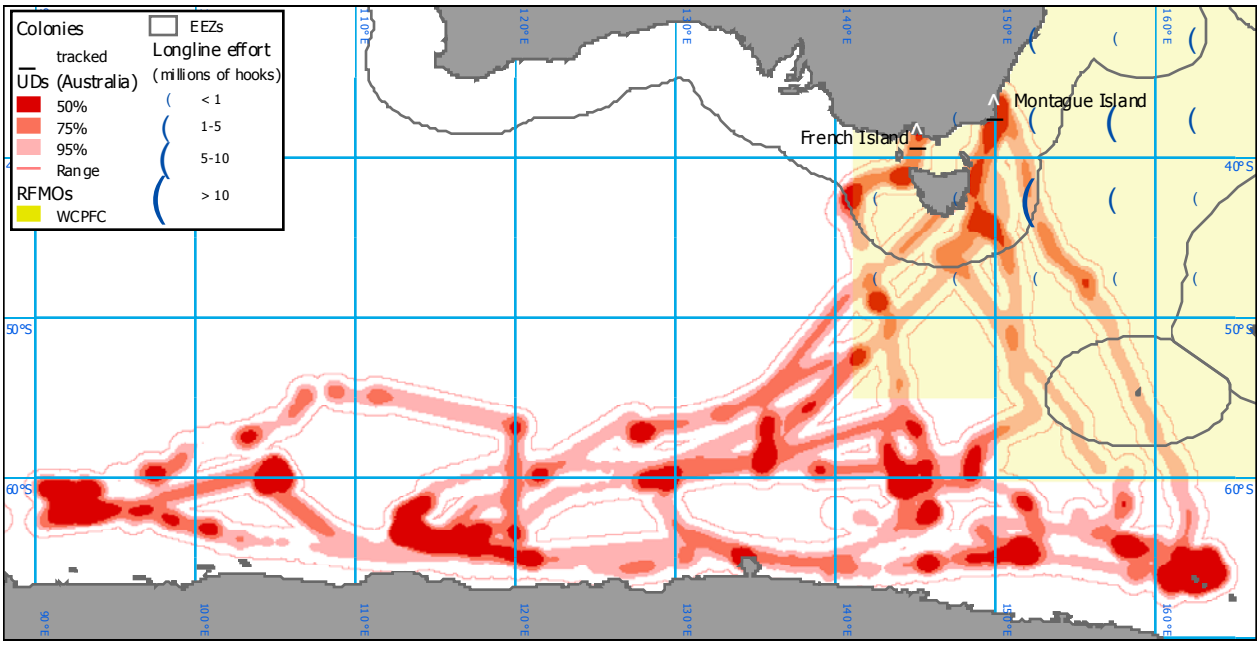
B. NON-BREEDING DISTRIBUTION

No tracking data available

Figure A16. Distribution of breeding Short-tailed Shearwaters tracked from Australia and overlap with the WCPFC Convention Area and WCPFC longline fishing effort from 2000-2003 (hooks per 5° grid square per year).

A. BREEDING DISTRIBUTION

Data from N. Klomp, M.Schultz, School of Environmental and Information Sciences, Charles Sturt University, Australia; D.G. Nicholls. Data from 2 of more than 160 colonies, representing <1% of the total global population.



B. NON-BREEDING DISTRIBUTION

No tracking data available