



Agreement on the Conservation of Albatrosses and Petrels

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BirdLife International

**Foraging Ranges and Overlap with Fisheries:
The Global Procellariiform Tracking Database**



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The Global *Procellariiform* Tracking Database

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Hobart, 20-22 July 2005

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Data contributors to the database are listed below. *Tracking Ocean Wanderers* was compiled, and all maps prepared, by Frances Taylor, assisted by Janet Silk and the authors of the individual sections, and edited by John Croxall. Financial support was provided by the Wallace Research Foundation and Census of Marine Life. This paper was prepared by Dr Cleo Small, BirdLife Global Seabird Programme (cleo.small@rspb.org.uk).

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PTT Data Contributors

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Foraging Ranges and Overlap with Fisheries: the Global Procellariiform Tracking Database

Contents

1. Overview
 2. Development and content of the database
 3. Analyses done so far
 4. Data gaps - tracking data
 5. Data gaps - fishing effort data
 6. Future analyses – recommendations
 7. Additional sources of tracking data
 8. Future developments of the database
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1. Overview

The Global *Procellariiform* Tracking Database provides a powerful resource for:

- Increased understanding of the ecology of albatrosses and petrels
- Identifying important areas for foraging and migration
- Assessing potential susceptibility of birds to mortality from interaction with fishing vessels
- More efficient and effective targeting of conservation resources
- Prioritising the work of ACAP

Priority areas for development include filling gaps in the tracking data, and analysing spatial and temporal overlap with pelagic and demersal longline fishing effort.

The ACAP Advisory Committee is invited to:

- *Identify the gaps in the tracking data (Table 2) that are priorities for funding, and consider possibilities for funding from ACAP member, or from external sources*
- *Where data exist but are not yet in the database (Section 4ii), consider avenues for encouraging the submission of these data*
- *Identify ACAP priorities for analyses, particularly in relation to overlap with fisheries (Section 6b & 6c), and consider what resources are available for undertaking these analyses*

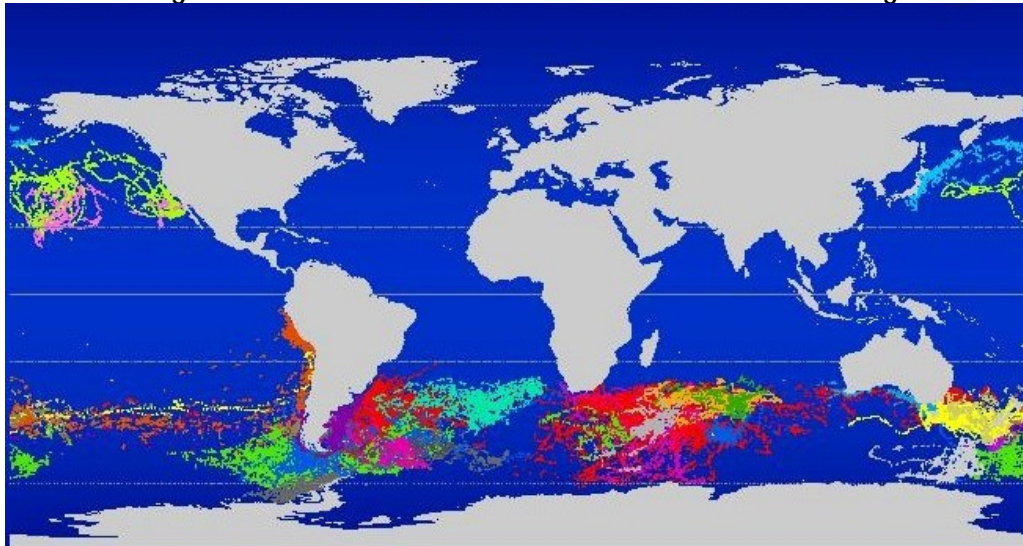
2. Development and content of the Global *Procellariiform* Tracking Database

The Global *Procellariiform* Tracking Database is the result of a pioneering initiative, coordinated by BirdLife International, in which scientists from around the world have collaborated to assemble and analyse over 90% of the world's remote-tracking data of albatrosses and petrels. Results from the initial analysis of the database have been published in the report *Tracking Ocean Wanderers: the global distribution of albatrosses and petrels* (BirdLife, 2004).

Data used in the analyses include:

- **Breeding data:** Satellite tracking (PTT) data from 16 albatross species, both giant-petrels, White-chinned Petrel
- **Non-breeding data:** Satellite tracking (PTT) data from 10 albatross species, geolocator (GLS) data from 2 albatross species

Fig 1. Satellite tracking locations submitted to the Global *Procellariiform* Tracking Database



The list of data analysed in the report is given in Annex 2 of *Tracking Ocean Wanderers*. The database will continue to grow as new data become available. Data that are in the process of being added are:

- **Campbell Albatross:** PTT breeding data, Campbell Is (Vaugh *et al*, 1999)
- **Waved Albatross:** breeding and non-breeding data from Galapagos (PTT and GPS) (Anderson *et al*, 1998, 2003; Awkerman *et al* 2005; Fernandez *et al*, 2001).
- **Short-tailed shearwater:** PTT breeding and non-breeding data (Klomp & Schultz, 1998, 2000; Nicholls *et al*, 1998)
- **Laysan and Black-footed Albatross:** PTT breeding data from Tern & Guadalupe Is, GLS post-breeding data (S. Shaffer, Y. Tremblay, M. Antolos, W.R. Henry, unpublished; Shaffer *et al*, 2005)
- **Light-mantled, Black-browed and Grey-headed Albatross:** PTT breeding data, South Georgia (Phillips *et al*, 2005; Phillips *et al* 2005)
- **Black-browed Albatross and White-chinned Petrel:** post-breeding (Black-browed) and breeding/post-breeding (White-chinned) GLS data from South Georgia (Phillips *et al* in press, Phillips *et al*, submitted)
- **Southern Giant-petrel:** PTT breeding data from the Staten Island, Argentina and post-breeding data from Isla Arce & Isla Gran Robredo, Argentina (F. Quintana, unpublished).

3. Analyses done so far

Analyses done so far are summarised in the table below.

Table 1. Summary of the analyses presented in *Tracking Ocean Wanderers* (BirdLife, 2004)

Analysis in relation to...	Species (N=21) or group of species	Breeding sites (N= approx 30) or area covered	Page
Stage of breeding cycle	Wandering Albatross	Crozet	11
	Tristan Albatross	Gough	13
	Black-browed Albatross	Falklands (Malvinas), Chile	14
Sex	N & S Giant-petrels	South Georgia	16
	Wandering Albatross	South Georgia	18
	Buller's Albatross	Snares	19
Year	Grey-headed Albatross	South Georgia	20
	Wandering Albatross	Crozet	21
Colonies of same population	Black-browed Albatross	Chile & Falklands (Malvinas)	23
	Shy Albatross	Tasmania	23
Populations of same species	Black-browed Albatross	Chile, Falklands/Malvinas, S.Georgia, Kerguelen, Macquarie	24
	Wandering Albatross	Crozet, Kerguelen, Prince Edward, S.Georgia	25
Non-breeding adults and immatures during breeding season	Buller's Albatross	Snares	26
	Grey-headed Albatross	South Georgia	27
	Chatham Albatross	Chatham	28
	Northern Royal Albatross	Chatham & Taiaroa Head	29
Non-breeding adults & immatures during non-breeding season	Shy Albatross	Tasmania	30
	Chatham Albatross	Chatham	31
	Northern Royal Albatross	Chatham and Taiaroa	32
	Black-browed Albatross	S. Georgia, Falklands (Malvinas), Chile	33
	Grey-headed Albatross	South Georgia	35
Regional summaries	Breeding & non-breeding	South America/SW Atlantic	36
	Breeding	Southern Indian Ocean	40
	Breeding & non-breeding	Australasia	43
	Breeding & non-breeding	North Pacific	47
Pelagic longline fishing effort 1990-1998*	Breeding	South of 30°S (<i>see Figure 3</i>)	51
FAO Statistical Area	Breeding		54
RFMO areas	Breeding	(<i>see Figure 2</i>)	56
Japan, Korea & Taiwan pelagic longline fishing effort (1998-2003) *	Wandering Albatross	Southern Indian Ocean, below 30°S	53
EEZs (and % time on high seas)	Breeding	Argentina, Australia, Brazil, Chile, Canada, France, Mexico, Norway, New Zealand, South Africa, UK, Uruguay, USA, High Seas	62
Gap analysis			66

* **Note:** The analysis of the distribution of albatrosses and petrels in relation to overlap with pelagic longline fishing effort data is presented as overlay maps. Numerical analyses have not yet been performed.

4. Data gaps – tracking data

Gaps in the Global Procellariiform Tracking Database are summarised in Annex 7 of *Tracking Ocean Wanderers*, though several gaps have since been filled by the addition of new data (listed in Section 2, this report). The three sections below summarise current data gaps.

(i) Species for which breeding and/or non-breeding tracking data do not yet exist

Regarding breeding albatrosses (Table 2a), no breeding distribution data yet exist for Salvin's Albatross, and data are lacking for key sites for other species.

Data on non-breeding birds are lacking for many species (Table 2b). Since non-breeding albatrosses are less restricted to waters close to breeding colonies, non-breeding data have great importance for understanding distribution throughout the foraging range, including within EEZs and on the high seas. Overall, greater emphasis should be put on completing the distribution picture for non-breeding adult birds before studying juveniles and immatures (see *Tracking Ocean Wanderers* Section 6.3.1, page 71).

In addition, neither breeding nor non-breeding tracking data yet exist for Spectacled Petrel, Parkinson's Petrel or Grey Petrel.

(ii) Data that exist but are not yet in the database

- Southern Giant-petrel breeding and non-breeding data from the Antarctic Peninsula, held by Donna Patterson and William Fraser (USA) (Patterson *et al*, in press). These data were originally submitted to the workshop, but subsequently withdrawn.
- Atlantic Yellow-nosed, Sooty and Tristan Albatross are being tracked from Gough by the RSPB in collaboration with Percy Fitzpatrick Institute (UK/South Africa). Geolocators are being used to track breeding birds through the breeding & non-breeding seasons. Data holders have indicated their intention to submit the data to the database.
- Extensive data on Antipodean (including Gibson's) Albatross distribution, held by Kath Walker and Graeme Elliot (New Zealand)
- Short-tailed Albatross breeding distribution data, held by Yamashina Institute of Ornithology (Japan)
- Westland Petrel breeding data, held by Amanda Freeman (New Zealand) (Freeman *et al*, 1997, 2001)
- Black Petrel breeding data have been collected by Wildlife Management International Ltd.

(iii) Data enhancement

Data for some sites are limited and enhancements are needed. More data (and in most cases from more individuals) are necessary both to enhance understanding, and to reduce biases in the dataset. In particular, more data are needed for:

- (i) Specific stages of the breeding cycle (especially during incubation)
- (ii) Sexed birds
- (iii) Inter-annual data to assess the consistency of basic distribution patterns.

Table 2 indicates some of the key sites where data enhancement is needed.

Table 2. Gaps in breeding and non-breeding tracking data

Species marked with * are those for which no tracking data yet exist for that species. Sites in parentheses are those where data exist, but need enhancing. Gaps where data exist but are not in the database are not shown in these tables.

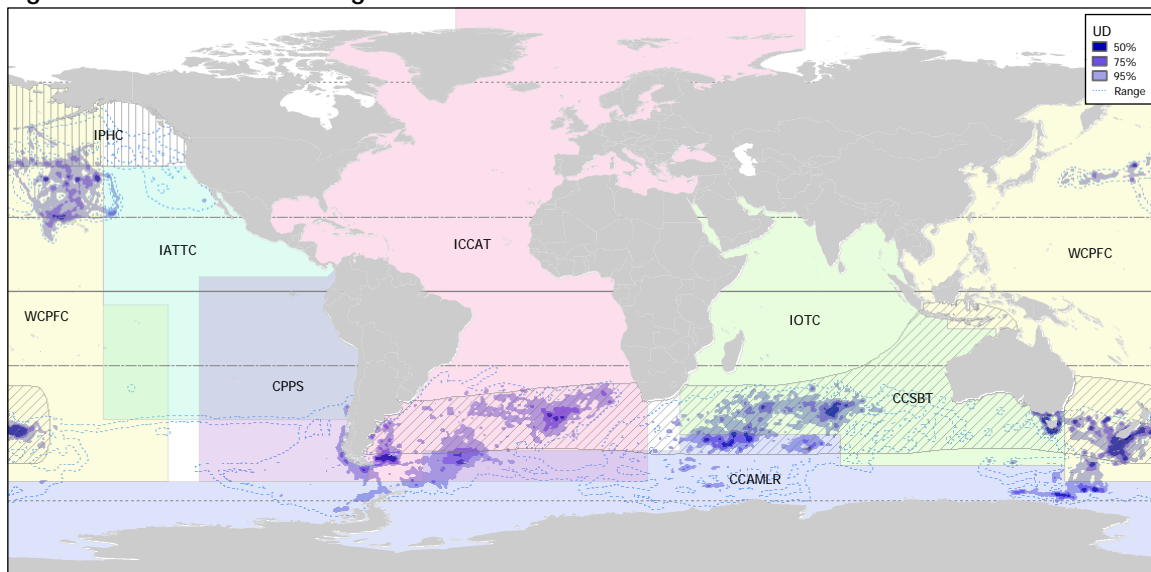
(a) Gaps in breeding data

Species (Status)	Sites with >20% popn	Sites with 10-19% popn	Sites with 2-9% popn
Atlantic Yellow-nosed (EN)	Tristan da Cunha		
Black-browed (EN)	(Falklands/Malvinas)		
Black-footed (EN)			Ogasawa Gunto/Bonin Is
Buller's (VU)	Chatham Is		
Campbell (VU)	(Campbell Is)		
Grey-headed (VU)			Crozet, Kerguelen (Pr. Edward)
Indian Yellow-nosed (EN)		Prince Edward, Crozet	
Light-mantled (NT)	Auckland	Kerguelen, Crozet	Campbell, Heard & McDonald
Salvin's (VU)*	Bounty Islands		
Short-tailed (VU)			Senkaku
Shy (NT)	Auckland		
Sooty (EN)	Prince Edward, Tristan		Amsterdam
Southern Royal (VU)	(Campbell)		
Northern Giant-petrel (NT)		Chatham, Kerguelen, Macquarie	Crozet, Prince Edward, Antipodes, Campbell
Southern Giant-petrel (VU)	Falklands/Malvinas (Antarctic Peninsula)	Heard & McDonald, S.Orkney	Macquarie, Prince Edward, S.Sandwich, Argentina, Crozet
White-chinned Petrel (VU)			Kerguelen

(b) Gaps in non-breeding data

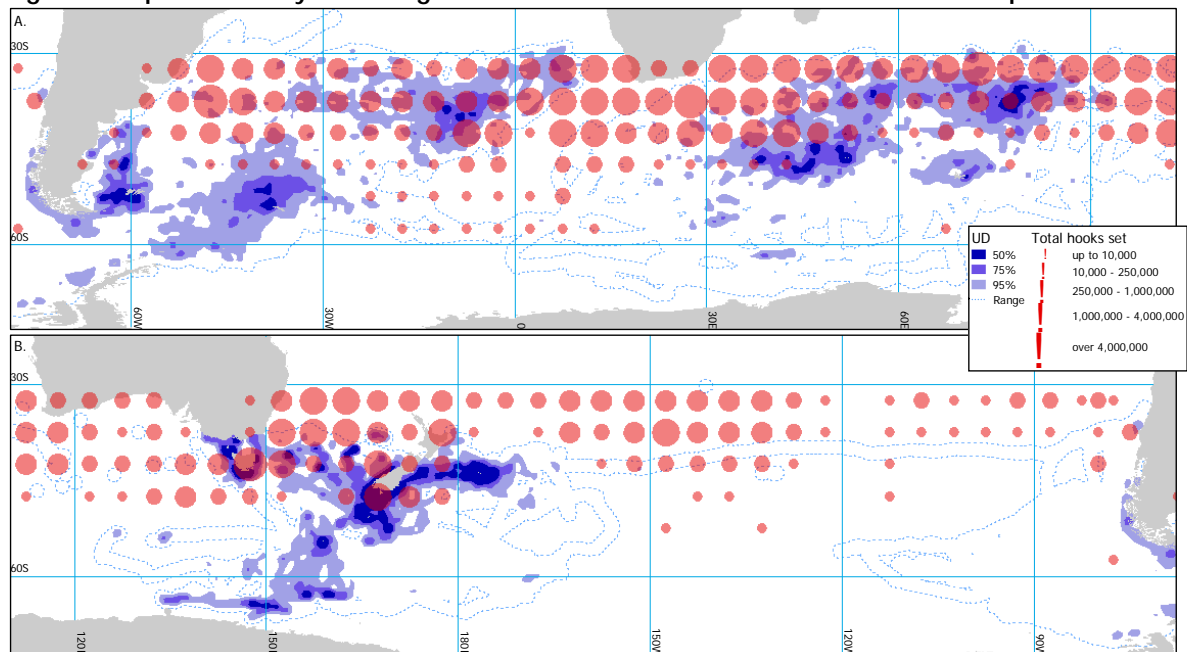
Species	Sites with >20% popn	Sites with 10-19% popn	Sites with 2-9% popn
Amsterdam (CR)*	Amsterdam Is.		
Atlantic Yellow-nosed (EN)	Tristan da Cunha		
Black-browed (EN)		Chile	
Black-footed (EN)			Ogasawa Gunto/Bonin Is
Buller's (VU)	Chatham		
Campbell (VU)*	Campbell Is		
Grey-headed (VU)	(South Georgia)	(Chile)	Prince Edward, Kerguelen, Crozet, Campbell
Indian Yellow-nosed (EN)*	Amsterdam	Prince Edward, Crozet	
Laysan (VU)*	Hawaiian Is		
Light-mantled (NT)*	S. Georgia, Auckland	Kerguelen, Crozet	Macquarie, Campbell, Heard & McDonald
Salvin's (VU)*	Bounty Islands		
Short-tailed (VU)			Senkaku
Shy (NT)	Auckland		
Sooty (EN)*	Gough, Prince Edward, Tristan	Crozet	Amsterdam
Southern Royal (VU)*	Campbell		
Tristan (EN)*	Gough		
Wandering (VU)	(Crozet)	Kerguelen	
N Giant-petrel (NT)*	S. Georgia	Chatham, Kerguelen, Macquarie	Crozet, Prince Edward, Antipodes, Campbell
S Giant-petrel (VU)	Falklands/Malvinas	S.Georgia, Heard & McDonald, S.Orkney	Macquarie, Prince Edward, S. Sandwich, Argentina, Crozet
White-chinned Petrel (VU)			Kerguelen

Fig 2. Distribution of breeding albatrosses in relation to RFMO areas



Tracking Ocean Wanderers Figure 5.8: Global utilisation distributions (UDs) of breeding albatrosses in relation to the areas of competence of selected Regional Fisheries Management Organisations (RFMOs). A UD provides a probability contour indicating the relative amount of time birds spend in a particular area i.e. they will spend 50% of their time within the 50% UD. The dotted line represents the entire range, or 100% UD. This composite was created by calculating the UD for breeding data from 16 albatross species and combining them, weighting each species by population size (but not threat status).

Fig 3. Example of overlay of fishing effort data with distribution of albatrosses and petrels



Tracking Ocean Wanderers Figure 5.1: Overlay between the reported annual fishing effort from pelagic longline fleets operating south of 30°S averaged across years 1990-1998 (by 5° grid square) and the combined utilization distribution of 13 species of breeding albatrosses obtained from satellite tracking data. Fishing effort data are from Tuck et al. 2003. Satellite tracking data are from 1989 to 2003. A. South Atlantic and SW Indian Ocean. B. South Pacific. Note that demersal fishing effort data are not shown on this map.

5. Data gaps – fishing effort data

Analysis of the overlap between albatross and petrel distribution and fisheries requires access to fishing effort data at the highest spatial and temporal resolution possible. For initial analyses, minimum resolutions are by month and 5° lat long (1° lat long resolution is desirable).

Many Regional Fisheries Management Organisations make catch and effort data publicly available, and downloadable from the internet. For example:

- **Commission for the Conservation of Southern Bluefin Tuna (CCSBT):** Catch and effort data are available online at 5° resolution by month, species, gear, country
- **Indian Ocean Tuna Commission (IOTC):** Catch and effort data are available online at 5° resolution by month, species, gear, country
- **International Commission for the Conservation of Atlantic Tunas (ICCAT):** Catch and effort data are available online by month, species, gear, country. Longline data at 5° resolution (USA longline data at 1° resolution)
- **Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR):** Catch and effort data are available by area/subarea, month, species, gear, country.

Fishing effort datasets typically contain gaps, and a key aspect of analysis of overlap between fisheries and albatross and petrel distribution is to deal with these gaps appropriately. Analyses of overlap are therefore likely to be best achieved through collaboration with the data managers of the fishery management organisations. Such collaborations also provide opportunities for building closer working relationships within these organisations. The CCAMLR Secretariat has requested BirdLife to analyse the distribution of albatrosses in CCAMLR areas and sub-area in preparation for the CCAMLR meetings in Oct 2005.

Other data gaps include demersal longline fishing effort data outside the CCAMLR region. Within the Southern Indian Ocean, fishing States have recently resolved to submit these data to the IOTC pending establishment of a new RFMO in the Southern Indian Ocean (SIOFA).

Trawl data are a further data gap that may be considered, particularly once more is known on the impact of trawl fisheries on albatross and petrel populations.

6. Future analyses - recommendations

- a) **Fill in gaps in tracking data and incorporate data into database. Repeat relevant analyses from *Tracking Ocean Wanderers***
Key analyses are likely to include regional summaries and species summaries as well as others as dictated by the content of the new data.
- b) **Further analysis of the temporal distribution of albatrosses and petrels in EEZs & RFMO areas**
 - **EEZs:** Analysis to date has highlighted the importance of the EEZs of New Zealand, French Territories, Australia, UK, USA, Argentina and South Africa. Repeat analysis with the addition of Waved Albatross data, as well as Short-tailed Albatross data and further non-breeding data when available. This is likely to highlight additional EEZs, especially Chile, Japan, Peru, Russia, and probably Canada, China and Ecuador.
 - **RFMOs:** Initial analysis has highlighted the importance of CCSBT, WCPFC, IOTC, ICCAT and CCAMLR as the top 5 RFMOs in relation to albatross distribution. Extend analysis to assess distribution by month.
- c) **HIGH PRIORITY: Analysis of spatial and temporal overlap between albatross & petrel distribution and fishing effort, including**
 - Analysis in relation to the longline fleets of each RFMO
 - Analysis in relation to use of mitigation measures & bycatch data collection programmes
 - Analysis of fishing fleets of selected flag states and/or within selected EEZs
- d) **Marine Important Bird Areas (marine IBAs)**
 - Identification of areas of concentration of albatrosses and petrels (including breeders around islands, breeders in oceanic areas, non-breeders)
 - Analysis of persistence/variability of these areas of concentration during/between years
 - Analysis of albatross and petrel distribution in relation to oceanographic features
 - Sensitivity analysis to explore consequences of implementing marine protected areas of different radii around breeding colonies (see *Tracking Ocean Wanderers*, page 50)
 - Link database to other seabird data (especially penguins)
 - Use database as input to development of global criteria for identification of Marine IBAs.
- e) **Marine Protected Areas (MPAs)**
The albatross and petrel distribution database represents the most complete dataset for species distribution on the high seas. The database has the potential to:
 - Be of key value in developing criteria for MPAs
 - Give profile to the importance of consideration of albatrosses and petrels within global initiatives to protect high seas areas
 - Provide key input into identification and development of a network of MPAs on the High Seas
- g) **IUU fishing**
 - Assess the feasibility of analysing overlap between albatross and petrel distribution and IUU fishing

7. Additional sources of tracking data

Potential additional sources of tracking data include:

- **GPS:** GPS devices are suited to collecting breeding and non-breeding data at high resolution and these data are potentially of high value to the database. The tracking duration is in days rather than weeks. The need is to consult with the GPS data-holding community regarding how data-collaboration might be achieved. This could be pursued via a workshop, similar to the one held for PTT and geolocator data holders. Since GPS data are delivered at a very fine scale, it may be necessary to sub-sample them to a scale that is congruent with PTT data.
- **Banding studies:** Further work needs to be done to investigate whether banding data can provide added value to database. Recovery data record where birds are found (usually dead), often providing only two data points for each bird (where banded, where found). Further work also needs to be on how to control for data biases, for example to control for detection probability. Recovery data are likely to be most useful for species where no other form of tracking data currently exist.
- **At-sea data:** At-sea data are a large potential source of data, and are likely to include substantial data on non-breeding birds. However, constraints include not knowing the provenance, sex and age of birds and the establishing the methodological compatibility between at-sea data sets. Types of data include:
 - At-sea data collected by specifically designed surveys (most useful)
 - At-sea data collected for purposes such as oil and gas impact assessments. There may be a bias towards high seas over coastal areas (may be good coverage of shelf areas)
 - At-sea data collected opportunistically from vessels (query usefulness)

As noted in *Tracking Ocean Wanderers*, there is a real need to investigate the feasibility and utility of combining remote tracking and at-sea survey data sets. Prime candidate areas for pilot studies include the NE Pacific, tropical E Pacific, SW Atlantic and the Southern Indian Ocean. These are all sites where substantial quantitative at-sea surveys have taken place in areas commonly frequented by remote-tracked albatrosses.

8. Future developments of the database

Priorities are:

- Fill gaps in the tracking database, including sites where data are lacking, sites where data need enhancing, and additional petrel species
- Encourage submission of data where data already exist but are not in the database
- Undertake further analyses on albatross and petrel distribution, and on overlap with fisheries
- Use database to contribute to identification of marine Important Bird Areas and Marine Protected Areas

Additional needs are listed in Section 5.3 of *Tracking Ocean Wanderers*, and include:

- Enhance database functionality for data-holders (e.g. provide online tools for analysis, enhance meta-data collection)
- Integrate with other relevant datasets (e.g. additional sources of tracking data (see above), mitigation data, environmental data, distributions of other seabird species, distributions of other marine species)

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