all around Tasmania (Wandering, Antipodean (Gibson's), Shy and Buller's Albatrosses), and from there north-eastwards along the Victoria and New South Wales coast north to about 34ºS (well documented over-wintering area of Wandering and Antipodean (Gibson's) Albatrosses) (Nichols *et al.* 1996, Brothers *et al.* 1998, Stahl and Sagar 2000a and b, Hedd *et al.* 2001). Around New Zealand, areas of most extensive use are located over shelf and slope areas from 40ºS off the South Island south to 50ºS south of the Snares (Antipodean (Gibson's), Northern Royal and Buller's Albatrosses), over the central and eastern parts of the Chatham Rise (Antipodean, Northern Royal, Chatham Albatrosses), and around the Antipodes Islands (Antipodean Albatross) (Stahl and Sagar 2000a and b, Nichols *et al.* 2002, Robertson, C. *et al.* 2003b). Over oceanic waters, the area most extensively used is located in the western Tasman Sea between 36–43ºS (Antipodean (Gibson's), Buller's Albatrosses). More confined areas of intensive use are located over the Challenger Plateau and Lord Howe Rise west of New Zealand (Antipodean (Gibson's) Albatross), and over oceanic waters east and north-east of the Chathams (Wandering, Antipodean). Similar patterns are obtained when weighting species equally or according to IUCN threat status (Nichols *et al.* 1995, Stahl and Sagar 2000a and b).

Species density obtained from 95% utilisation distributions was highest over the Chatham Rise (up to 4–5 species), around Tasmania and east of the South Island of New Zealand (up to three species), and over oceanic waters in the western and central Tasman Sea and east of the Chatham Islands (up to three species). Species overlaps of 50% utilisation contours were confined to the eastern part of the Chatham Rise (up to three species), western Tasman Sea, and shelf and slope areas east of Tasmania and New South Wales and south-east of Kangaroo Island (up to two species).

Jean-Claude Stahl, Paul Sagar, David Nicholls, Aleks Terauds and Rosemary Gales.

Figure 4.5. Regional summary of non-breeding albatrosses around New Zealand and Australia.

A. Combined utilisation distribution map for 7 species of non-breeding albatross tracked in the region of New Zealand and the Australian continent. (See Table 4.8 for the list of species and datasets included). Each species has been given equal weighting.

B. Combined utilisation distribution map for the above 7 species of breeding albatross, where each species has been weighted according to their IUCN threat status: Antipodean Albatross (V); Antipodean (Gibson's) Albatross (V); Buller's Albatross (V); Chatham Albatross (CE); Northern Royal Albatross (E); Shy Albatross (NT); Wandering Albatross (V). The weights used were: NT (Near Threatened) = 1; V (Vulnerable) = 2; E (Endangered) = 3; CE (Critically Endangered) = 4.

C. Species density distribution map including the above 7 species. Only the range included in the 95% utilisation distribution of each species was used to calculate the number of species in each area.

D. Species density distribution map including the above 7 species. Only the range included in the 50% utilisation distribution of each species was used to calculate the number of species in each area.

E. Locations of colonies from which non-breeding birds were originated (Marion and Crozet Islands, the sites of origin of the Wandering Albatrosses, are not shown).

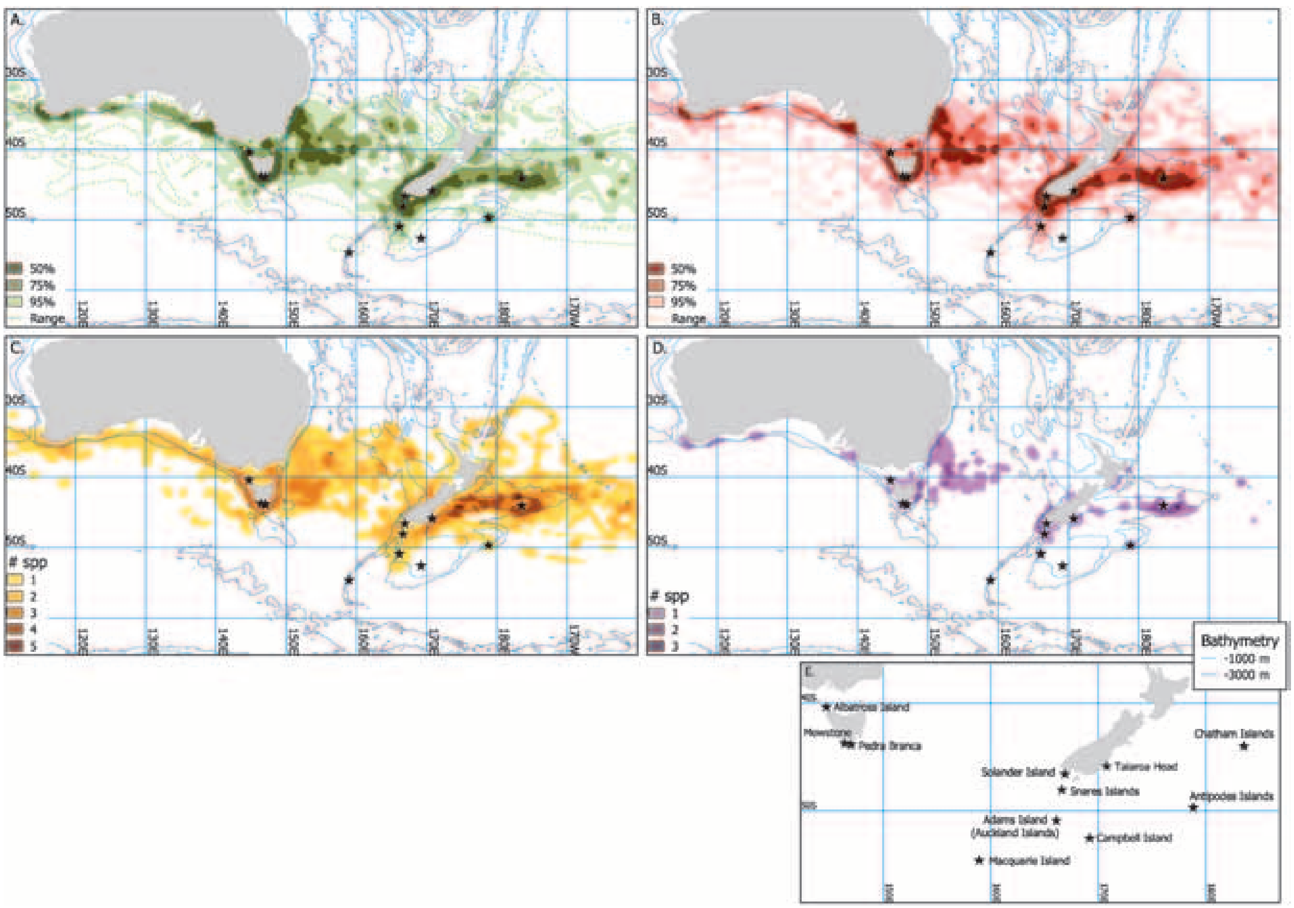


Table 4.8. PTT tracking datasets included in the summary of non-breeding birds in the Australasian region.

Site	Colony	Age	Status	Year(s)	No. of hours	No. of indivs	No. of tracks	Contributor(s)
Antipodean Albatross								
Antipodes Islands		adult	failed/migration	1996	1,009	1	1	David Nicholls
		adult	non-breeding	1996–1997	814	2	12	
				Total	**1,823**	**3**	**13**	
Antipodean (Gibson's) Albatross								
Auckland Islands	Adams Island	adult	non-breeding	1995	2,382	2	2	David Nicholls
Unknown		adult	non-breeding	1994	1,693	1	1	
				Total	**4,075**	**3**	**3**	
Buller's Albatross								
Solander Islands	North-West Headland	adult	failed/migration	1997	1,060	1	8	Jean-Claude Stahl, Paul Sagar
		unknown	non-breeding	2002	8,375	8	129	
Snares Islands	Mollymawk Bay	immature	non-breeding	2000–2001	1,310	2	11	
	Punui Bay	adult	failed/migration	2002	388	2	12	
		adult	non-breeding	2001	804	1	12	
		immature	non-breeding	2000–2001	5,695	4	62	
				Total	**17,632**	**18**	**234**	
Chatham Albatross								
Chatham Islands	The Pyramid	adult	failed/migration	1997–1999	18,894	9	17	Christopher Robertson, David Nicholls
		immature	non-breeding	1998	1,626	2	2	
				Total	**20,520**	**11**	**19**	
Northern Royal Albatross								
Chatham Islands		adult	failed/migration	1996–1998	2,566	4	15	Christopher Robertson, David Nicholls
New Zealand	Taiaroa Head	adult	failed/migration	1998	3,769	1	2	
		immature	non-breeding	1998	2,364	2	14	
				Total	**8,699**	**7**	**31**	
Shy Albatross								
Tasmania	Albatross Island	immature	non-breeding	1996	2,587	3	3	Rosemary Gales
	Mewstone	adult	failed/migration	2002	913	3	3	
	Pedra Branca	adult	failed/migration	2002	212	2	2	
				Total	**3,712**	**8**	**8**	
Wandering Albatross								
Indian Ocean		adult	non-breeding	1992	2,161	1	1	David Nicholls
Tasmania		adult	non-breeding	1993–1995	5,459	4	4	
				Total	**7,620**	**5**	**5**	

4.4 NORTH PACIFIC

4.4.1 Breeding and non-breeding (including post-breeders)

Three species of *Phoebastria* albatrosses breed on islands spanning the sub-tropical North Pacific Ocean: Laysan (*P. immutabilis*), Black-footed (*P. nigripes*), and Short-tailed (*P. albatrus*) Albatrosses (see Table 4.10). Ship-based observations, fisheries bycatch and satellite tracking studies reveal that Laysan, Black-footed, and Short-tailed Albatrosses are widely distributed in the North Pacific, ranging from the sub-Arctic waters of the Bering Sea (60–65°N), to tropical waters in the south (15–20°N) (Hasegawa and DeGange 1982, McDermond and Morgan 1993). In contrast to its two congeners, however, the Short-tailed Albatross primarily occurs in continental shelf and slope waters (McDermond and Morgan 1993, USFWS unpubl. data) and is much less densely distributed, owing to its small population size.

While there is much less information on the oceanic habitats and overall ecology of the Short-tailed Albatross, all three species are attracted to fishing vessels and forage in regions that overlap with commercial fisheries. Thus, interactions with fishing vessels can be a significant cause of mortality (e.g. Stehn *et al*. 2001). Of particular concern are interactions involving Short-tailed Albatrosses because their populations are at critically low numbers compared to the other two species and their breeding range is restricted to two colonies. Furthermore, recent censuses and demographic models suggest that Black-footed Albatross populations may be at risk due to impacts of longline fishing (Lewison and Crowder 2003). If albatross populations are affected by detrimental anthropogenic activities at sea, then studies addressing the habitat use and the marine distributions of albatrosses are essential to implement the necessary policy changes.

The data summarised in the figures below were collected by multiple studies from various breeding sites in the North Pacific. The majority of the tracking effort for Laysan and Black-footed Albatrosses originates from the Northwest Hawaiian Islands, primarily Tern Island. Following research conducted in 1998 (Fernández *et al.* 2001, Hyrenbach *et al.* 2002), researchers from TOPP (Tagging of Pacific Pelagics; see Annex 5) conducted a total of 54 deployments on Laysan and Black-footed Albatrosses in 2002–2004. This study differed from earlier work in that: (1) both satellite transmitters and light-based geolocation loggers were deployed simultaneously on some individuals (n=28); and (2) birds were studied during the incubation and brooding periods from mid-November to mid-February. In the 2002–2003 breeding season (shown in Figure 4.6), both albatross species made excursions to the North Pacific transition zone (between 30–40°N). Foraging trips ranged from 10–32 days

Table 4.9. PTT tracking datasets included in the summary of breeding and non-breeding birds in the North Pacific.

Site	Colony	Breeding stage/ Status	Year(s)	No. of hours	No. of indivs	No. of tracks	Contributor(s)
Black-footed Albatross							
Hawaiian Islands	Tern Island	incubation	2002–2003	1,517	6	6	Scott Shaffer
		brood	2003	354	4	7	
		early breeding	2003	818	4	4	
Unknown		failed/migration	1997–1999	1,846	6	8	David Hyrenbach
			Total	**4,535**	**20**	**25**	
Laysan Albatross							
Hawaiian Islands	Tern Island	incubation	2002–2003	3,582	8	8	Scott Shaffer
		brood	2003	242	4	7	
		early breeding	2003	650	2	2	
Mexico	Isla de Guadalupe	early breeding	2003	3,792	20	20	
			Total	**8,266**	**34**	**37**	
Short-tailed Albatross							
Izu Shoto	Torishima	failed/migration	2002–2003	2,616	7	7	Rob Suryan
			Total	**2,616**	**7**	**7**	

Table 4.10. Gap analysis of breeding PTT tracking data for the North Pacific.

Species	Site	Annual no. breeding pairs	% regional population	PTT tracking data			
				No. of hours	No. of individuals	No. of tracks	% tracking data (in hours)
Black-footed Albatross	Hawaiian Islands	62,575	97%	2,689	14	17	100%
	Izu Shoto	914	1%				0%
	Ogasawara Gunto	1,103	2%				0%
	Senkaku Retto	25	0%				0%
Laysan Albatross	Hawaiian Islands	554,318	100%	4,474	14	17	54%
	Izu Shoto	1	0%				0%
	Mexico	350	0%	3,792	20	20	46%
	Ogasawara Gunto	30	0%				0%
Short-tailed Albatross	Hawaiian Islands	1	0%				
	Izu Shoto	220	95%				
	Senkaku Retto	11	5%				
Waved Albatross	Isla de la Plata	10	0%				
	Islas Galápagos	18,200	100%				

during the incubation stage to 1–3 days during the brooding stage. Given the time constraints of the brooding stage, most albatrosses remained close to their colony and below the transition zone. The TOPP research team also deployed satellite transmitters and light-based geolocation loggers on Laysan Albatrosses at Guadalupe Island, Baja California, Mexico. This is very small colony (~350 pairs), and was recently established (within last 50 years). Furthermore, almost nothing was known about the foraging ecology of birds from this island. In the 2002–2003 breeding season, 24 Laysan Albatrosses were studied during the incubation, brooding, and early rearing stages from late January to late March. The deployments were identical to those made on Tern Island in the same season. However, the data show that there is little overlap in the spatial distribution of the birds breeding at Guadalupe Island and in Hawaii. Albatrosses from Guadalupe Island remained primarily in the California Current region south of 45°N, with some birds venturing within 10 km of the coastline, though one bird travelled north to the Aleutian Islands (Henry unpubl.). Inter-annual differences (Tern Island only) and gender-based segregation have not yet been examined. In addition to determining the foraging movements of albatrosses at Tern and Guadalupe Islands, TOPP researchers also compared and validated the use of geolocation loggers (GLS) against conventional satellite telemetry by conducting dual deployments of the tags on each albatross.

Satellite tracking of Short-tailed Albatrosses (n=30 individuals) has occurred during May to November and in all cases the transmittered birds were not actively breeding or returning to a breeding colony. Most transmitters (n=26) were deployed on birds (sub-adult and adult) just prior to their post-breeding dispersal from the colony at Torishima, Japan. Another four individuals were captured at-sea in the Aleutian Islands, Alaska, during the non-breeding season. Upon leaving Torishima, all birds flew to the east coast of Japan into the Kuroshio Current region. From there, further migration seemed to follow two general patterns. Birds flew east, offshore of the continental shelf then directly north, arriving at the Aleutian Islands within two to four weeks. The second pattern was for albatrosses to remain in the Kuroshio and Oyashio Current regions off Japan and southern Kurile Islands, Russia, for nearly three months. However, in early September they travelled north and east along the Kurile Islands and southern Kamchatka Peninsula (Russia) and into the Aleutian Islands and Bering Sea. Once at the Aleutian Islands and Bering Sea, the birds usually began travelling east or north, often remaining over the continental shelf and slope and within passes between islands, but occasionally moving farther offshore. One Short-tailed Albatross was tracked to the California Current region of North America.

In addition to colony-based studies, Black-footed Albatrosses have been tracked during their post-breeding dispersal (July–September) off California. A pilot project during 1997–99 established the feasibility of tagging this species at-sea and provided valuable insights into the movements and habitats of post-breeding birds. In spite of the small sample size (1 male / 5 females), this study revealed that non-breeding birds range over large distances (100s–1,000s km) and inhabit the same oceanographic 'transition zones' where swordfish *Xiphias* spp. and albacore *Thunnus alalunga* are taken in the northeast Pacific Ocean (Hyrenbach and Dotson 2003). These preliminary results suggest that post-breeding albatrosses are particularly susceptible to U.S. and foreign pelagic longline fleets.

Scott Shaffer, Dan Costa, Rob Suryan, and David Hyrenbach

Figure 4.6. Regional summary of breeding and non-breeding albatrosses in the North Pacific.

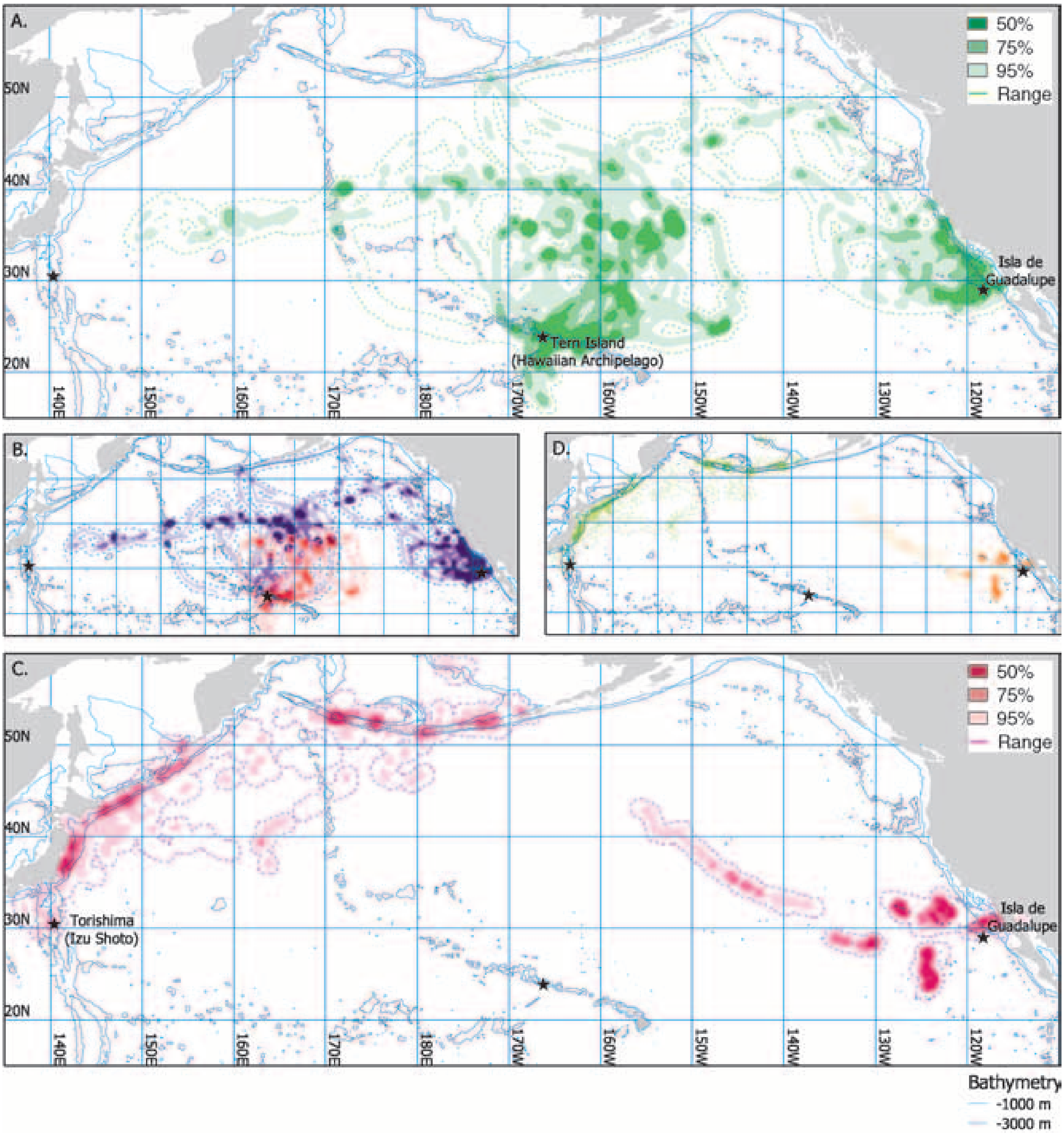
A. Combined breeding utilisation distribution map for two species of albatross tracked in the North Pacific. (See Table 4.9 for the list of breeding species and datasets included.) Colonies were given equal weight.

B. Shows the separate distributions of the two species, with Laysans in blue and Black-footed in red.

C. Combined non-breeding utilisation distribution map for two species of albatross tracked in the North Pacific. (See Table 4.9 for the list of non-breeding species and datasets included.)

D. Shows the separate distributions of the two species, with Short-tailed in green and Black-footed in orange.

For the combined maps species were given equal weights.



5 DISCUSSION

This section reports discussion on topics relating to the strategic aims of the workshop, that is: contribution to definition of critical marine habitats; links to data on fishing effort and fishery management responsibilities; and the potential establishment of the GIS database as an international conservation tool.

5.1 MARINE IMPORTANT BIRD AREAS (IBAS)

Existing global IBA criteria could be adapted and applied in the marine environment to identify IBAs for albatrosses and giant-petrels. Existing global IBA criteria of probable relevance to the marine environment are:

A1 Globally-threatened species
Criterion: The site regularly holds significant numbers of a globally threatened species or other species of global conservation concern.

A3 Biome-restricted assemblages
Criterion: The site is known or thought to hold a significant component of a group of species whose distributions are largely or wholly confined to one biome.

A4 Congregations
Criteria: Site known or thought to hold on a regular basis:
i. 1% of the global population of a congregatory seabird species
ii. ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabird of one or more species
iii. to exceed thresholds for migratory species at bottleneck sites.

BirdLife's European Partnership had previously suggested four possible types of marine IBA:
1. Seaward extensions to breeding colonies, where the seaward boundary would, as far as possible, be species-specific based on average foraging range.
2. Non-breeding concentrations in shallow coastal waters—for divers, grebes, sea ducks etc.
3. Migration bottlenecks through or around which large numbers pass regularly, such as straits, headlands etc.
4. Open ocean sites for pelagic species.

Of these, 1–3 at least can be accommodated within the existing criteria without any difficulty.

At the workshop discussion of the first of these suggested that seaward extensions from breeding colonies of 200 nautical miles, the limit of EEZs, would protect the breeding populations of a significant number, perhaps two-thirds, of albatross species and also other, non-breeding but centre-place foraging birds, as well as those species which migrate to staging areas or wintering destinations within the EEZs of other countries when not breeding. Species for which this approach is unlikely to be adequate when breeding include those with long incubation stints, which forage beyond continental shelves and shelf breaks.

Inclusion of the whole EEZ of at least some countries, particularly the larger ones, as 'marine IBAs' is unrealistic and a narrower focus will be needed to identify core areas in which more stringent levels of protection would apply. Also, innovative management strategies, such as seeking to close or limit fisheries during periods when birds are present, in order to minimise interaction, should be investigated. Where data allow, the actual distribution of the birds should be used, rather than, say, an arbitrary circle drawn around an island.

It was agreed that future work was needed to assess for each species what proportion of time they spend within EEZs and to conduct sensitivity analyses to explore the consequences of using different radii around colonies. These analyses will also take into account the conservation status of the species concerned; the consequences will be explored of seeking to capture a greater proportion—say 80%—of the density grid within IBAs for species classified as Critical, as opposed to 50%, which might be the default for Vulnerable and Near Threatened species. This study also needs to take account of the fact that some species behave differently in different parts of their range.

It was recognised that open oceanic [type 4] sites, beyond EEZs, would need to be identified for concentrations of some species. The predictability and persistence of such areas is likely to vary from reasonably high to fairly low, depending, at least in part, upon the oceanographic feature(s)—bathymetry, gyres etc.—responsible for the concentration, but further work is needed to clarify this.

Data availability was recognised to be a limiting factor in being able to identify potential IBAs. This is particularly true for adults in their non-breeding phase and juveniles; identifying sites for these will be more difficult.

Overall, for albatrosses, IBAs are likely to be of three types:
1. Congregations of breeders around islands.
2. Congregations of breeders in oceanic areas.
3. Congregations of non-breeders.

It was suggested that there is little effective difference between the second and fourth type of marine IBA proposed by the European Partnership; they are merely two ends of a continuum. The underlying distinction between inshore and offshore waters may be of less importance outside the European sphere.

The existing global IBA category A4ii, designed to capture seabird breeding colonies, could readily be adapted for application to non-breeding concentrations, by simply using the 20,000 individuals threshold used for waterbirds.

The possibility of adapting IBA category A3 for biome-restricted assemblages to the marine environment was debated, using a map of oceanographic provinces as a point of departure. Although of limited use for albatrosses, it was felt that this approach might have application for smaller seabirds, at least some of which are confined to one or a limited number of such provinces. Advice was needed from relevant experts. It was pointed out that some species are more likely to be found along the boundaries of such provinces, rather than within the provinces themselves. Shipboard observations of seabirds at sea would be a particularly useful source of data for this analysis.

Overall, it was concluded that if marine IBAs could be identified for albatrosses, it ought to be possible to identify sites for other seabirds.

Since the workshop one significant development has been the commencement of a four-year project to identify marine IBAs for seabirds in Spain, to be executed by the Sociedad Española de Ornitología (SEO), the BirdLife Partner in Spain, in conjunction with Sociedade Portuguesa para o Estudo das Aves (SPEA), the BirdLife partner in Portugal, with funding from the European Union and the Spanish Ministry of the Environment. This project seeks to create maps of distribution at sea and use of space in the marine environment for those seabird species listed in Annex 1 of the European Union's Birds Directive with populations in Spain. The work will involve satellite tracking of Cory's Shearwater *Calonectris diomedea*, and Audouin's Gull *Larus audouinii*, radio tracking of Bulwer's Petrel *Bulweria bulwerii*, Little Shearwater *Puffinus assimilis,* Madeiran Storm-petrel *Oceanodroma castro* and European Shag *Phalacrocorax aristotelis desmarestii*, analysis and mapping of seabird ringing recoveries in Spain, surveys of coastal waters around gull and tern breeding colonies in the Ebro delta and Albufera de Valencia, collection and analysis of data from observers on board fishing vessels and of a database of beached seabirds. The oceanographic (physical and biotic as well as anthropic) factors influencing the distribution patterns of seabirds at sea are to be identified and mapped. These findings will then be integrated and used to develop further the criteria for the selection of marine IBAs.

Lincoln Fishpool

5.2 INTERACTIONS WITH FISHERIES AND FISHERY MANAGEMENT ORGANISATIONS

5.2.1 Relationships between distribution of albatrosses and petrels and fishing effort

Albatross and petrel bycatch

Many species of albatross and petrel are incidentally caught on the hooks of pelagic and demersal longline fishing vessels operating in both the Northern and Southern Hemispheres. Attracted to offal discharge or thousands of baited hooks, the birds can become hooked or entangled and drown. The expansion of commercial longline operations has been coincident with the recorded decline of several populations of seabird. Longline fishing has been implicated in this decline.

The major pelagic commercial distant-water longline fleets have traditionally been those of Japan, Taiwan and Korea. The distant-water vessels of Japan targeting tunas and billfish began expanding their range in the 1950s. During the 1960s longline effort spread southward from the tropical regions of the Pacific. This expansion was hastened by the development of vessels with deep freezers and the discovery of the rich southern bluefin tuna stock. The Taiwanese fleet moved into southern waters in the 1970s and is currently the largest and most extensive fleet operating in the Southern Ocean. More recently, effort from the local pelagic longline fleets of Australia, New Zealand, South Africa and South America has increased within their Exclusive Economic Zones. Japanese-style pelagic longline fisheries tend to set around 3,000 hooks per shot on main lines that may be 100 km or more in length. In southern waters they typically target albacore, swordfish and southern bluefin tuna to 45°S.

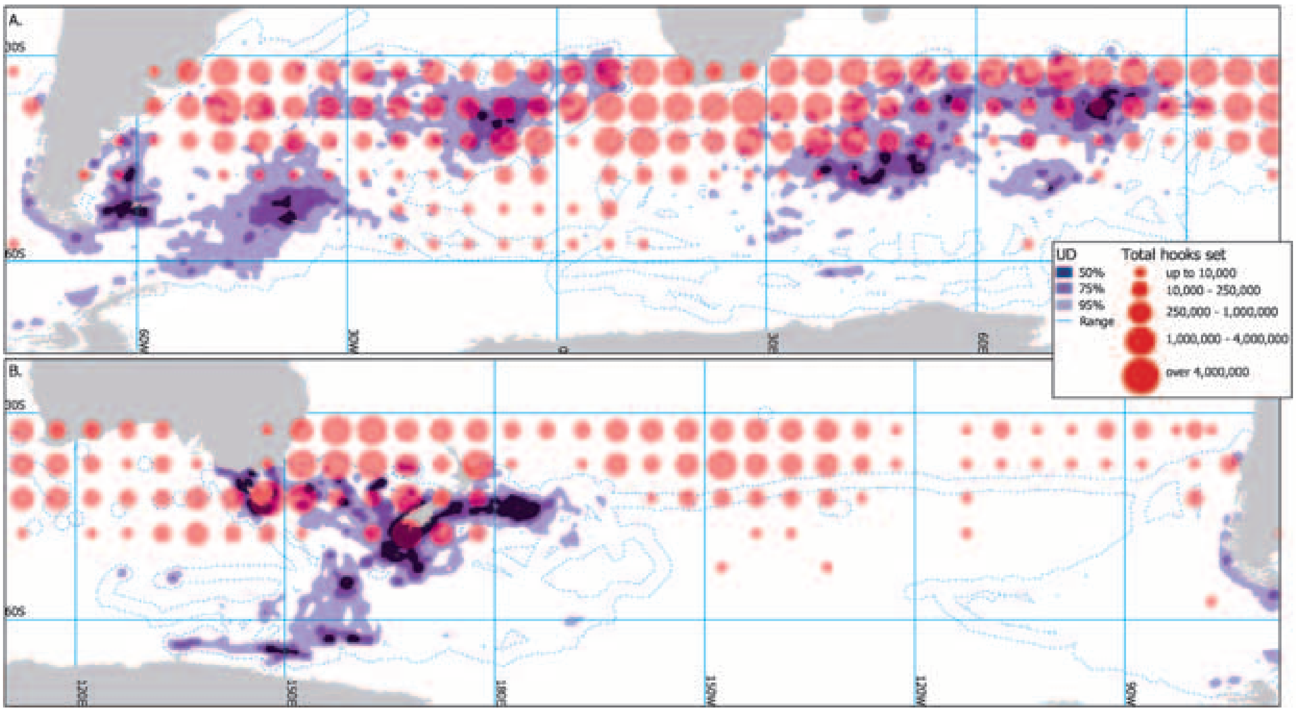
The demersal, or bottom-set, longline fleets of the Southern Ocean did not begin to expand until the 1980s. These vessels target species that include Patagonian toothfish, hake and ling. Demersal vessels can set more than one line in a day and a single set can have 20,000 hooks. As the target species are demersal, and not as dispersed as the tunas, the lines are generally shorter than a pelagic line (around 15 km). The main demersal longline nations operating in the Southern Ocean are Chile and Argentina (with large industrial and artisanal fleets), New Zealand and those operating under the jurisdiction of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Pelagic longline vessels that target the mobile and dispersed tuna species on the high seas pose a serious threat due to the highly migratory nature of albatrosses and petrels. On the other hand, demersal longliners, which target more sedentary species on continental shelf or slope regions, place breeding birds and fledglings at risk.

In addition to those vessels regulated by Regional Fisheries Management Organisations (RFMOs), recent high prices and restrictive quotas for tunas and toothfish have led to the rapid expansion of Illegal Unregulated or Unreported (IUU) longline fishing. The substantial effort of these vessels and subsequent impact on target and incidentally caught species is difficult to quantify. However, as these vessels are unlikely to be employing bycatch mitigation measures at all, or at the same level as regulated vessels, the impact on seabirds may be substantial.

Figures 5.1 to 5.3 show the distribution of reported pelagic fishing effort for all nations combined averaged across years 1990 to 1998 south of 30°S, overlain with the utilisation distributions of breeding albatrosses. These data do not include any IUU data or scaled-up estimates of effort records that are not reported to RFMOs. The figures show strong concentrations of effort off southern Africa, the east and west coasts of Australia and New Zealand and off the coast of Uruguay. Not shown are demersal fisheries with concentrations off Chile, the Patagonian Shelf, New Zealand and many sub-Antarctic islands. It is important to note that these spatial distributions have changed since the beginning of the fisheries, and as shown in Figure 5.3, change over time and space even within a year. This has implications for assessing historical and current impacts on bird populations. Figures 5.8 to 5.13 show overlaps between estimated albatross and petrel foraging distributions and areas of jurisdiction for various RFMOs. These figures and Tables 5.3 to 5.5 clearly highlight the critical role that RFMOs have in the conservation of oceanic seabirds through appropriate management of their fisheries.

Clearly the overlap in spatial and temporal distributions between fishing effort and seabird foraging distributions is critical in terms of our ability to assess and mitigate interactions. Determining overlaps can assist the identification of hot spots of interaction, facilitate bycatch rate analyses and guide monitoring and mitigation policies. However, fisheries, and even individual vessels, will differ in their overall impact on seabirds. This is because they differ in their application of mitigation measures (e.g. bird scaring devices, line weighting) and operational procedures (e.g. time of set, season/area of fishing, offal discharge). In addition, seabirds vary in their desire and ability to attack and

Figure 5.1. Overlap 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 utilisation distribution of 13 species of breeding albatrosses obtained from satellite tracking data. Effort data are only that reported to the IOTC, ICCAT, SPC, IATTC, CCSBT and domestic New Zealand, Australian and South African fishery agencies (from Tuck *et al.* 2003). Satellite tracking data are from 1989 to 2003. A. South Atlantic and Southwest Indian Ocean; B. South Pacific.
Regional Fisheries Bodies: Commission for the Conservation of Southern Bluefin Tuna (CCSBT); Indian Ocean Tuna Commission (IOTC); Inter-American Tropical Tuna Commission (IATTC); International Commission for the Conservation of Atlantic Tunas (ICCAT); Secretariat of the Pacific Community (SPC).



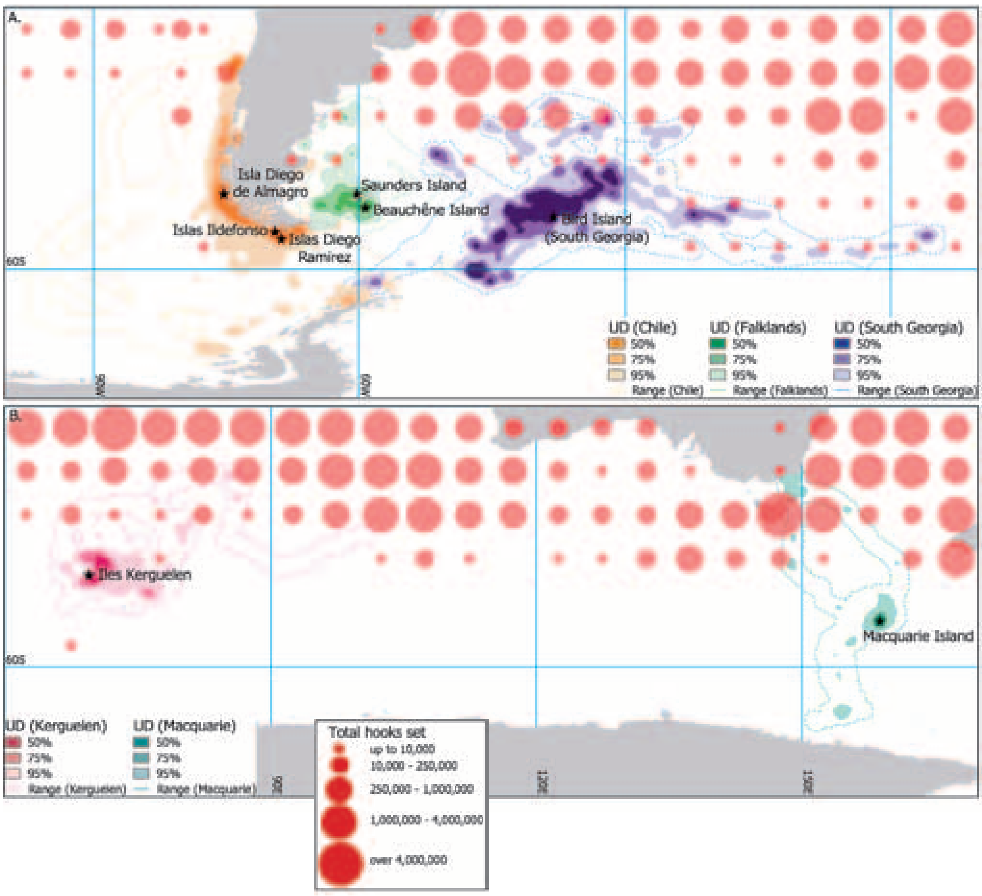
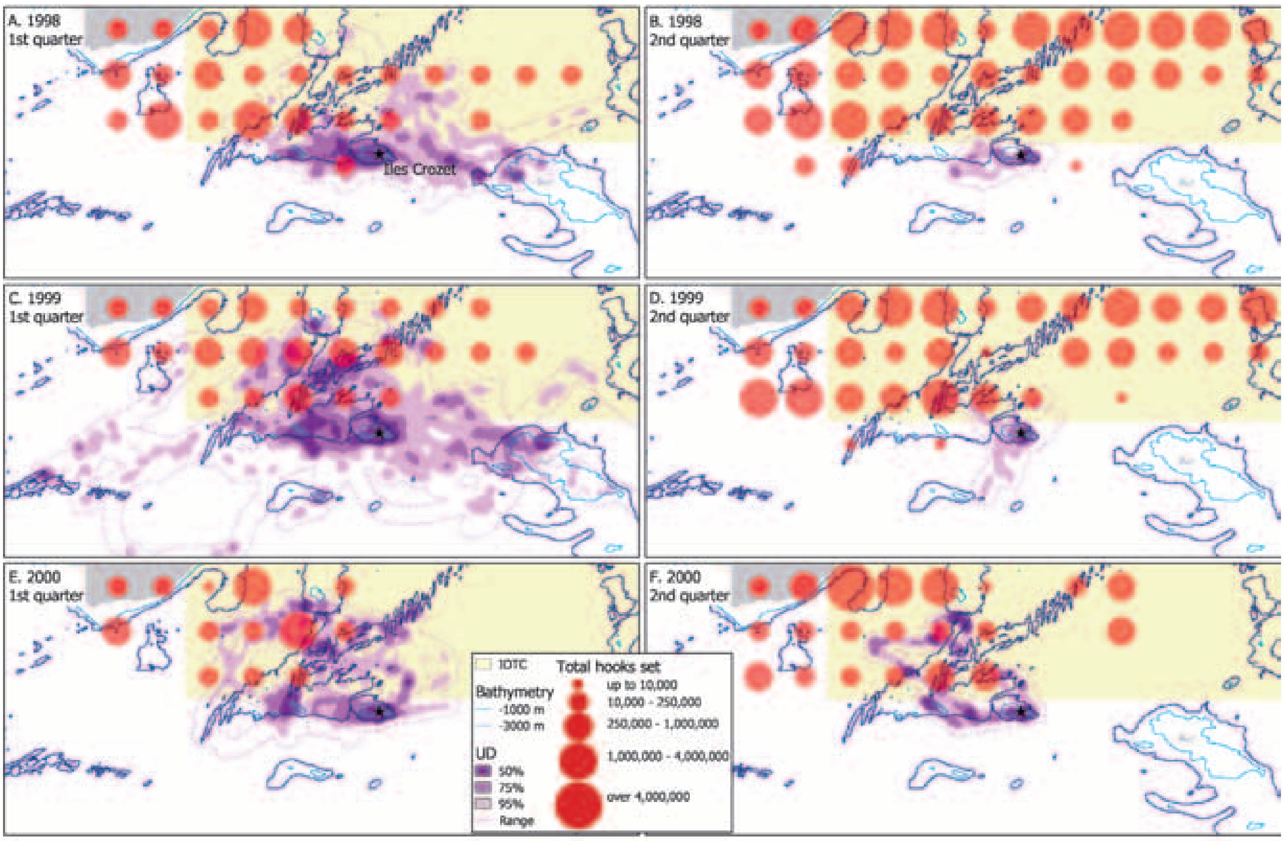


Figure 5.2. Overlap between the reported annual fishing effort from pelagic longline fleets operating south of 30°S averaged across years 1990–1998 (by 5° grid square) and the utilisation distributions of breeding Black-browed Albatrosses from 5 populations obtained from satellite tracking data. Effort data are only those reported to the IOTC, ICCAT, SPC, IATTC, CCSBT and domestic New Zealand, Australian and South African fishery agencies (from Tuck *et al.* 2003). Satellite tracking data are from 1992 to 2002. A. Chilean, Falkland Islands (Malvinas) and South Georgia populations; B. Kerguelen and Macquarie populations.
Regional Fisheries Bodies: Commission for the Conservation of Southern Bluefin Tuna (CCSBT); Indian Ocean Tuna Commission (IOTC); Inter-American Tropical Tuna Commission (IATTC); International Commission for the Conservation of Atlantic Tunas (ICCAT); Secretariat of the Pacific Community (SPC).

Figure 5.3. Overlap between the total quarterly Japanese, Korean and Taiwanese longline fishing effort reported to the Indian Ocean Tuna Commission (IOTC) (by 5° grid square) and the corresponding utilisation distributions of breeding Wandering Albatrosses tracked from Iles Crozet during the first and second quarters of 1998, 1999 and 2000. Together the above fishing fleets represent 98%, 92% and 90% of the total fishing effort reported to the IOTC during 1998, 1999 and 2000 respectively. (The first quarter is January to March (incubation) and the second is April to June (early chick-rearing).)



capture baited hooks. This all suggests that studies of the overlap of distributions, the continuation (or in many cases, the establishment) of reliable and transparent monitoring systems and the development and implementation of adequate mitigation regimes are vital.

Fishing data

There is a strong need to be able to access appropriate fishery data in order to carry out studies of interactions with seabird populations. These data need to be easily accessed, easily interpreted, well-maintained and as comprehensive as possible. However, a public database of fishing effort and related data will need to overcome several issues, not least of which is the potential commercial sensitivity of the data itself. Some of these data issues are listed below:

- *Access arrangements:* RFMOs vary in their willingness to provide data. However, most are willing to provide data to individuals or research organisations for relevant research purposes, as long as the RFMO can maintain some degree of control over use (who is using it, what for, what does the product look like). Obtaining data (specifically effort data) for general public use will require mutual agreement between the data provider and end user. In some circumstances, requests from users may need to go directly to data managers at RFMOs for consideration on a case-by-case basis.
- *Use:* There are many areas where users may unwittingly misuse the provided fishing data (e.g. using incomplete fishing effort data, assuming interactions where none exist). Appropriate caveats agreed by the data provider will need to be attached.
- *Delays in obtaining up-to-date data:* Wherever possible, data provided should be the most current available. Clear dates should be attached to the data.
- *Spatial and temporal scales:* Historical and current data should be provided, however in many cases the spatio-temporal scales will be determined by the data-provider. For example, in many cases shot-by-shot data would be ideal for analyses, however fishery agencies may legally only be able to provide data on a much broader scale (e.g. spatial resolution by Fishery Management Area and an annual temporal resolution).
- *Gaps:* There are many fisheries for which we have limited or no knowledge of effort (magnitude, where, when) or bycatch. The best available data should be provided in these cases, with appropriate literature references and contacts.

In addition to fishing effort data, operational and management procedures should be made available within the database (or website). Such information should include any RFMO conservation measure requirements (e.g. mandatory night setting, use of tori lines), notes on observer programs and monitoring, bycatch information (if it exists), and key contacts within the RFMO.

Geoff Tuck

5.2.2 Relationships between distribution of albatrosses and petrels and the Statistical Areas of the Food and Agriculture Organisation of the United Nations (FAO)

Much fisheries information, including catch and effort data for many fisheries which have potential for bycatch of albatrosses and petrels, is still provided only at the scale of FAO Statistical Areas (Figure 5.4) and subdivisions of these. While any analysis and comparison with seabird data at these scales is likely to be too coarse to be of much use in management contexts, nevertheless it may represent the lowest common denominator for some data compilations and comparisons, at least for the time being.

To indicate the scale and nature of potential comparisons with albatross and petrel range data, we provide simple depictions, using breeding phase data only (Figure 5.5), tabulated in Table 5.1 and summarised on a species-specific basis in Figure 5.6.

The basic comparisons by area (Figure 5.5, Table 5.1) emphasise the importance of five main regions: (a) north Pacific (FAO areas 77, 67 and 61 in order of priority); (b)

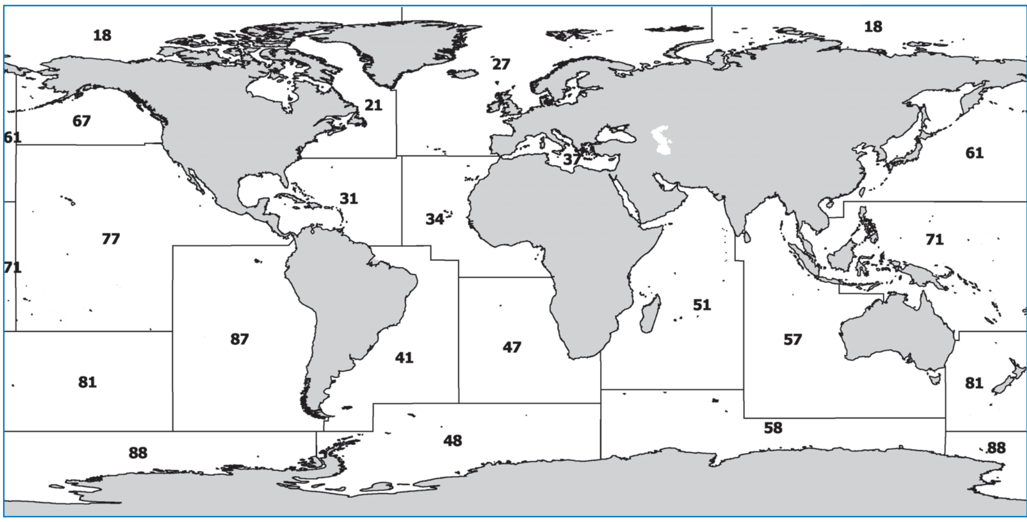


Figure 5.4. Map of the Food and Agriculture Organisation of the United Nation's (FAO) Statistical Areas.

Figure 5.5. Global utilisation distributions (UD's) of breeding albatrosses in relation to the FAO Statistical Areas. 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 utilisation distributions for each species and combining them giving each species equal weighting. UD's for each species were derived from density distribution maps obtained by satellite tracking of breeding birds of the following 16 species from these locations: Amsterdam Albatross (Amsterdam Island), Antipodean (Gibson's) Albatross (Auckland Islands), Black-browed Albatross (Isla Diego de Almagro, Islas Ildefonso, Islas Diego Ramirez, Falkland Islands (Malvinas), South Georgia and Iles Kerguelen), Black-footed Albatross (Tern Island), Buller's Albatross (Solander Island and Snares Islands), Chatham Albatross (Chatham Islands), Grey-headed Albatross (Islas Ildefonso, Islas Diego Ramirez, South Georgia, Marion Island, Campbell Island and Macquarie Island), Light-mantled Albatross (Macquarie Island), Laysan Albatross (Tern Island and Isla de Guadalupe), Northern Royal Albatross (Chatham Islands and Taiaroa Head), Southern Royal Albatross (Campbell Island), Shy Albatross (Albatross Island, Mewstone and Pedra Branca), Sooty Albatross (Iles Crozet), Tristan Albatross (Gough Island), Wandering Albatross (South Georgia, Marion Island, Iles Crozet and Iles Kerguelen) and Indian Yellow-nosed Albatross (Amsterdam Island).

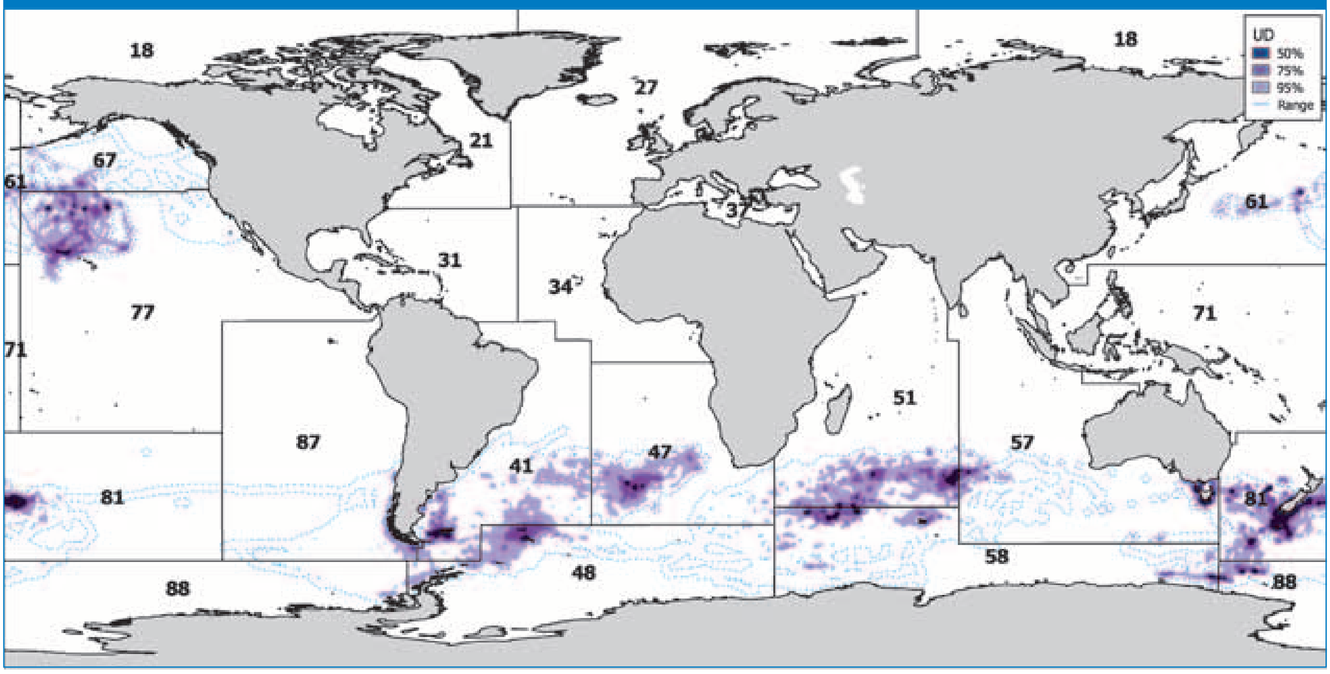


Figure 5.6. Percentage time at sea spent in different FAO Statistical Areas while breeding for 11 species of albatross. Only those species for which a large proportion (over 70%) of the global population is represented by satellite tracking data are shown.

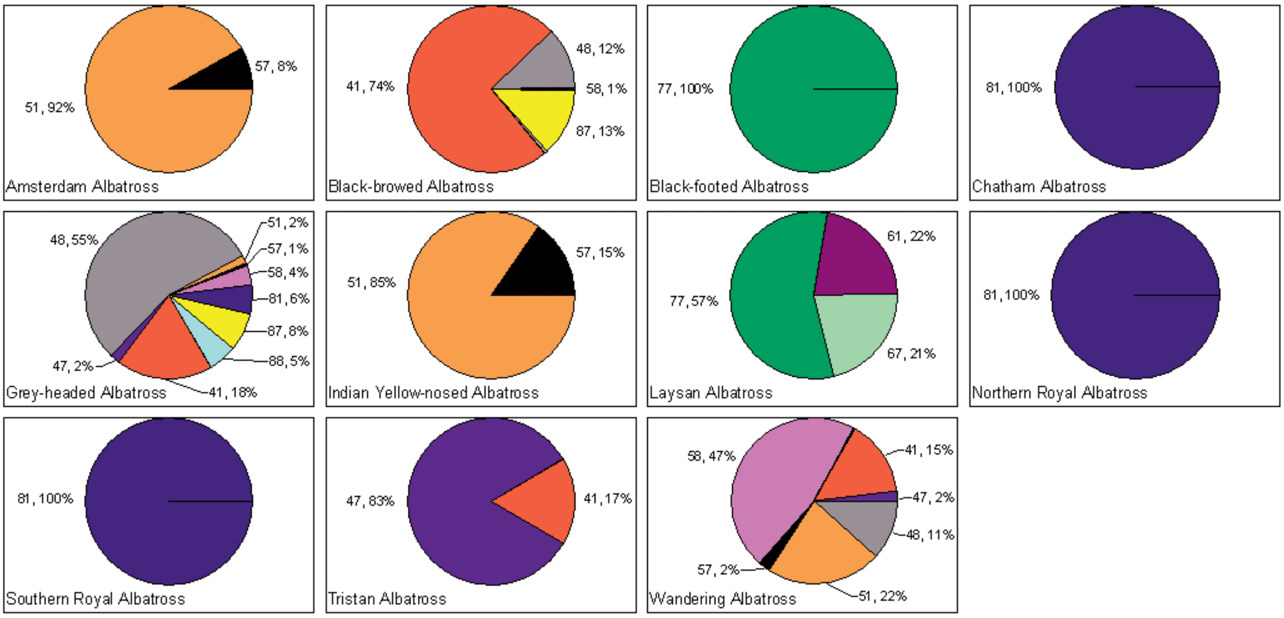


Table 5.1. Percentage time at sea spent in selected FAO Statistical Areas while breeding for 16 species of albatross, two species of giant-petrel and one petrel species for which satellite tracking data were submitted to the workshop.

Species	Threat status[1]	% global popn tracked[2]	Sites tracked[3]	FAO Area 41	47	48	51	57	58	61	67	77	81	87	88
Albatrosses															
Amsterdam	CE	100	all > 1%				92	8							
Antipodean	V	59	–										100		
Black-browed	E	100	all > 1%	74		12			1					13	
Black-footed	E	97	all > 5%									100			
Buller's	V	42	–					3					96	1	
Chatham	CE	100	all > 1%										100		
Grey-headed	V	87	–	18	2	55	2	1	4				6	8	5
Indian Yellow-nosed	E	70	–				85	15							
Laysan	V	100	all > 1%							22	21	57			
Light-mantled	NT	9	–						14				56		30
Northern Royal	E	100	all > 1%										100		
Shy	NT	15	–					100							
Sooty	E	17	–			1	35	1	62				1		
Southern Royal	V	99	all > 1%										100		
Tristan	E	100	all > 1%	17	83										
Wandering	V	100	all > 1%	15	2	11	22	2	47						
Giant-petrels and Petrels															
Northern Giant-petrel	NT	38	–	34		63								3	
Southern Giant-petrel	V	20	–	32		68									
White-chinned Petrel	V	?	?	34		63	1		2						

1 NT: Neat Threatened, V: Vulnerable, E: Endangered, CE: Critically Endangered (BirdLife International 2004a)
2 The percentage of the global population tracked was calculated by summing the proportion of the global annual number of breeding pairs at each site for which tracking data was contributed.
3 Indicates whether tracking data was submitted for all sites containing over 1% or 5% of the global annual number of breeding pairs.

Table 5.2. Comparison of the importance of FAO Areas to the breeding albatrosses for which satellite tracking data was submitted to the workshop.

FAO Area	41	47	48	51	57	58	61	67	77	81	87	88
No. of albatross species tracked within FAO Area during breeding (out of 16 total)	4	3	4	6	9	7	1	2	2	10	4	4
% time spent in RFMO by tracked breeding birds:												
– species given equal weight	8	6	5	15	7	8	1	1	10	35	1	2
– species weighted by threat status	8	7	4	20	4	8	1	1	11	34	1	1
Rank of importance of FAO Area to satellite tracked breeding albatrosses, taking the number of species and time spent in the FAO Area into account	5	7	8	2	6	4	10	11	3	1	12	9
No. of albatross species caught in long-line fisheries within FAO Area (out of 21 total)[1]	8	7	7	7	17	8	3	3	4	15	10	4
No. of albatross species caught in trawl fisheries within FAO Area (out of 21 total)[1]	3	6	2	0	8	2	0	2	0	10	0	1

1 From Robertson, C. *et al.* 2003a.

the cold temperate South Atlantic (areas 41 and 47); (c) central Indian Ocean (area 51); (d) Australasia – west Pacific (areas 57 and 81); and (e) Antarctica (areas 48, 58 and 88).

At a species level, Figure 5.6 indicates the potential difference between species with existing tracked breeding ranges essentially confined to single FAO areas (e.g. Black-footed Albatross in area 77, Chatham, Northern Royal and Southern Royal Albatrosses in area 81) and those whose breeding ranges overlap with many FAO areas (e.g. Grey-headed and Wandering Albatrosses).

All of these data emphasise, in terms of trying to compare seabird and fisheries data, the artificiality of the FAO boundaries, at least as far as pelagic seabirds are concerned. For most purposes, therefore, comparisons at finer scales will be essential and are likely, in terms of influencing management, to be targeted more effectively in relation to the areas of jurisdiction of regional fishery bodies.

John Croxall and Frances Taylor

5.2.3 Relationships between distribution of albatrosses and petrels and areas of jurisdiction of Regional Fisheries Management Organisations (RFMOs)

Duty of RFMOs

In the 1990s, developments in the international legal framework governing the oceans established the duty of States to cooperate within Regional Fisheries Management Organisations (RFMOs), recognising that many marine species are highly mobile and can only be conserved through collaboration between States (FAO 1995, Lugten 1999, United Nations 1995). Of particular relevance to the conservation of albatrosses, the new legal framework also established the duty of RFMOs to conserve not only target fish stocks, but also all non-target species affected by fishing (Small in review).

Overlap between RFMO areas and albatross distribution

Of the 18 RFMOs in existence (FAO 2004), the areas of twelve coincide with the known distributions of albatrosses. In addition, the Galapagos Agreement, not yet in force, plans to establish a new RFMO in the Southeast Pacific, and the Permanent Commission for the South Pacific (CPPS) (an advisory body) is acting as Secretariat in the interim period. The areas of these 13 RFMOs are illustrated in Figure 5.7. Overlap with the global distribution of breeding albatrosses is shown in Figure 5.8 (all species with equal weights) and Figure 5.9 (species weighted by threat status), and overlap with respect to regions is shown in Figure 5.10. Table 5.3 summarises the distribution of breeding albatrosses in relation to RFMO areas.

The results indicate that breeding albatrosses spend most time in the areas managed by (1) Commission for the Conservation of Southern Bluefin Tuna (CCSBT), (2) Western and Central Pacific Fisheries Commission (WCPFC), (3) Indian Ocean Tuna Commission (IOTC), (4) International Commission for the Conservation of Atlantic Tunas (ICCAT) and (5) Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (Table 5.4). All five of these RFMOs have longline fisheries operating within their areas, and each is also particularly important for individual albatross species (Figure 5.11).

CCSBT was the highest ranked RFMO in terms of % albatross time, with an area that coincides with the ranges of 14 of the 16 albatross species for which breeding data were available. This includes approximately 70% of the total distribution of breeding albatrosses, almost 100% of the breeding ranges of both Critically Endangered albatross species

Table 5.3. Percentage time at sea spent in selected RFMOs while breeding for 16 species of albatross, two species of giant-petrel and one petrel species for which satellite tracking data was submitted to the workshop. (Note: the percentages do not total to 100% as several RFMO boundaries overlap.)

Species	Threat status[1]	% global popn tracked[2]	Sites tracked[3]	RFMO[4] CCAMLR	CCSBT	CPPS	IATTC	IATTC new	ICCAT	IOTC	IPHC	WCPFC	CEPTFA	NPAFC	PSC	SEAFO	SWIOFC
Albatrosses																	
Amsterdam	CE	100	all > 1%		100					100							93
Antipodean	V	59	–		98							98					
Black-browed	E	100	all > 1%	12	16	12	1	3	79								
Black-footed	E	97	all > 5%				6	6				94		37			
Buller's	V	42	–		90	1		1		3		87					
Chatham	CE	100	all > 1%		99							99					
Grey-headed	V	87	–	67	24	8		1	64	2		6				2	2
Indian Yellow-nosed	E	70	–		100					100							86
Laysan	V	100	all > 1%				1	2			27	98	1	73			
Light-mantled	NT	9	–	44	1							55					
Northern Royal	E	100	all > 1%		98							98					
Shy	NT	15	–		83					83		1					
Sooty	E	17	–	68	88					31		1					31
Southern Royal	V	99	all > 1%		96							99					
Tristan	E	100	all > 1%		99				100							83	
Wandering	V	100	all > 1%	61	84				26	22						2	20
Giant-petrels and Petrels																	
Northern Giant-petrel	NT	38	–	60	20	3			92								
Southern Giant-petrel	V	20	–	64	20				84								
White-chinned Petrel	V	?	?	65	28				93	1							1

[1] –: not threatened, NT: Neat Threatened, V: Vulnerable, E: Endangered, CE: Critically Endangered (BirdLife International 2004a)
[2] The percentage of the global population tracked was calculated by summing the proportion of the global annual number of breeding pairs at each site for which tracking data was contributed.
[3] Indicates whether tracking data was submitted for all sites containing over 1% or 5% of the global annual number of breeding pairs.
[4] CCAMLR – Commission for the Conservation of Antarctic Marine Living Resources, CEPTFA – Council of the Eastern Pacific Tuna Fishing Agreement, CCSBT – Commission for the Conservation of Southern Bluefin Tuna, CPPS – Permanent Commission for the South Pacific: area proposed under the Galapagos Agreement, IATTC – Inter-American Tropical Tuna Commission, IATTC new – Area that will be managed by IATTC if the Antigua Agreement comes into force, ICCAT – International Commission for the Conservation of Atlantic Tuna, IOTC – Indian Ocean Tuna Commission, IPHC – International Pacific Halibut Commission, NPAFC – North Pacific Anadromous Fish Commission, PSC – Pacific Salmon Commission, SEAFO – South East Atlantic Fisheries Organisation, SWIOFC – South West Indian Ocean Fisheries Commission, WCPFC – Western and Central Pacific Fisheries Convention.

Figure 5.7. Areas of jurisdiction of selected RFMOs. CCAMLR – Commission for the Conservation of Antarctic Marine Living Resources, CEPTFA – Council of the Eastern Pacific Tuna Fishing Agreement, CCSBT – Commission for the Conservation of Southern Bluefin Tuna, CPPS – Permanent Commission for the South Pacific: area proposed under the Galapagos Agreement, IATTC – Inter-American Tropical Tuna Commission, ICCAT – International Commission for the Conservation of Atlantic Tuna, IOTC – Indian Ocean Tuna Commission, IPHC – International Pacific Halibut Commission, NPAFC – North Pacific Anadromous Fish Commission, PSC – Pacific Salmon Commission, SEAFO – South East Atlantic Fisheries Organisation, SWIOFC – South West Indian Ocean Fisheries Commission, WCPFC – Western and Central Pacific Fisheries Convention.

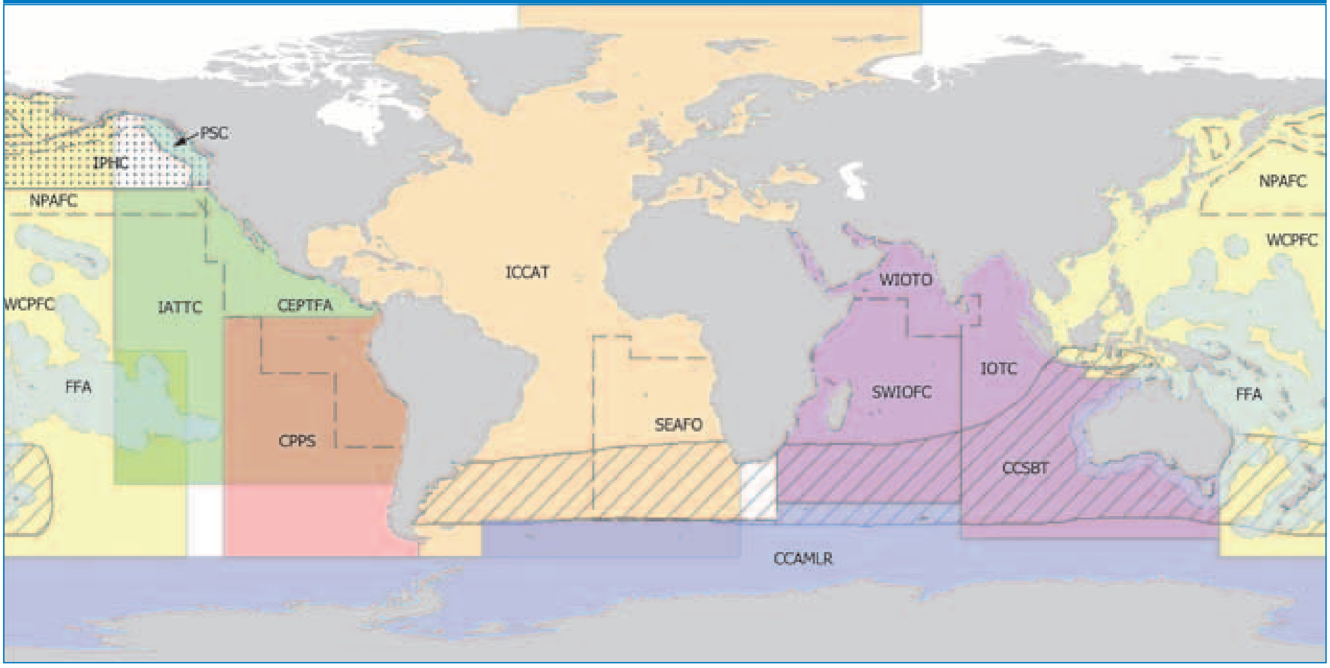


Figure 5.8. Global utilisation distributions (UDs) of breeding albatrosses in relation to the areas of competence of selected RFMOs. A UD provides a probability contour indicating the relative amount of time birds spend in a particular area i.e. they will spend 50% of their time within the 50% UD. The dotted line represents the entire range, or 100% UD. This composite was created by calculating the utilisation distributions for each species and combining them giving each species equal weighting. UD's for each species were derived from density distribution maps obtained by satellite tracking of breeding birds of the following 16 species from these locations: Amsterdam Albatross (Amsterdam Island), Antipodean (Gibson's) Albatross (Auckland Islands), Black-browed Albatross (Isla Diego de Almagro, Islas Ildefonso, Islas Diego Ramirez, Falkland Islands (Malvinas), South Georgia and Iles Kerguelen), Black-footed Albatross (Tern Island), Buller's Albatross (Solander Island and Snares Islands), Chatham Albatross (Chatham Islands), Grey-headed Albatross (Islas Ildefonso, Islas Diego Ramirez, South Georgia, Marion Island, Campbell Island and Macquarie Island), Light-mantled Albatross (Macquarie Island), Laysan Albatross (Tern Island and Isla de Guadalupe), Northern Royal Albatross (Chatham Islands and Taiaroa Head), Southern Royal Albatross (Campbell Island), Shy Albatross (Albatross Island, Mewstone and Pedra Branca), Sooty Albatross (Iles Crozet), Tristan Albatross (Gough Island), Wandering Albatross (South Georgia, Marion Island, Iles Crozet and Iles Kerguelen) and Indian Yellow-nosed Albatross (Amsterdam Island). For explanation of RFMO acronyms see Fig. 5.7.

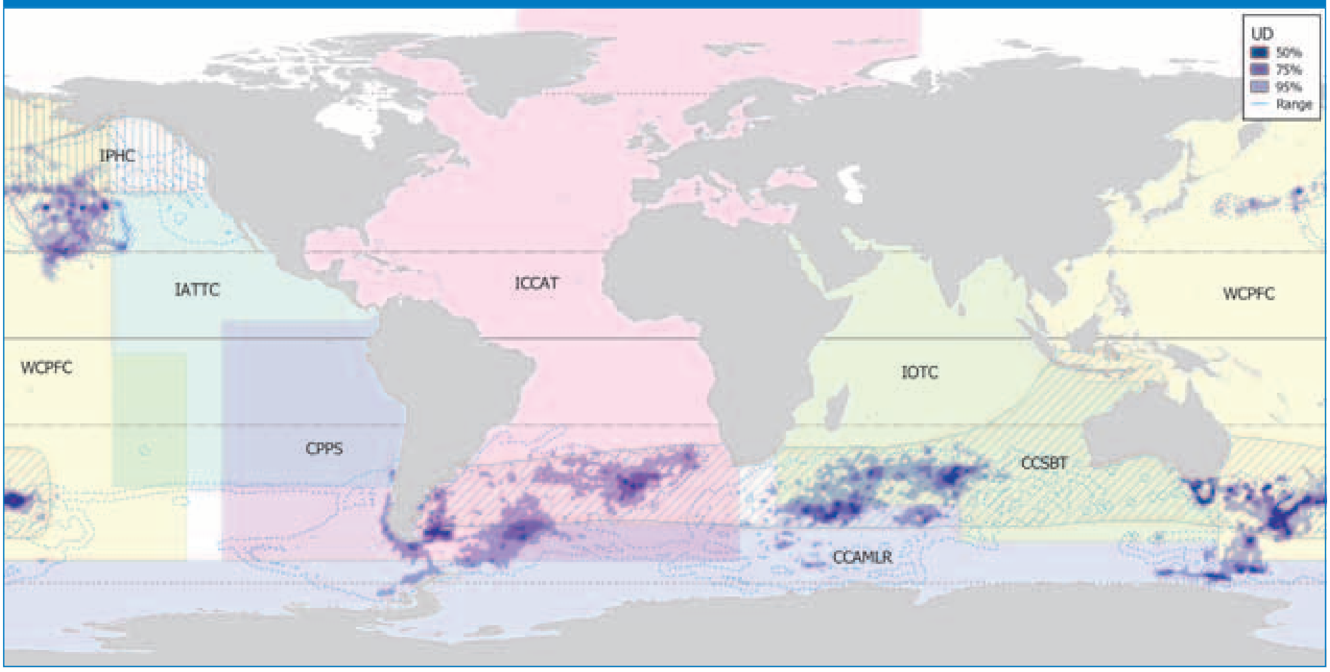


Figure 5.9. Global utilisation distributions (UD's) of breeding albatrosses weighted by threat status, in relation to the areas of competence of selected RFMOs. A UD provides a probability contour indicating the relative amount of time birds spend in a particular area i.e. they will spend 50% of their time within the 50% UD. The dotted line represents the entire range, or 100% UD. This composite was created by calculating the utilisation distributions for each species and combining them by weighting each species according to its IUCN threat status. The weights used were: NT (Neat Threatened) = 1; V (Vulnerable) = 2; E (Endangered) = 3; CE (Critically Endangered) = 4. The threat status of each species is given below. UD's for each species were derived from density distribution maps obtained by satellite tracking of breeding birds of the following 16 species from these locations: Amsterdam Albatross: CE (Amsterdam Island), Antipodean (Gibson's) Albatross: V (Auckland Islands), Black-browed Albatross: E (Isla Diego de Almagro, Islas Ildefonso, Islas Diego Ramirez, Falkland Islands (Malvinas), South Georgia and Iles Kerguelen), Black-footed Albatross: E (Tern Island), Buller's Albatross: V (Solander Island and Snares Islands), Chatham Albatross: CE (Chatham Islands), Grey-headed Albatross: V (Islas Ildefonso, Islas Diego Ramirez, South Georgia, Marion Island, Campbell Island and Macquarie Island), Light-mantled Albatross: NT (Macquarie Island), Laysan Albatross: V (Tern Island and Isla de Guadalupe), Northern Royal Albatross: E (Chatham Islands and Taiaroa Head), Southern Royal Albatross: V (Campbell Island), Shy Albatross: NT (Albatross Island, Mewstone and Pedra Branca), Sooty Albatross: E (Iles Crozet), Tristan Albatross: E (Gough Island), Wandering Albatross: V (South Georgia, Marion Island, Iles Crozet and Iles Kerguelen) and Indian Yellow-nosed Albatross: E (Amsterdam Island). For explanation of RFMO acronyms see Fig. 5.7.

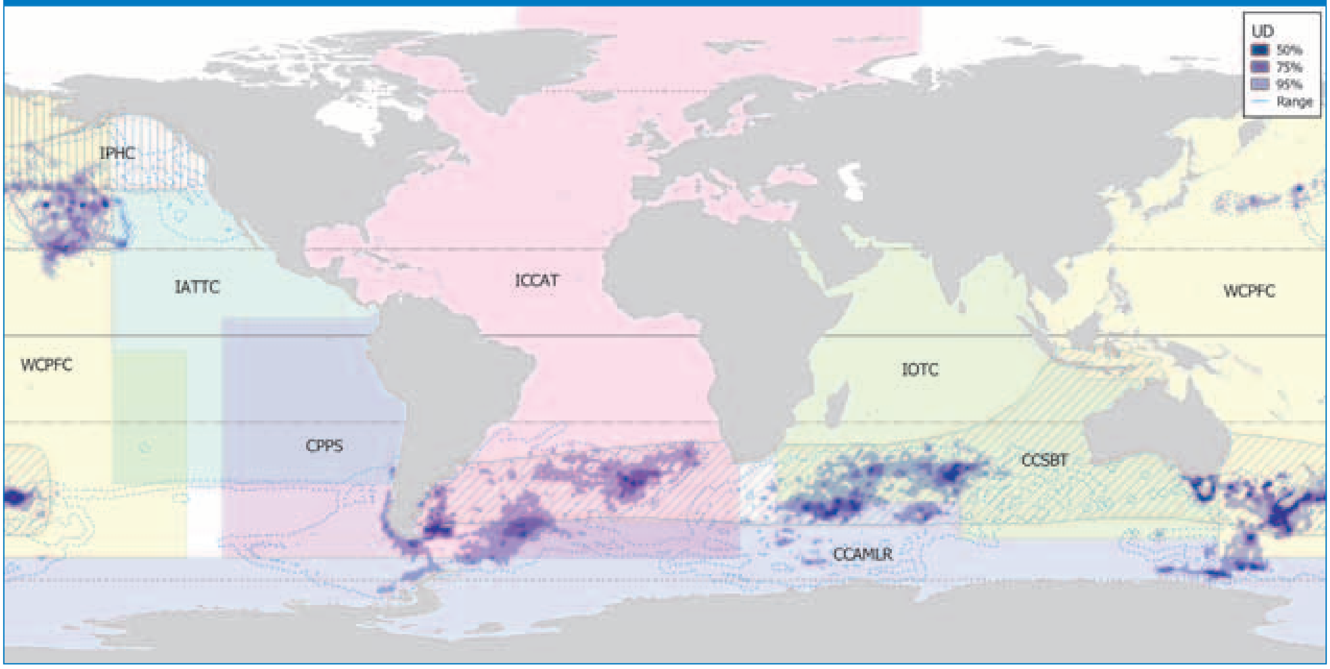


Table 5.4. Comparison of the importance of selected RFMOs to the breeding albatrosses for which satellite tracking data was submitted to the workshop. For explanation of RFMO acronyms see Table 5.3.

	CCAMLR	CCSBT	CPPS	IATTC	IATTC new	ICCAT	IOTC	IPHC	WCPFC	CEPTFA	NPAFC	PSC	SEAFO	SWIOFC
RFMO Area (millions of km²)	83	73	37	62	75	137	69	14	129	18	20	1.6	23	27
No. of albatross species tracked within RFMO during breeding (out of 16 total)	8	14	4	5	7	4	9	2	12	1	2	1	4	6
% time spent in RFMO by tracked breeding birds:														
– species given equal weight	16	67	1	1	1	17	21	2	46	0	7	0	5	14
– species weighted by threat status	14	72	1	1	1	18	23	1	45	0	6	0	6	19
Rank of importance of RFMO to satellite tracked breeding albatrosses, taking the number of species and time spent in the RFMO into account	5	1	10	12	11	4	3	9	2	13	7	14	8	6

and 90% or more of the ranges of at least 4 of the 6 Endangered albatross species for which tracking data are available.

The WCPFC was the second highest RFMO in terms of albatross distribution, containing more than 45% of breeding albatross time. Highest concentrations of albatross distribution occur offshore from southeast Australia, and around New Zealand (Figure 5.12), and the WCPFC area includes 79% of the breeding distribution of New Zealand and Australian albatrosses (Table 5.5). Non-breeding data are also available for this region, and indicate that some of the WCPFC's breeding albatrosses migrate into areas managed by IOTC and the Inter-American Tropical Tunas Commission (IATTC) during non-breeding (Figure 5.13).

The WCPFC area is also highly important for the three species of albatrosses breeding in the northern hemisphere (Figure 5.10), including almost 100% of the breeding ranges of the Laysan and Black-footed Albatrosses in the North Pacific. (No breeding distribution data were available for the Short-tailed Albatross, but distribution is likely to be highly, if not entirely, concentrated within the WCPFC area.)

IOTC, ICCAT, and CCAMLR follow in terms of proportion of albatross distribution, each including 16–21 % of albatross distribution, and each being particularly important for specific albatross species: the southern part of the Indian Ocean, managed by IOTC, is crucial for the Critically Endangered Amsterdam Albatross and the

Endangered Indian Yellow-nosed Albatross, while the South Atlantic, managed by ICCAT, is crucial for the Endangered Tristan, Black-browed, and Atlantic Yellow-nosed Albatrosses. CCAMLR's area is particularly important for Wandering and Grey-headed Albatrosses.

The East Pacific Ocean, managed by IATTC and the RFMO established by the Galapagos Agreement, once it comes into force (the Secretariat is being managed by the Permanent Commssion of the South Pacific (CPPS) in the interim period), contains a low proportion of the breeding

Figure 5.10. Regional maps of global utilisation distributions (UD's) of breeding albatrosses in relation to the areas of competence of selected RFMOs. Important breeding sites for albatrosses in each region are shown. A. North Pacific; B. Australasia; C. Southern Atlantic and Indian Oceans. These composites were created by calculating the utilisation distributions for each species and combining them with equal weighting of each species. For explanation of RFMO acronyms see Fig. 5.7.

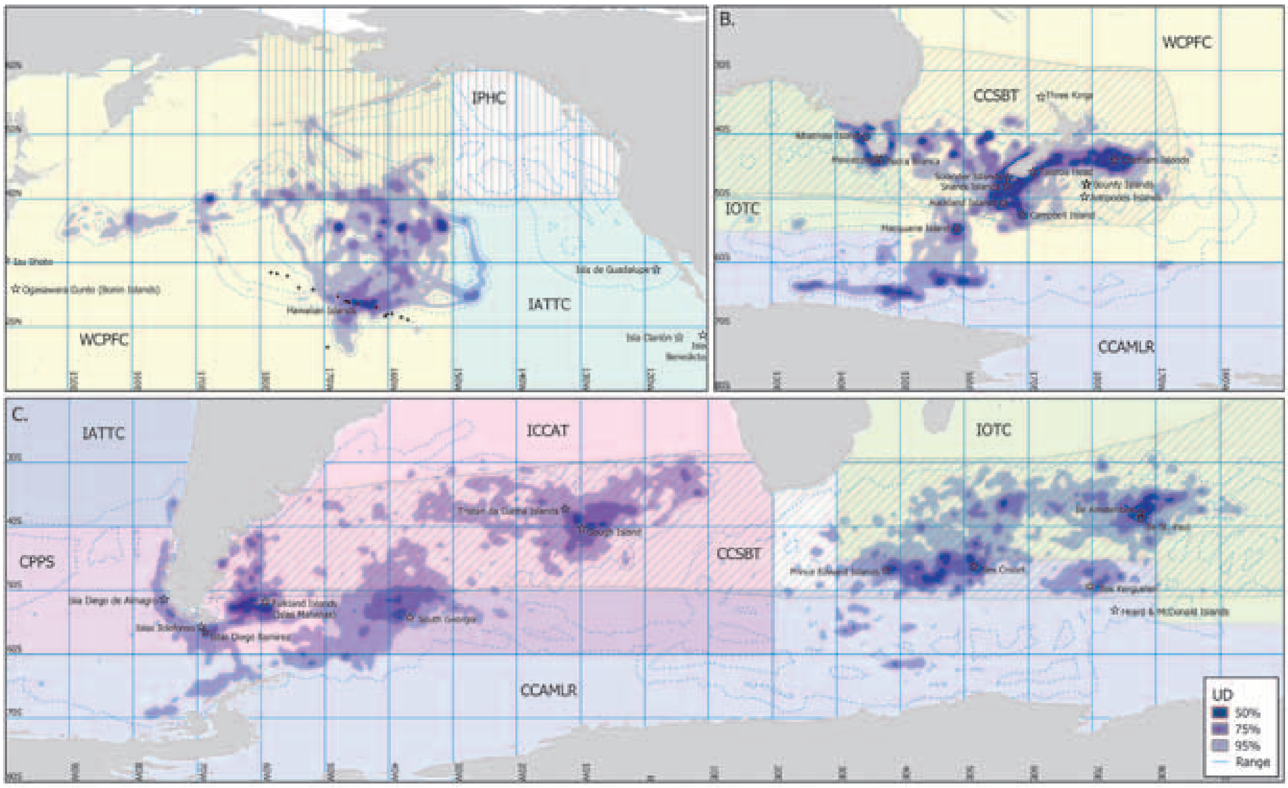


Figure 5.11. Percentage time at sea spent in selected RFMOs while breeding for 11 species of albatross. Only those species for which a large proportion (over 70%) of the global population is represented by satellite tracking data are shown. (Note: the percentages do not total to 100% as several RFMO boundaries overlap.) For explanation of RFMO acronyms see Fig. 5.7.

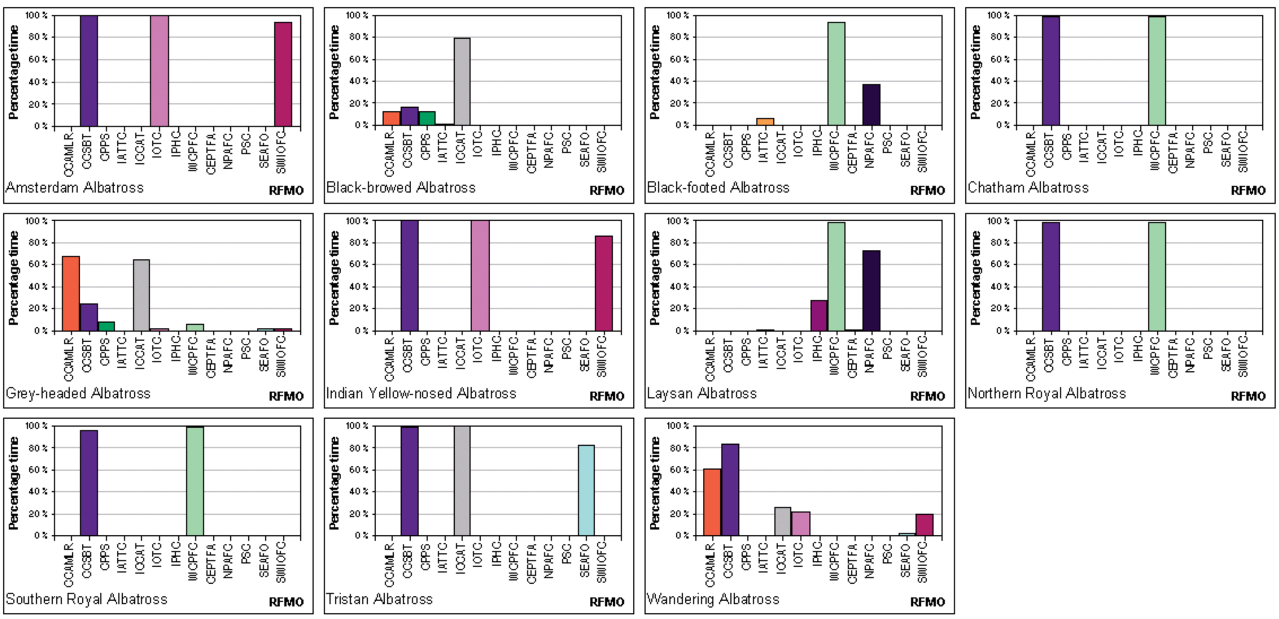
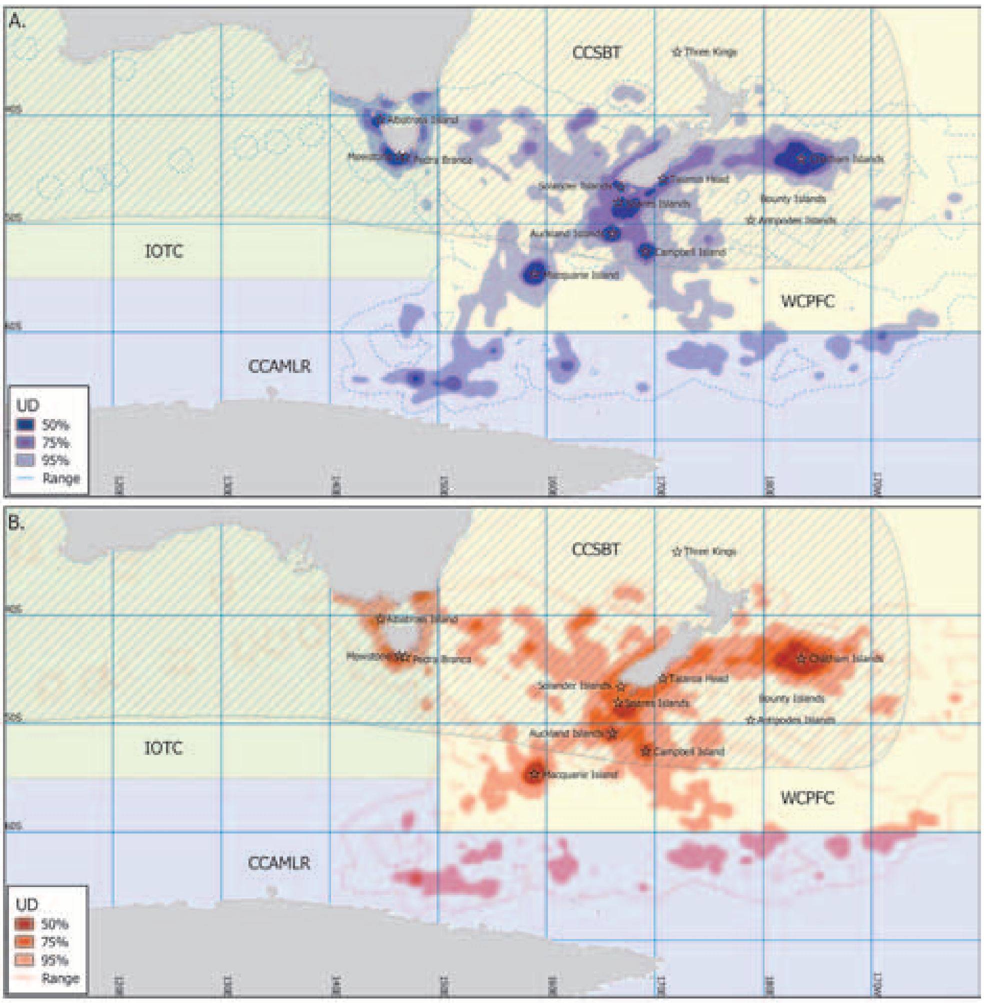


Figure 5.12. Global utilisation distributions (UD's) of breeding albatrosses from New Zealand and Australia in relation to the areas of competence of selected RFMOs. For explanation of RFMO acronyms see Fig. 5.7. A UD provides a probability contour indicating the relative amount of time birds spend in 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. Important breeding sites for albatrosses in the region are shown. The composite in A. was created by calculating the utilisation distributions for each species and combining them with equal weighting of each species. The composite in B. was created by calculating the utilisation distributions for each species and combining them by weighting according to IUCN threat status. The weights used were: NT (Neat Threatened) = 1; V (Vulnerable) = 2; E (Endangered) = 3; CE (Critically Endangered) = 4. The threat status of each species is given after the species name below.

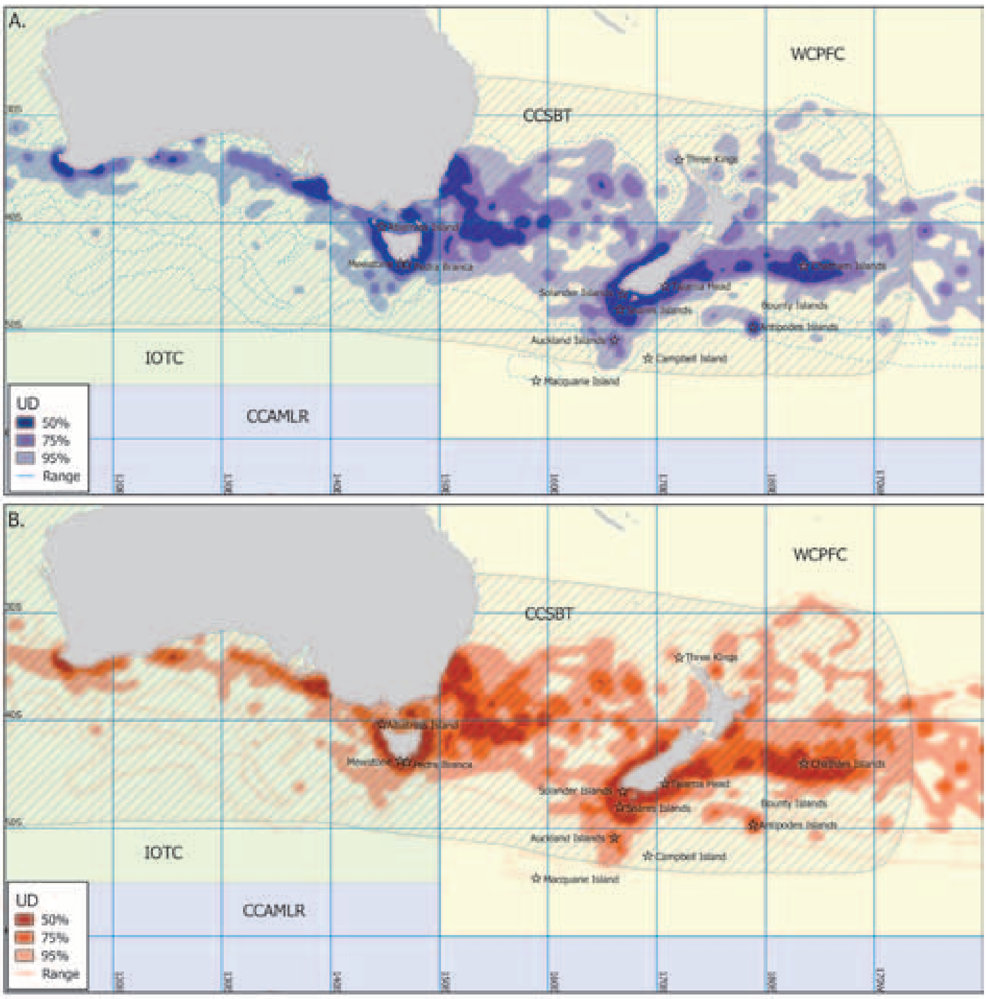


UD's for each species were derived from density distribution maps obtained by satellite tracking breeding birds of the following 9 species from the locations given: Antipodean (Gibson's) Albatross: V (Auckland Islands), Black-browed Albatross: E (Macquarie Island), Buller's Albatross: V (Solander Island and the Snares Islands), Chatham Albatross: CE (Chatham Islands), Grey-headed Albatross: V (Macquarie and Campbell Islands), Light-mantled Albatross: NT (Macquarie Island), Northern Royal Albatross: E (Chatham Islands and Taiaroa Head), Southern Royal Albatross: V (Campbell Island) and Shy Albatross: NT (Albatross Island, Mewstone and Pedra Branca).

Table 5.5. Comparison of the importance of selected RFMOs to the New Zealand and Australian albatrosses (breeding and non-breeding) for which satellite tracking data was submitted to the workshop. For explanation of RFMO acronyms see Table. 5.3.

	CCAMLR	CCSBT	CPPS	IATTC	IATTC new	ICCAT	IOTC	IPHC	WCPFC	CEPTFA	NPAFC	PSC	SEAFO	SWIOFC
RFMO Area (millions of km^2)	83	73	37	62	75	137	69	14	129	18	20	1.6	23	27
No. of albatross species tracked within RFMO:														
– breeding (out of 9 total)	2	5	1	1	1	0	3	0	5	0	0	0	0	0
– non-breeding (out of 6)	2	4	3	2	3	1	3	0	4	2	0	0	1	1
% time spent in RFMO by tracked birds:														
– breeding														
– species given equal weight	7	70	0	0	0	0	10	0	79	0	0	0	0	0
– species weighted by threat status	4	74	0	0	0	0	5	0	87	0	0	0	0	0
– non-breeding														
– species given equal weight	0	70	18	7	20	5	24	0	44	6	0	0	0	2
– species weighted by threat status	0	63	25	12	27	7	15	0	46	9	0	0	0	2
Rank of importance of RFMO to satellite tracked albatrosses, taking the number of species and time spent in the RFMO into account:														
– breeding	4	2	6	7	5	8	3	8	1	8	8	8	8	8
– non-breeding	10	1	5	6	4	8	3	12	2	7	12	12	11	9

Figure 5.13. Global utilisation distributions (UD's) of non-breeding albatrosses from New Zealand and Australia in relation to the areas of competence of selected RFMOs. For explanation of RFMO acronyms see Fig. 5.7. 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. Important breeding sites for albatrosses in the region are shown. The composite in A. was created by calculating the utilisation distributions for each species and combining them giving each species equal weighting. The composite in B. was created by calculating the utilisation distributions for each species and combining them by weighting according to IUCN threat status. The weights used were: NT (Neat Threatened) = 1; V (Vulnerable) = 2; E (Endangered) = 3; CE (Critically Endangered) = 4. The threat status of each species is given after the species name below.



UD's for each species were derived from density distribution maps obtained by satellite tracking non-breeders and failed breeders of the following 7 species from the locations given: Antipodean Albatross: V (Antipodes Islands), Antipodean (Gibson's) Albatross: V (Auckland Islands), Buller's Albatross: V (Solander Island and the Snares Islands), Chatham Albatross: CE (Chatham Islands), Northern Royal Albatross: E (Chatham Islands and Taiaroa Head), Shy Albatross: NT (Albatross Island, Mewstone and Pedra Branca) and Wandering Albatross: V (Indian Ocean and Tasman Sea).

distribution of albatrosses, though this would be increased if breeding distribution data from Waved Albatrosses were included in the dataset. However, the Southeast Pacific, particularly the coastal shelf offshore from Peru and Chile is significantly more important when the ranges of non-breeding albatrosses are considered. If IATTC's new Antigua Convention comes into force, IATTC's area will expand by 10º latitude north and south. The new IATTC convention area, and the area managed by CPPS/Galapagos Agreement would then each encompass approximately 20% of the non-breeding distribution of Australian and New Zealand albatrosses

The areas of the non-tuna RFMOs in the Southeast Atlantic and Southwest Indian Ocean also overlap with albatross distributions. South-East Atlantic Fisheries Commission (SEAFO) and South-West Indian Ocean Fisheries Commission (SWIOFC) are still in the process of development—in particular, SWIOFC's convention has not yet been drafted, and the area that it will manage is still under discussion. However, the area currently proposed for SWIOFC includes 14% of breeding albatross distribution, which increases to 19% of distribution if weighted by threat status. The areas that will be managed by SEAFO and SWIOFC are particularly important in relation to the Critically Endangered Amsterdam Albatross, and the Endangered Tristan and Indian Yellow-nosed Albatrosses, respectively. The indications are that they will be principally responsible for trawl fisheries and artisanal fisheries (since tuna longlines in their areas will be managed by ICCAT and IOTC, respectively). However, incidental mortality is known to be widespread in trawl fisheries (Bartle 1991, Sullivan *et al.* 2003). Management by SEAFO and especially SWIOFC will therefore be important in relation to albatross conservation.

Implications for albatross conservation

CCAMLR is the only RFMO to have undertaken comprehensive measures to reduce albatross mortality: CCSBT requires its vessels to use streamers lines and WCPFC is not yet fully active, but ICCAT and IOTC have neither assessed albatross mortality within their fisheries, nor established any mitigation measures. The new WCPFC Convention includes a commitment to minimising impact of fisheries on non-target species, to developing a regional observer program within its fisheries and to monitoring the status of such species. These commitments present a unique opportunity to ensure that WCPFC undertakes effective mitigation of albatross bycatch.

Cleo Small and John Croxall

5.2.4 Relationships between distribution of albatrosses and petrels and Exclusive Economic Zones (EEZs)

Several albatross species are at risk from interactions with longline fisheries because of their vast foraging ranges, particularly during non-breeding phase. These ranges often occur over high seas areas, where fisheries regulation is difficult to implement. Although the RFMOs discussed above perform some of this regulation, currently it is mainly within territorial waters and Exclusive Economic Zones (EEZs) that it is practical to enforce measures to ensure the conservation of threatened albatrosses and petrels. It is thus essential to examine the amount of time spent in these regions by different species during different phases of their life cycle, so that countries can be made aware of the importance of their national waters to albatross survival. For the purposes of this study, the EEZ area (usually claimed from 24–200 nm) includes the 12 nm territorial waters and 24 nm contiguous zones (Figure 5.14).

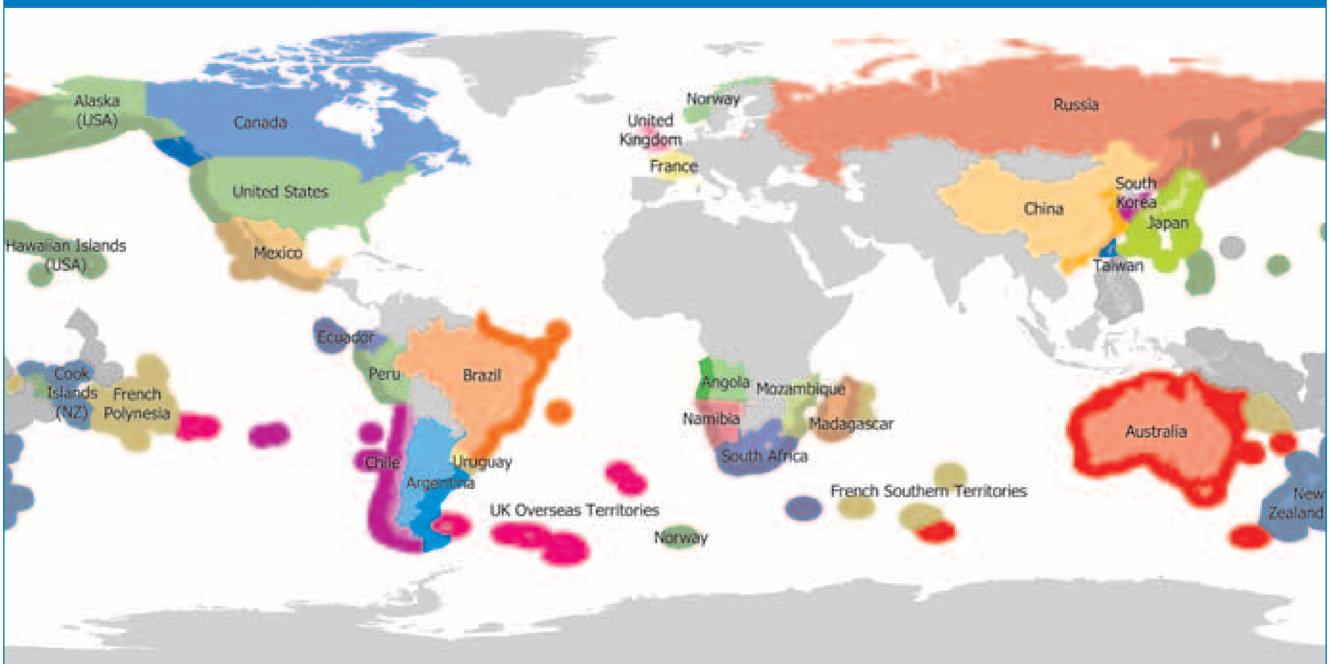
From Table 5.6 and Figure 5.15 it is clear that some species of albatross rely more heavily on EEZ areas during breeding than others. Thus Laysan Albatrosses spend 84% of their time during breeding on the high seas. Other species particularly at risk outside EEZs include Black-footed (66%), Grey-headed (56%), Tristan (56%), Indian Yellow-nosed (49%) and Wandering (45%) Albatrosses. Of these, the Black-footed, Indian Yellow-nosed and Tristan Albatrosses are listed as Endangered by the IUCN, whereas the rest are Vulnerable. Of the 11 species for which tracking data were submitted for a large proportion of the global population, all spent some time during the breeding season on the high seas, although in some cases this was as low as 1 or 2%. This amount of time is expected increase substantially for non-breeders, when birds are no longer restricted to breeding colonies found within the EEZs. Unfortunately insufficient data was submitted to the workshop to perform a similar analysis for non-breeders.

An examination of the regional distribution of breeding albatrosses (Figure 5.16) shows the importance of particular countries for the different species. The Critically Endangered Chatham, Endangered Northern Royal and Vulnerable Southern Royal Albatrosses are confined almost exclusively to the New Zealand EEZ during breeding, spending at most 2% of their time outside this area. The Critically Endangered Amsterdam Albatross spends 79% of its time within the area of France's Southern Territories EEZ, being restricted to breeding on French Ile Amsterdam. Similarly the Indian Yellow-nosed Albatross, which breeds only in the French Southern Territories and South African Prince Edward Islands, spends 51% of its time in French waters. Other countries of importance to particular species include the United Kingdom (Black-browed (51%), Grey-headed (33%) and Tristan (44%) Albatrosses) and United States (Black-footed (34%) and Laysan (15%) Albatrosses).

For three species in particular, Black-browed, Grey-headed and Wandering Albatross, international co-operation is vital to ensure their survival. These species have wide breeding and foraging ranges and are found over most of the Southern Ocean. Differing levels of protection by the countries whose EEZs they frequent will place them at risk during different phases of their annual and life cycle.

Due to the number of endemic species found breeding on its surrounding islands, New Zealand ranks as the most

Figure 5.14. Main countries with EEZs overlapping albatross distribution (the EEZs include territorial and contiguous waters).



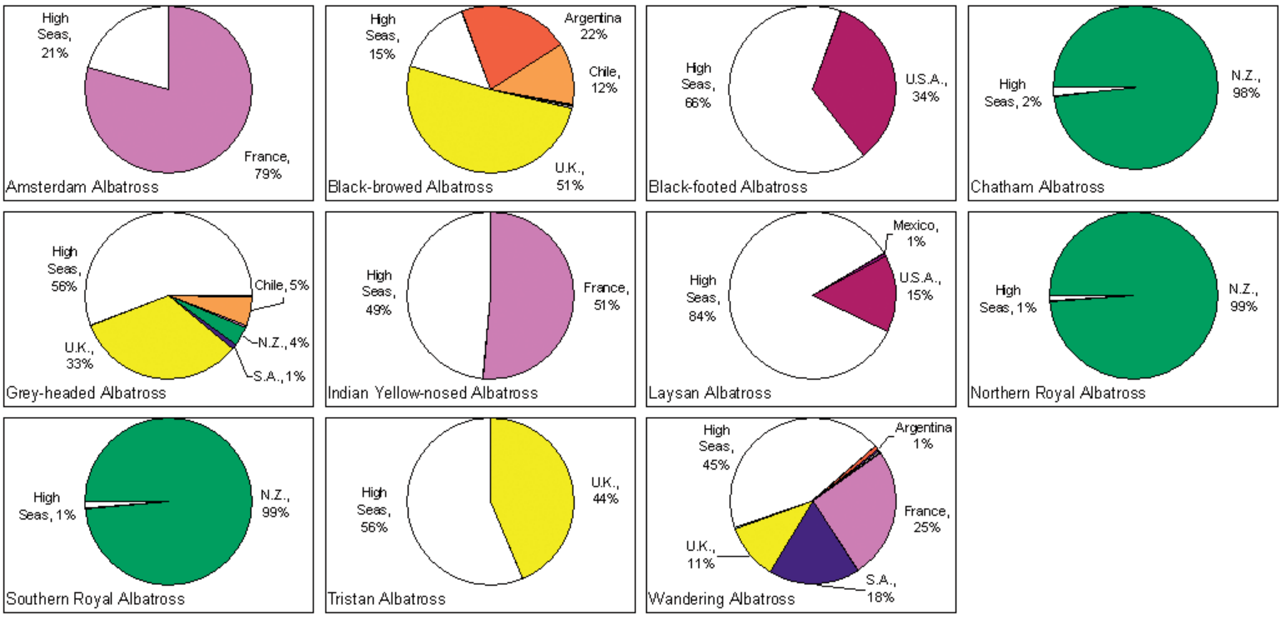
The geographical designations employed do not imply the expression of any opinion whatsoever on the part of BirdLife International concerning the legal status of any country, territory or area, or concerning the delimitation of its frontiers or boundaries. At the time of going to press it was noted that the EEZ surrounding South Georgia does not extend as far west as indicated in the map. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning the sovereignty over the Falkland Islands (Malvinas).

Table 5.6. Percentage time at sea spent in EEZs as opposed to the high seas while breeding for 16 species of albatross, two species of giant-petrel and one petrel species for which satellite tracking data was submitted to the workshop. (The EEZ area includes territorial and contiguous waters.)

Species	Threat status[1]	% global popn tracked[2]	Sites tracked[3]	Argentina	Australia	Brazil	Chile	Canada	France	Mexico	Norway	New Zealand	South Africa	United Kingdom	Uruguay	USA	High seas
Albatrosses																	
Amsterdam	CE	100	all > 1%						79								21
Antipodean	V	59	–		2							59					39
Black-browed	E	100	all > 1%	22			12							51			15
Black-footed	E	97	all > 5%													34	66
Buller's	V	42	–		4							79					17
Chatham	CE	100	all > 1%									98					2
Grey-headed	V	87	–				5					4	1	33			56
Indian Yellow-nosed	E	70	–						51								49
Laysan	V	100	all > 1%							1						15	84
Light-mantled	NT	9	–		50												50
Northern Royal	E	100	all > 1%									99					1
Shy	NT	15	–		83												17
Sooty	E	17	–						40				3				56
Southern Royal	V	99	all > 1%									99					1
Tristan	E	100	all > 1%											44			56
Wandering	V	100	all > 1%	1					25				18	11			45
Giant-petrels and Petrels																	
Northern Giant-petrel	NT	38	–	14			3							59			24
Southern Giant-petrel	V	20	–	21										39			41
White-chinned Petrel	V	?	?	16					1					53			30

[1] NT: Neat Threatened, V: Vulnerable, E: Endangered, CE: Critically Endangered (BirdLife International 2004a)
[2] The percentage of the global population tracked was calculated by adding the proportion of the global annual number of breeding pairs at each site for which tracking data was contributed.
[3] Indicates whether tracking data was submitted for all sites containing over 1% or 5% of the global annual number of breeding pairs.

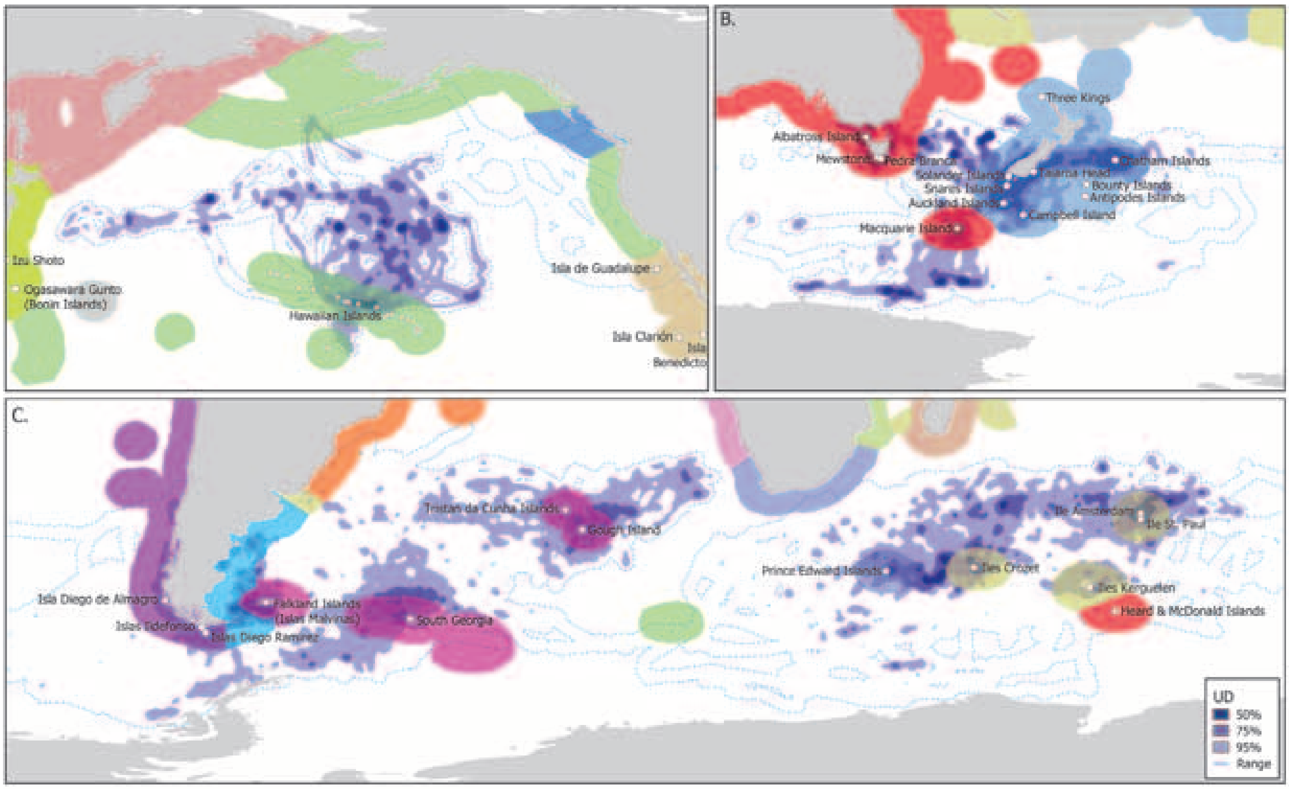
Figure 5.15. Percentage time at sea spent in EEZs as opposed to the high seas while breeding for 11 species of albatross. Only those species for which a large proportion (over 70%) of the global population is represented by satellite tracking data are shown.



important country for the conservation of breeding albatrosses, with seven species spending 29% of their time during breeding within its EEZ (Table 5.7). France, Australia, the United Kingdom and the USA follow in order of importance. The Agreement on the Conservation of Albatrosses and Petrels (ACAP), which seeks to conserve albatrosses and petrels in the southern hemisphere by coordinating international activity to mitigate known threats to their populations, entered into force on the 1 February 2004. Of the nations listed above with EEZs in the southern ocean, all have signed ACAP but France has yet to ratify the agreement. The USA has developed a National Plan of Action to deal with bycatch issues.

The importance of several countries for breeding albatrosses has been under-estimated because some datasets were not submitted to the workshop. The addition of tracking data for Waved Albatrosses, for example, will highlight Ecuador and Peru's primary responsibilities for the protection of this species (Anderson *et al.* 2003), while the distribution of Short-tailed Albatrosses overlaps the EEZs of China, Japan, Russia, South Korea and Taiwan. The non-breeding distribution of albatrosses also needs to

Figure 5.16. Regional maps of global utilisation distributions (UD's) of breeding albatrosses in relation to EEZs. Important breeding sites for albatrosses in each region are shown. A. North Pacific; B. Australasia; C. Southern Atlantic and Indian Oceans. These composites were created by calculating the utilisation distributions for each species and combining them giving each species equal weighting.



The geographical designations employed 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 frontiers or boundaries. At the time of going to press it was noted that the EEZ surrounding South Georgia does not extend as far west as indicated in the map. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning the sovereignty over the Falkland Islands (Malvinas).

be examined. Several of the New Zealand albatrosses are known to frequent the coastal shelf off South America (Nicholls *et al.* 2002, Spear *et al.* 2003), making Argentina, Chile, Peru and Uruguay crucial for their conservation.

Frances Taylor

5.3 ESTABLISHMENT, MAINTENANCE AND USE OF A GIS TRACKING DATABASE

The workshop participants acknowledged the importance and uniqueness of the integrated perspective of global Procellariiform distributions achieved at this workshop, and agreed to maintain the tracking database assembled for the Important Bird Area (IBA) delineation exercise beyond this meeting. However, participation in this exercise does not imply the contribution of the tracking data into a permanent database, nor does it give BirdLife International the permission to use the contributed data indefinitely. The data sets used in this workshop will not be automatically incorporated into a permanent database at the end of this exercise. Instead, the workshop participants will be given the opportunity to re-submit their data sets into a permanent repository, on the basis of agreed-upon terms of use to be ratified at a later date. Alternatively, users may choose to withdraw their data from the tracking database once the IBA exercise has been completed.

Many important issues concerning data ownership and the longevity of this database will be determined in future discussions. Nonetheless, the participants decided to proceed with the establishment of the Procellariiform tracking database at this time, acknowledging the need to

Table 5.7. Comparison of the importance of overlapping EEZs to the breeding albatrosses for which satellite tracking data was submitted to the workshop. (The EEZ area includes territorial and contiguous waters.)

	Argentina	Australia	Brazil	Chile	Canada	France	Mexico	Norway	New Zealand	South Africa	United Kingdom	Uruguay	USA	High seas
No. of albatross species tracked within EEZ during breeding (out of 16 total)	3	9	2	3	1	7	1	2	7	3	4	2	2	16
% time spent in EEZ by tracked breeding birds:														
– species given equal weight	1	9	0	1	0	12	0	0	27	1	9	0	3	36
– species weighted by threat status	2	4	0	1	0	16	0	0	29	1	9	0	3	34
Rank of importance of EEZ to satellite tracked breeding albatrosses, taking the no. of species and time spent in the EEZ into account	6	3	10	8	13	2	9	12	1	7	4	11	5	

balance the broad availability of this information to the conservation community with the proprietary rights of the individual data contributors. The workshop participants felt enough safeguards were currently in place to mitigate the perceived threat of unauthorised use of the contributed data.

Overall Strategy: The Procellariiform tracking database seeks to:

- *Attract Data Providers with Tools:* The development and integration of analytical tools (e.g., data filtering, quality control, analysis, and visualisation) will be essential to attract additional data providers. Access to these tools and services will serve as an incentive for data holders to contribute to the database. Every effort will be made to acknowledge contributions to the system by the data holders, through the creation of data provider pages (Annex 6.1), and data set summaries (Annex 6.2).
- *Enhance Meta-data Collection:* The establishment of reporting criteria for ancillary data (e.g., tag specifications, sampling regime, methodology, data filtering) will enhance the retroactive compilation of standardised meta-data from past studies, and the collection of complete ancillary measurements for future research. Meta-data standards are particularly important for discriminating between different versions of the same datasets (e.g., raw locations versus tracks cleaned with a "speed filter"), and for providing an accurate description of the data archived in the system.
- *Integrate Tracking Data with Other Relevant Datasets:* This database will add value to the tracking data by integrating these observations with other relevant information such as 1) **seabird distribution information** including colony size and location, at-sea surveys, and bycatch distributions; 2) **threats** from interactions with fisheries, fishing effort, and shipping lanes; 3) **environmental data** such as bathymetry, oceanographic variables (e.g., sea surface temperature, chlorophyll concentration, sea-level height), and wind speed and direction; 4) **management information** for EEZs, RFMOs, IBAs; and 5) **ecological data** such as distributions of prey, fishery target species, and other threatened taxa (e.g., turtles, sharks, cetaceans). In essence, these disparate data layers will enhance the broad applicability and the value of the Procellariiform tracking database by placing the tracking data in a broader context. This integration may take several forms, ranging from visual overlays to statistical summaries of the raw data, and will require the collaboration with other existing initiatives. In particular, the workshop participants highlighted the need to coordinate with the Tagging of Pacific Pelagics (TOPP) and the Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP) projects to avoid "reinventing the wheel".
- *Promote Collaboration:* It is our hope that the creation of this database will enhance collaborations between investigators, by promoting the exchange of perspectives, ideas, and analytical techniques. The complete meta-data documentation, including annotated lists of published references, tools (e.g., software) linked with specific datasets, and contact information for each data contributor, will help open these channels of communication. Moreover, this developing "information commons" will nurture a sense of community, essential to forge firm collaborations.

Data Contribution: The Procellariiform tracking database will only be an effective conservation tool if providers contribute their data in a complete and prompt manner.

- *Rapid Integration:* The sooner new tracking data are contributed to the database, the better. Ideally, we would hope that providers would contribute their data within five years of their collection.
- *Completeness:* Data providers are urged to contribute both the raw data and any updated filtered versions.
- *Documentation:* All contributions will include complete and standardised meta-data documentation of data collection, filtering, and processing procedures.

Data Sharing: Data sharing protocols will ensure the broad utility of the system, while protecting the proprietary rights of the data providers.

- *Management of Data Sets:* Data providers will be able to restrict user access to specific products (e.g., raw data, kernel plots) on any or all of their datasets by using a password protected data provider profile page (Annex 6.1). Public access may be restricted (1) to avoid the misinterpretation of data that are scarce or of poor quality (e.g., small sample sizes, large location errors); and (2) to protect the exclusive rights of providers to new or unpublished data. Database users will be notified of the restricted status of the data, and will be urged to contact the original data provider to gain access to this information.
- *Display:* The display of various data sets and products (e.g., maps, tabular summaries) should enhance the utility of the system to the broader community, while ensuring that the proprietary rights of data contributors are protected. Because users with different needs and computer skills will interact with this system, we advocate a flexible approach, whereby a central database will take on a variety of distinct appearances. To facilitate diverse searching and browsing options, the database system will provide species-specific pages, summaries of individual data sets including meta-data, a search engine interface, and a mapping tool interface.

  A species coverage page will display a tabular summary of the data holdings, including the species names, taxonomic information, and the number of datasets and records for a given species (example at http://seamap.env.duke.edu/species). This page will give users the ability to rapidly determine whether the database holds the information they seek. It will also provide links to species-specific page listings for all individual datasets, including relevant observations and summary pages describing each individual data set in the system (Annex 6.2).
- *Searching:* Users will have the ability to search the database for available data using individual species names (e.g., common name, Integrated Taxonomic Information System name / code), provenance (e.g., colony of origin), jurisdictions (e.g., Exclusive Economic Zones, Regional Fishery Management Council), status (e.g., breeding or non-breeding), specific geographic areas (e.g., latitude / longitude), and appropriate temporal windows (e.g., monthly and quarterly time periods were considered). These queries will yield information about the number of records and datasets that include observations of the species in question, and will provide links to web pages devoted to individual species and specific data sets.

- *Mapping:* We envision two types of basic data displays: (1) a static picture of all the locations (e.g., unfiltered, 1×1 degree resolution) included within the meta-data posted for each individual data set (Annex 6.2), and (2) a dynamic picture of filtered low resolution (1×1 degree) locations interactively defined by the user (example at http://obis.env.duke.edu/map/main/viewer.pmap). Because the raw tracking data can be publicly available, the decimal location information will be rounded off to the nearest degree of latitude and longitude to decrease the spatial resolution of the observations. Users will be able to interactively modify these maps by querying the system for individual species names (i.e., based on the query search capability listed above). Additionally, these observations may be superimposed on other environmental (e.g., bathymetry, SST, chlorophyll, etc.) and management (e.g., EEZs, RFMOs) data layers.
- *Tools:* Data providers will be able to use publicly available filtering / analysis tools on their own datasets. However, **all data users** will have to seek the authorisation from the original provider(s), before they can use these tools on other datasets.

System Longevity: The long-term viability of the Procellariiform tracking database is critical to enhance its conservation applicability. Because the maintenance of the system will incur costs, it is important to develop tools for automating the addition of new datasets or appending older versions of an original dataset. This approach should keep the costs of maintaining the database to a minimum. Overall, workshop participants did not favour a "use for fee" system; rather it was suggested that the database be publicly available for free. Therefore, in order to maintain the database, workshop participants agreed that support from an NGO was preferable to a government agency due to concerns of trust, capacity, and longevity. **BirdLife International** is an ideal candidate for this task due to its vital interest in the conservation of all bird life. Furthermore, the workshop participants agreed that **BirdLife International**'s experience working with management / conservation agencies worldwide, provided an essential bridge between researchers and resource managers.

Terms of Use

While these terms of use are in principle broadly applicable, the workshop participants acknowledge that other types of data (e.g., fisheries effort and bycatch, at-sea surveys) may be subject to more / less stringent proprietary / confidentiality controls.

By using any Procellariiform tracking dataset, **ALL** users agree to the following terms and conditions:

1. Not to use data contained herein in any publication, product, or commercial application **without prior written consent** from the original data provider(s). While initial inquiries may be conducted by electronic mail, users and providers will formalise their collaboration agreements using standardised electronic "terms of use" forms (e.g., terms.pdf) that will be archived by the database manager(s) (Annex 6.3).
2. Once consent has been obtained, users shall adhere to the following conditions:
   - The original data provider(s) must be given **co-authorship** of any product including "recent" data (i.e., gathered during the previous 10 years) unless the original data provider declines authorship. Ultimately, inclusion as an author is decided by the data provider(s) and not the data user(s).
   - Authorship will be **optional** for products involving "historical" data gathered more than 10 years in the past. In this case, authorship decisions will be at the discretion of the user(s) and not the original data provider(s).
   - After approval of use is obtained, authors agree to **cite** and / or acknowledge both the original data provider(s) and the Procellariiform Tracking dataset appropriately in all publications or products (e.g., web pages, models, and presentations). For publication in peer-reviewed journals, editors have suggested that the database version and the date the system was accessed be included in the citation. The version of the specific database, as described in the meta-data, will be essential to determine the level of data filtering and processing.
3. No data user shall hold any tracking device manufacturer (e.g., Lotek, Microwave Telemetry) or location processing service (e.g., Argos Inc.), the Procellariiform tracking database, or the original data provider(s) liable for errors in the data. While every effort has been made to ensure the integrity and quality of the database, BirdLife International (or whomever ultimately maintains this database) cannot guarantee the accuracy of the datasets contained herein.

David Hyrenbach, Daniel Costa, John Croxall, Richard Cuthbert, Lincoln Fishpool, William Fraser, Rosemary Gales, Nic Huin, Deon Nel, David Nicholls, Donna Patterson, Richard Phillips, David Pinaud, Flavio Quintana, Christopher Robertson, Graham Robertson, Peter Ryan, Scott Shaffer, Janet Silk, Jean-Claude Stahl, Robert Suryan, Frances Taylor, Aleks Terauds, Geoff Tuch, Henri Weinerskirch, Barbara Weinecke

5.4 GAP ANALYSIS

Inspection of the data in Annex 7 allows a very rough assessment of the main and priority gaps in remote-tracking data for albatrosses and giant-petrels. For breeding birds this assessment (based only on PTT data) is summarised in Table 5.8 and Figure 5.17. Absence of data is relatively straightforward to assess. Under-representation of data was assessed rather simplistically against a minimum expectation that tracking hours should exceed 10% of the number of breeding individuals at a site and that the number of individuals tracked (or inferred to be tracked from the number of tracks available) should exceed 0.1% of the number of breeding individuals at that site.

This preliminary overview does not take account the distribution of tracking sites within the populations concerned. In general, only one or two colonies, often from only one island of an archipelago, have been the sites for collection of remote-tracking data. There are, however, some notable exceptions to this, particularly for Black-browed and Grey-headed Albatross in Chile, for Shy Albatross in Tasmania and Black-browed Albatross in the Falkland Islands (Malvinas).

For birds other than those of breeding status tracked while breeding, the gaps are so extensive (Figure 5.18) that it is easier to indicate what information we have (Table 5.9).

John Croxall and Frances Taylor

Table 5.8. Data requirements to complete or augment existing remote-tracking data for breeding albatrosses and petrels. This assessment relates to main breeding sites (>5% of global breeding population). Values in parentheses are proportion (%) of global breeding population.

Species	Data lacking	Data enhancement needed
Amsterdam Albatross	–	–
Antipodean (including Gibson's) Albatross	Antipodes Is (41)	Auckland Is (59)[1]
Atlantic Yellow-nosed Albatross	All (Gough (23)/Tristan (77))	
Black-browed Albatross	–	Falkland Is (Malvinas) (62), South Georgia (16)[2]
Black-footed Albatross	–	Hawaiian 15 (97)[2]
Buller's Albatross	Chatham Is (95)	
Campbell Albatross	–	Campbell I (100)[3]
Chatham Albatross	–	–
Grey-headed Albatross	Crozet (6), Kerguelen (7)	South Georgia (58), Prince Edward Is (7)
Indian Yellow-nosed Albatross	Crozet (12), Prince Edward Is (17)	
Laysan Albatross		Hawaiian Is (100)[2]
Light-mantled Albatross	All sites except Macquarie (9)[1], particularly Auckland (23), Campbell (7), Crozet (11), Kerguelen (18), South Georgia (28)[1]	–
Northern Royal Albatross	–	–
Salvin's Albatross	All (Bounty Is (99))	–
Short-tailed Albatross	All (Izu (95), Senkaku (5))[2]	?
Shy Albatross	Auckland Is (85)	–
Southern Royal Albatross	–	Campbell I (99)
Tristan Albatross	–	–
Wandering Albatross	–	–
Waved Albatross	–	Galapagos[3]
Northern Giant-petrel	All sites except South Georgia, particularly Chathams (19), Kerguelen (12), Macquarie (10)	–
Southern Giant-petrel	All sites except South Georgia, particularly Falkland Islands (Malvinas) (10), Heard (14), South Orkneys (11)	–
White-chinned Petrel	All sites except South Georgia, Crozet, particularly Antipodes, Auckland, Kerguelen	South Georgia, Crozet
Spectacled Petrel	All	–
Blue Petrel	All	–
Parkinson's Petrel	All	–
Grey Petrel	All	–

[1] Data in process of publication; [2] Additional data known, or believed, to be available; [3] Data published.

Table 5.9 Summary of tracking data available from main breeding sites (sites with >5% total global population) for (a) Adult non-breeders and (b) Sub-adults and juveniles.

A. Adult non-breeders	Data available	during breeding season	out of breeding season
Antipodean (including Gibson's) Albatross	both main sites		3 birds each site
Black-browed Albatross	GLS data from all three sites PTT data from two of three sites	 1 bird	36 birds 2 birds
Black-footed Albatross	only main site	6 birds	
Buller's Albatross	two of three sites	1 and 3 bird(s)	
Chatham Albatross	only main site	6 birds	5 birds
Grey-headed Albatross	GLS data from one of six sites PTT data from two of six sites	17 birds 1 bird each site	6 birds
Northern Royal Albatross	both main and subsidiary site	4 and 1 bird(s)	
Short-tailed Albatross	only main site	2 birds	5 birds
Shy Albatross	one of two main sites	5 birds	
Wandering Albatross	three of four main sites and at sea	1, 3 and 4 bird(s)	
B. Sub-adult/juveniles	**Data available**	**during breeding season**	**out of breeding season**
Buller's Albatross	one of three sites	6 birds	
Chatham Albatross	only main site	2 birds	
Northern Royal Albatross	subsidiary site	2 birds	
Shy Albatross	one of two main sites		3 birds

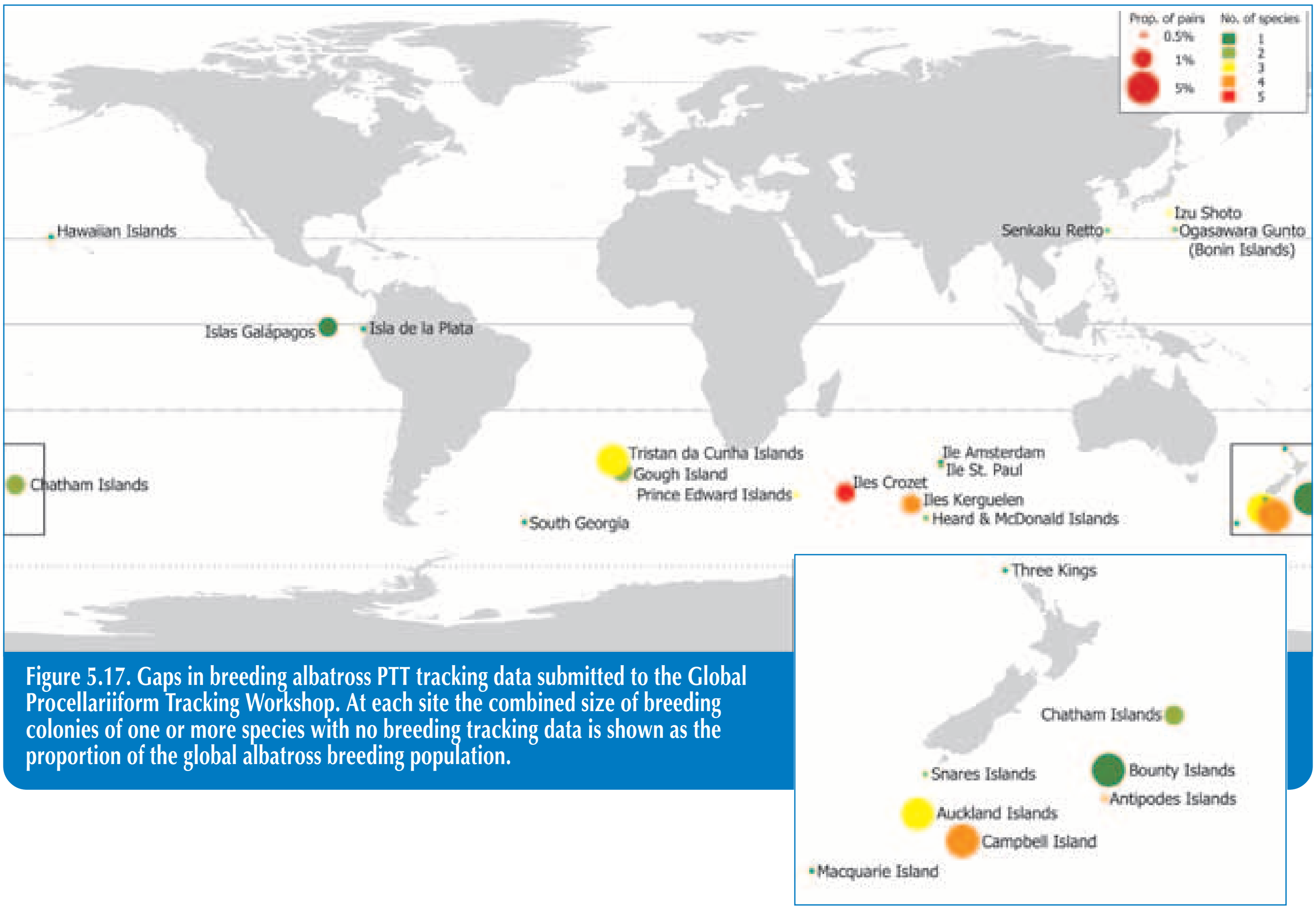


Figure 5.17. Gaps in breeding albatross PTT tracking data submitted to the Global Procellariiform Tracking Workshop. At each site the combined size of breeding colonies of one or more species with no breeding tracking data is shown as the proportion of the global albatross breeding population.

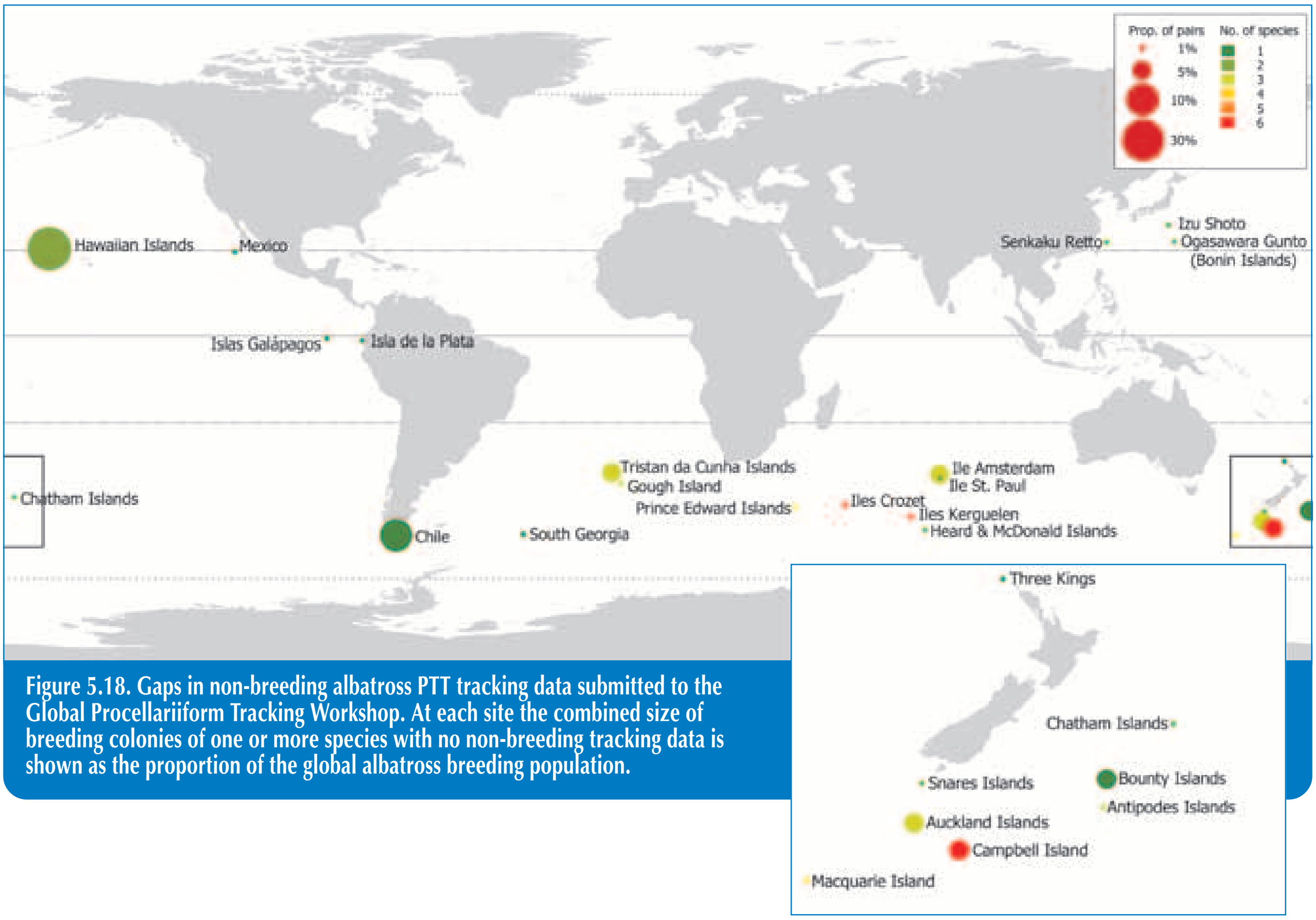


Figure 5.18. Gaps in non-breeding albatross PTT tracking data submitted to the Global Procellariiform Tracking Workshop. At each site the combined size of breeding colonies of one or more species with no non-breeding tracking data is shown as the proportion of the global albatross breeding population.

6 CONCLUSIONS AND FUTURE WORK

In addition to evaluating progress in respect of the original strategic aims, this section also attempts to summarise the achievements of the workshop and to indicate some of the future steps necessary to develop its potential.

This recognises that the workshop, and the work undertaken subsequently, was undoubtedly a landmark in the collaborative use of remote-recording data on the ranges and distributions of seabirds. Nevertheless, this initiative is still only a start in the evolution of what we hope will become a valuable tool for collaboration and cooperation. We hope it will help advance scientific understanding of the principles underlying the use of marine habitats by albatrosses and petrels and also the application of this knowledge to address priority conservation and management issues in marine systems—especially on the high seas.

6.1 COLLABORATION AND SYNTHESIS

This workshop could not have happened without the commitment of individual scientists and organisational dataholders to contribute their data—in most cases containing material unpublished and/or unexploited to a greater or lesser extent—to address goals of common concern and interest.

This trust and commitment allowed a number of important achievements to be realised.

Data

- Over 90% of all extant albatross and petrel tracking data was submitted to the workshop, representing 18 of the 23 candidate species of albatross and giant-petrel, plus White-chinned Petrel.

Methods

- Standard analytical procedures could be developed and applied to the satellite tracking (PTT) data because dataholders were prepared to submit the raw data records.
- Consistent procedures could be developed for the presentation of geolocator tracking data—the main source of information for distributions in non-breeding seasons.
- Agreement could be reached, for the purposes of the present exercise, on appropriate analytical procedures to transform location data to density distributions, a crucial step in the visualisation, analysis and interpretation of data sets in combination.

Preliminary results

- Indication of the nature and variation in range and distribution, for breeding birds, in relation to stage of breeding season, gender (sex) and year (i.e. interannual variation).
- Indication of differences in range and distribution of breeding birds from different colonies within the same population (island group).
- Indications of both similarities and differences in range and distribution of breeding birds from different populations of the same species. These syntheses at the species level, particularly for the two species (Wandering Albatross, Black-browed Albatross) with the most comprehensive data, provide compelling evidence of the insights that can be generated by applying common and consistent approaches to data from a variety of studies and sites.
- Regional syntheses providing preliminary indications of the potential (and challenges) for using data across a range of albatross and petrel species to identify areas of key habitat common to different species.
- Illustration of both similarities and differences in range and distribution of breeding and non-breeding birds at the same time of year.
- Illustration of the spectacular journeys and far-distant destinations (comprising migratory routes, staging areas and wintering ranges) of some species of albatross and petrel during the non-breeding season.

All the foregoing represent very significant achievements, some indicating interesting aspects and avenues for future research, others identifying potential biases and concerns relating to analysis and interpretation of data, yet others revealing key gaps in our knowledge, nevertheless all indicating the potential of such data to address important questions relating to albatross and petrel ecology and conservation.

6.2 STRATEGIC AIMS AND APPLICATIONS

6.2.1 Definition of Important Bird Areas (IBAs) and contribution to high seas Marine Protected Areas

Despite the many difficulties identified and foreseen, there was unanimous recognition that tracking data for albatrosses and petrels will be essential contributors to attempts to identify areas of critical habitat from marine organisms and hotspots of biodiversity in coastal and pelagic marine ecosystems.

The approaches developed in relation to characterising density distributions and to combining (weighting) these with estimates of source population size, while requiring further refinement, are likely to be fundamental elements that will come to be standard practice for these and other migratory pelagic marine taxa.

The extent to which existing definitions of IBAs, developed for terrestrial species and systems, can be extended to marine contexts requires considerable further investigation (including as specified in Section 5.1), for which the albatross and petrel data are uniquely suited.

Valuable though the IBA concept has been, concerns were raised that the levels of knowledge of distribution and abundance of marine taxa (especially threatened species) and the ways in which marine habitat protection has been developed so far, favour approaches which combine data from different groups of marine animals (e.g. fish, seabirds, marine mammals).

Nevertheless, as the albatross and petrel data represent a uniquely coherent and comprehensive data set, covering large areas of marine habitat, they are especially suitable for further investigation, perhaps particularly in high seas contexts.

6.2.2 Interactions with fisheries and fishery management organisations

The great potential to match data on the distribution (and abundance) of albatrosses and petrels with data on fishing effort, particularly for longline fisheries, is evident and has been stressed in several publications seeking to address the potential impact of longline fisheries on albatrosses (see Section 5.2). Several examples of overlap between albatross distribution (both breeding and on migration) and fishing effort are provided in Section 5.2 to illustrate the considerable importance of such approaches.

However, as noted, for many purposes the difficulties in obtaining data for appropriate scales and times, even for the better documented fisheries, may constrain what can be achieved, especially in terms of analysis seeking to estimate bycatch rates and/or their impact on source populations of albatrosses.

Nevertheless, combining fishing effort and albatross distribution data may provide the only effective way to address these issues. The data are certainly adequate to provide broad characterisation of the location (and timing) of potential interactions between albatross species and different longline fisheries; this is a high priority task.

The albatross distribution data are, despite the gaps and deficiencies in terms of providing a consistent global overview, very useful for enabling a preliminary identification of the responsibilities of Regional Fisheries Management Organisations (RFMOs) for environmentally sensitive management of albatrosses and their habitat based on overlap of ranges and jurisdictions.

For the Southern Hemisphere this provides very clear indications of the critical role of, in preliminary priority order, CCSBT, WCPFC, IOTC, ICCAT and CCAMLR (see Table 5.3).

These results offer considerable opportunity as a factual basis for approaching particular RFMOs in respect of their obligations to address issues of seabird bycatch, especially of albatrosses and petrels.

Combined with data on overlap with fishing operations, they also provide scope to identify the times, places and fisheries where adverse interactions are most likely and, thereby, allow the identification of mitigation measures appropriate to the circumstances.

6.2.3 Establish and maintain a Geographical Information System (GIS) database as an international conservation tool

Participants agreed to maintain the tracking database, assembled for the purposes of this workshop, beyond the meeting and production of its report.

They agreed that the database should be reconstituted by re-submission of data once an appropriate policy on data access and use, safeguarding a proprietary rights of individuals and organisations (whether as dataholders, data providers or data owners), had been agreed.

Both the policy and practice for data access and use (based on principles developed for the Census of Marine Life Ocean Biogeographic Information Service (OBIS) – SEAMAP Programme) was developed during the workshop (see Section 5.3).

On the assumption that the GIS database used during the workshop would be required to be maintained for future use, BirdLife International offered, at least as an interim measure, to house and manage the database at its Secretariat headquarters in Cambridge, UK.

This offer was appreciated and accepted in principle. However it was recognised that:

a) this entailed considerable work, simply to maintain the database;
b) if/when the database was augmented with new data and used as a collaborative tool, this would create considerable additional work in respect of managing data, data access and data use;
c) there would be increasing needs to link the albatross and petrel and tracking data to other, analogous, data sets and to the latest information on the physical and biological marine environment. It would likely require very rapid and effective links with other international databases. This may be facilitated by linking, or possibly migrating, the Procellariiform Tracking Database from BirdLife to an organisation or institution specialising in the management and analysis of data on marine systems and biogeography.

6.3 FUTURE WORK

6.3.1 Database enhancement

Supplementary data needs

The ability to generate realistic habitat use maps for albatrosses and petrels still requires substantial amounts of data.

1. At the species level, no data were submitted for Waved Albatross, Salvin's Albatross and Atlantic Yellow-nosed Albatross. However published breeding season data are available for the first two of these (Anderson *et al.* 1998, Fernández *et al.* 2001). Tracking work is in progress for Atlantic Yellow-nosed Albatross.

   Incorporating range data for Campbell Albatross (see Annex 10 – Errata) would emphasise the importance of the area of the Campbell Plateau south of New Zealand. The inclusion of data for Waved

Figure 6.1. Range of Waved Albatrosses tracked from Islas Galápagos (Fernández *et al.* 2001).

Albatross (Figure 6.1) would considerably emphasise the importance of the Humboldt Current habitat offshore of Ecuador and Peru and portray migration routes to and from albatross concentrations at sea around the Galapagos Islands.
2. For the other species, even for breeding birds, more data (and in most cases from more individuals) are needed for some stages of the breeding cycle (particularly incubation), for sexed birds and for sufficient years to assess the consistency of basic distribution patterns. Particularly, however, data are needed for additional populations (island groups) and from more colonies within populations.
3. For most species data are urgently needed on the distribution of adults when not breeding.
4. For almost every species data are lacking on the distribution of immatures and totally absent for early life-history stages (and the subsequent at-sea phase lasting the next 3–5 years).

It could be argued that without data for all breeding cycle and life-history stages we cannot depict albatross and petrel ranges sufficiently accurately for management and conservation purposes. Nevertheless, for many applications, if the adult breeding and non-breeding distributions and core areas could be characterised this would, until adequate empirical data become available, likely provide adequate safeguards for juveniles and immatures. Completing the picture for adult birds is, therefore, potentially more important than diverting much resource into studying juveniles and immatures.

Analysis and methods

More work is desirable to evaluate the potential biases of using the different types (and where appropriate different duty cycling) of existing data (e.g. PTT, GLS) in different kinds of analysis and particularly on the appropriate use of spatial statistics to create density distributions from the different kinds of tracking data.

Environmental data

There is a priority need to facilitate easy access to appropriate data sets on the physical and biological environment at appropriate scales, including detailed bathymetry, sea surface temperature, marine productivity, sea-ice etc.

6.3.2 Links to other tracking data

There is a need to facilitate links to analogous sets of data on other petrels (some data are becoming available for shearwaters and fulmars), penguins (extensive data exist from the temperate and sub-Antarctic species), marine mammals (many data sets for phocid and otariid seals and increasingly for cetaceans), sea turtles (data now available for most species) and migratory fish (some data for tuna and tuna-like species becoming available).

There is a need to encourage and support initiatives like the Marine Mammal Tracking Database (Annex 8) and programmes like Tagging Of Pacific Pelagics (Annex 5) which are trying to assemble similar data on a collaborative basis.

6.3.3 Links to seabird-at-sea survey data

Existing data are much more extensive than remote-tracking data and often deal with very large numbers of sightings. However the lack of knowledge of the origin and status (breeder, migrant, non-breeder) of the birds observed reduces their utility for some purposes. Also, for deriving density-distribution maps, essential for relating to environmental features and examining relationships of interest, most data were not collected by consistent standard methods valid for producing quantitative outputs. Therefore high quality survey data tend to be rather restricted in space and time.

Nevertheless there is a real need to investigate the feasibility and utility of combining remote tracking and survey data sets. Prime candidate areas for pilot studies to do this would include the north-east Pacific, tropical east Pacific, south-west Atlantic and parts of the Indian Ocean. These are all sites where substantial quantitative at-sea surveys have taken place in areas commonly frequented by remote-tracked albatrosses.

6.3.4 Links to data from fisheries

The highest priority investigations, involving comparing the distribution data for albatrosses and petrels and fishing effort would include:
1. Identification of times and places where potential exists for adverse interactions between fisheries and albatrosses/petrels. This would enable:
   i. Specification of mitigation measures appropriate to these circumstances;
   ii. Approaches to RFMOs, singly or in combination, with appropriate jurisdictions, to seek to develop the necessary regulations to apply the mitigation measures.
2. Estimation of bycatch rates of albatrosses/petrels for appropriate areas and at appropriate scales and for extrapolation to areas where bycatch data from fisheries are currently lacking.
3. Assistance for modelling seabird-fishery interactions with implications for fisheries (taking financial losses through bycatch into account in cost-benefit analyses) and for seabird populations.

6.3.5 IBAs and Marine Protected Areas

A priority need is to relate areas of core habitat (at different levels of definition) to population estimates and threatened status in order to evaluate in detail the implications of different criteria for helping define marine IBAs (from the perspective of albatrosses and petrels). Additional, related, suggestions are made in Section 5.1.

There is also a need to develop this approach further by choosing suitable systems/areas in which to link to remote-tracking data on other seabirds (especially penguins) and to at-sea survey data. This is especially relevant for coastal and shelf systems (i.e. within EEZs).

In the context of Marine Protected Areas, it is important to develop this further in conjunction with data on other marine taxa (e.g. marine mammals, sea turtles) and on resource use (e.g. fisheries, hydrocarbons). This is relevant both to EEZs and to high seas.

6.3.6 Relationship with the Agreement for the Conservation of Albatrosses and Petrels

As indicated in Annex 9 the applications envisaged of these albatross and petrel data, particularly as set out above, have substantial relevance to the work of ACAP.

BirdLife International will continue to assist the development of products of relevance. It will also try to facilitate coordination on these initiatives and products through its partners, particularly in countries which are members of ACAP.

6.3.7 Long term database management

As indicated earlier (Section 6.2.3) there is a need to consider the long term future of the database, particularly in terms of maximising its usefulness as a resource, both to scientific research and international conservation.

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ANNEXES

ANNEX 1 LIST OF PARTICIPANTS

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[1] Unable to attend workshop – represented by Aleks Terauds [2] Unable to attend workshop – represented by Barbara Wienecke [3] Unable to attend workshop – represented by David Pinaud

ANNEX 2 LIST OF DATA SUBMITTED

Table 1. Breeding PTT datasets submitted to the Global Procellariiform Tracking Workshop.

Site	Colony	Breeding stage	Year(s)	Contributor(s)	Main reference(s)
Wandering Albatross (*Diomedea exulans*)					
Iles Crozet		incubation	1989–2001	a	Jouventin and Weimerskirch 1990,
		chick	1990–1999		Waugh and Weimerskirch 2003, Weimerskirch 1998
Iles Kerguelen		chick	1998–1999	a	Jouventin and Weimerskirch 1990,
					Waugh and Weimerskirch 2003, Weimerskirch 1998
Prince Edward Islands	Marion Island	incubation	1998	k	Nel *et al.* 2002
		brood guard	1997		
		post guard	1997		
South Georgia	Bird Island	incubation	1991–2000	e	Croxall and Prince 1996, Prince *et al.* 1998
		chick	1990–2002		
Tristan Albatross (*Diomedea dabbenena*)					
Gough Island		incubation	2001	n	Cuthbert *et al.* 2004
		brood guard	2001		
		post guard	2001		
Antipodean (Gibson's) Albatross (*Diomedea antipodensis gibsoni*)					
Auckland Islands	Adams Island	incubation	1994	j	Walker *et al.* 1995
		unknown	1994		
Amsterdam Albatross (*Diomedea amsterdamensis*)					
Ile Amsterdam		incubation	1996–2000	a	Waugh and Weimerskirch 2003
Southern Royal Albatross (*Diomedea epomophora*)					
Campbell Island	Campbell Island	incubation	1999	a	Waugh and Weimerskirch 2003
Northern Royal Albatross (*Diomedea sanfordi*)					
Chatham Islands		early breeding	1994–1996	m	Robertson C. and Nicholls 2000
New Zealand	Taiaroa Head	early breeding	1993–1998	m	Robertson C. and Nicholls 2000
Black-footed Albatross (*Phoebastria nigripes*)					
Hawaiian Islands	Tern Island	incubation	2002–2003	f	N
		brood	2003		
		early breeding	2003		
Laysan Albatross (*Phoebastria immutabilis*)					
Hawaiian Islands	Tern Island	incubation	2002–2003	f	N
		brood	2003		
		early breeding	2003		
Mexico	Isla de Guadalupe	early breeding	2003	l	N
Shy Albatross (*Thalassarche cauta*)					
Tasmania	Albatross Island	incubation	1993–1996	d	Brothers *et al.* 1998, Hedd *et al.* 2001, M
		brood guard	1997		
		post guard	1994–1995		
	Mewstone	incubation	1997–1998		
	Pedra Branca	incubation	1997		
Chatham Albatross (*Thalassarche eremita*)					
Chatham Islands	The Pyramid	chick	1997–1999	h, i	Robertson C. *et al.* 2000a
Buller's Albatross (*Thalassarche bulleri*)					
Solander Islands	North-West Headland	incubation	1997	g	Broekhuizen *et al.* 2003, Sagar and Weimerskirch 1996,
		guard	1997		Stahl and Sagar 2000a
		post guard	1997		
Snares Islands	Mollymawk Bay	pre-egg	2001–2002	g	Broekhuizen *et al.* 2003, Sagar and Weimerskirch 1996,
		incubation	1995–2002		Stahl and Sagar 2000b
		guard	1996		
		post guard	1996		
	Punui Bay	pre-egg	2001–2002		
		incubation	1999–2002		
		guard	1999		
		post guard	1999		
	Razorback	incubation	1999		
		guard	1999		
		post guard	1999		
	Unknown	incubation	1995	a	Sagar and Weimerskirch 1996
Black-browed Albatross (*Thalassarche melanophrys*)					
Chile	Isla Diego de Almagro	incubation	2001	b	F
	Islas Diego Ramirez	incubation	1997–2001		
		brood	1999–2001		
		early breeding	1997–1999		
		post guard	2001–2002		
	Islas Ildefonso	incubation	2001		
Falkland Islands (Malvinas)	Beauchêne Island	incubation	2000	c	Huin 2002
		post guard	2000		
	Saunders Island	incubation	1998		
		post guard	1999		
Iles Kerguelen		incubation	1999	a	Weimerskirch 1998
		chick	1994–1995		
Macquarie Island		incubation	1999–2001	d	Terauds *et al.* in prep
		brood guard	2000		
South Georgia	Bird Island	incubation	1996	e	A
		chick	1993–1994		Prince *et al.* 1998

Table 1 ... continued. Breeding PTT datasets submitted to the Global Procellariiform Tracking Workshop.

Site	Colony	Breeding stage	Year(s)	Contributor(s)	Main reference(s)
Grey-headed Albatross (*Thalassarche chrysostoma*)					
Campbell Island		chick	1997	a	Waugh *et al.* 1999
Chile	Islas Diego Ramirez	incubation	1997–2001	b	F
		brood	2000–2002		
		post guard	2001–2002		
	Islas Ildefonso	incubation	2001		
Macquarie Island		incubation	1999–2001	d	Terauds *et al.* in prep
		brood guard	1999–2000		
Prince Edward Islands	Marion Island	incubation	1997	k	Nel *et al.* 2000, Nel *et al.* 2001
		chick	1998		
South Georgia	Bird Island	incubation	1993–1995	e	A
		chick	1991–2001		Prince *et al.* 1998
Indian Yellow-nosed Albatross (*Thalassarche carteri*)					
Ile Amsterdam		incubation	2000	a	Weimerskirch 1998, G
		chick	1995–2001		
Sooty Albatross (*Phoebetria fusca*)					
Iles Crozet		early breeding	1992–1995	a	Weimerskirch 1998
Light-mantled Albatross (*Phoebetria palpebrata*)					
Macquarie Island	Bauer Bay	incubation	2002–2003	d	M
		brood guard	2002–2003		
	Hurd Point	incubation	2002–2003		
		brood guard	2002–2003		
Southern Giant-petrel (*Macronectes giganteus*)					
Argentina	Isla Arce	brood	2001–2002	o	J
	Isla Gran Robredo	incubation	1999–2000		Quintana and Dell'Arciprete 2002
		brood	2000		
Antarctic Peninsula	Palmer Station	incubation	1999–2003	p[1]	I
		early breeding	1999–2003		
		brood	2001		
		brood guard	1999–2003		
		chick	1999–2003		
		guard	1999–2002		
		post guard	2003		
South Georgia	Bird Island	incubation	1998–1999	x	González-Solís *et al.* 2000a
Northern Giant-petrel (*Macronectes halli*)					
South Georgia	Bird Island	incubation	1998	x	A
White-chinned Petrel (*Procellaria aequinoctialis*)					
Iles Crozet		incubation	1996	a	Weimerskirch *et al.* 1999
		chick	1997		
South Georgia	Bird Island	incubation	1996–1997	e	Berrow *et al.* 2000
		chick	1998		

[1] Data withdrawn after workshop

Table 2. Non-breeding PTT datasets (including failed breeders, non-breeding adults and juveniles/sub-adults/immatures) submitted to the Global Procellariiform Tracking Workshop.

Site	Colony	Age	Status	Year(s)	Contributor(s)	Main Reference(s)
Wandering Albatross (*Diomedea exulans*)						
Iles Crozet		adult	non-breeding	1992	t	Nicholls *et al.* 1995
Indian Ocean		adult	non-breeding	1992	t	Nicholls *et al.* 1995
Prince Edward Islands	Marion Island	adult	failed/migration	1997	k	Nel *et al.* 2002
		adult	non-breeding	1992	t	Nicholls *et al.* 1995
South Georgia	Bird Island	adult	failed/migration	1992–1998	e	Croxall and Prince 1996, Prince *et al.* 1998
Tasmania		adult	non-breeding	1993–1995	t	Nicholls *et al.* 1995
Antipodean Albatross (*Diomedea antipodensis*)						
Antipodes Islands		adult	failed/migration	1996	j, q	Nicholls *et al.* 1996, Nicholls *et al.* 2000
		adult	non-breeding	1996–1997		
Antipodean (Gibson's) Albatross (*Diomedea gibsoni*)						
Auckland Islands	Adams Island	adult	non-breeding	1995	j	Nicholls *et al.* 2000
Unknown		adult	non-breeding	1994		
Northern Royal Albatross (*Diomedea sanfordi*)						
Chatham Islands		adult	failed/migration	1996–1998	m	Robertson C. and Nicholls 2000
New Zealand	Taiaroa Head	adult	failed/migration	1998	m	Robertson C. and Nicholls 2000
		immature	non-breeding	1998		
Short-tailed Albatross (*Phoebastria albatrus*)						
Izu Shoto	Torishima	adult	failed/migration	2002–2003	s	unpubl.
Black-footed Albatross (*Phoebastria nigripes*)						
Unknown		adult	failed/migration	1997–1999	r	Hyrenbach and Dotson 2001, Hyrenbach and Dotson 2003
Shy Albatross (*Thalassarche cauta*)						
Tasmania	Albatross Island	immature	non-breeding	1996	d	Brothers *et al.* 1998, Hedd *et al.* 2001, M
	Mewstone	adult	failed/migration	2002		
	Pedra Branca	adult	failed/migration	2002		

Table 2 ... continued. Non-breeding PTT datasets (including failed breeders, non-breeding adults and juveniles/sub-adults/immatures) submitted to the Global Procellariiform Tracking Workshop.

Site	Colony	Age	Status	Year(s)	Contributor(s)	Main Reference(s)
Chatham Albatross (*Thalassarche eremita*)						
Chatham Islands	The Pyramid	adult	failed/migration	1997–1999	h, i	Robertson C. *et al.* 2000a
		immature	non-breeding	1998		
Buller's Albatross (*Thalassarche bulleri*)						
Solander Islands	North-West Headland	adult	failed/migration	1997	g	Broekhuizen *et al.* 2003, Sagar and Weimerskirch 1996, Stahl and Sagar 2000a
		unknown	non-breeding	2002		
Snares Islands	Mollymawk Bay	immature	non-breeding	2000–2001	g	Broekhuizen *et al.* 2003, Sagar and Weimerskirch 1996, Stahl and Sagar 2000b
	Punui Bay	adult	failed/migration	2002		
		adult	non-breeding	2001		
		immature	non-breeding	2000–2001		
Black-browed Albatross (*Thalassarche melanophrys*)						
Falkland Islands (Malvinas)	Beauchêne Island	adult	failed/migration	2000	c	Huin 2002
South Georgia	Bird Island	adult	failed/migration	1992–1993	e	Prince *et al.* 1998
Grey-headed Albatross (*Thalassarche chrysostoma*)						
Chile	Islas Diego Ramirez	adult	failed/migration	1999	b	F
South Georgia						
	Bird Island	adult	failed/migration	1996	e	Prince *et al.* 1998
Southern Giant-petrel (*Macronectes giganteus*)						
Antarctic Peninsula	Palmer Station	adult	non-breeding	2001–2002	p[1]	I

[1] Data withdrawn after workshop

Table 3. Breeding and non-breeding GLS datasets submitted to the Global Procellariiform Tracking Workshop.

Site	Colony	Status	Year(s)	Contributor(s)	Main reference(s)
Black-browed Albatross (*Thalassarche melanophrys*)					
Chile	Islas Diego Ramirez	non-breeding	2001	u	A
Falkland Islands (Malvinas)	Saunders Island	non-breeding	1999–2000	v	A
South Georgia	Bird Island	non-breeding	2002	w	A
Grey-headed Albatross (*Thalassarche chrysostoma*)					
South Georgia	Bird Island	non-breeding	1999–2000	w	A

Data Contributors

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b. Graham Robertson, Australian Antarctic Division
Javier Arata, Instituto de Ecología y Evolución, Universidad Austral de Chile
c. Nic Huin, Falklands Conservation
d. Nigel Brothers, April Hedd, Rosemary Gales and Aleks Terauds, Department of Primary Industries, Water and Environment (DPIWE), Tasmania
e. John Croxall, Richard Phillips and Andy Wood, British Antarctic Survey, Natural Environment Research Council
f. Yann Tremblay[1], Scott A. Shaffer[1], Jill Awkerman[2], Dan P. Costa[1] and Dave J. Anderson[2]
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g. Jean-Claude Stahl, Museum of New Zealand Te Papa Tongarewa
Paul Sagar, National Institute of Water and Atmospheric Research
h. D.G. Nicholls, M.D. Murray and C.J.R. Robertson
i. C.J.R. Robertson, Department of Conservation New Zealand, D.G. Nicholls and M.D. Murray
j. D.G. Nicholls, M.D. Murray, E.C. Butcher, Kath Walker, Graeme Elliott and Department of Conservation New Zealand
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n. Richard Cuthbert, Royal Society for the Protection of Birds, UK
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q. D.G. Nicholls, M.D. Murray and E.C. Butcher
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Unpublished data and studies in progress

A. British Antarctic Survey
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E. Yamashima Institute, Japan *and* US Fish and Wildlife Services
F. Australian Antarctic Division, Universidad Austral de Chile *and* Instituto Antarctico Chileno
G. CNRS, France
H. Directorate of Marine and Coastal Management, South Africa
I. Polar Oceans Research Group (PORG), USA
J. Centro Nacional Patagónico, Argentina
K. Wildlife Management International Limited
L. Lincoln University, New Zealand (Amanda Freeman)
M. DPIWE, Tasmania (Rosemary Gales and Aleks Terauds)
N. Tagging of Pacific Pelagics (TOPP)

ANNEX 3 ALBATROSS TRACKING AND UTILISATION DISTRIBUTIONS FROM KERNELS

Introduction

The exploration of kernelling Royal Albatross data arose because there were strong differences on methods of analysis and the presentation of the results of satellite tracking. The Workshop faces similar challenges. Our satellite telemetry methodology differed between the various individuals within the single species. The differences were intentional at the time, but it requires careful analysis if we are to achieve valid comparisons and summaries. These complications are directly relevant to procedures combining datasets.

Definitions

The kernel is the shape placed over each observation. The process of summing the kernels creates a measure of abundance, either as a density, or the probability of occurrence across the range.

Utilisation distribution is the grid or contour map of the occurrence.

Home range is the area used by an animal in its normal daily activities. Home range for an albatross that has migrated to the other side of the world is arguably a contradiction, so we used range.

Methods

The homogenous data set is of a single northern royal albatross (abandoned breeding, migrated via the Pacific Ocean to the Patagonian Shelf; bird was present from March to 30 June, totalling 558 selected Argos locations; transmission regime: on-period 25 hours, off-period 23 hours, i.e. exactly two days. The kernels, utilisations distributions and maps were prepared in Animal Movements Extension 2.0 in ESRI ArcView 3.2.).

Results

Smoothing produces different forms of the Utilisation Distributions. The user must decide the form depending on their hypothesis. There is no single choice, and no one other than the user can decide. Different kinds of subsets of the data do affect the range and Utilisation Distributions. These differences may be deeply hidden in the data. We tested the sample size and its effects on the area of the range. Small samples underestimated the range, but indicated a measure of by how much the range might be underestimated. It cannot of course show the places where an underestimate might be occurring.

Subsets

With subsets, such as day versus night, or, night, dawn, day, dusk, accuracy of locations and speed, the area of the ranges was close to the range area expected for the sample size. However for transmission regime, or, for seasonal time periods of the time spent on the Patagonian Shelf namely, early, middle and late, the range areas emphatically did not match the range for the complete data set.

Conclusions

Choosing the smoothing is subjective. The activity at hot spots is speculative. Concentrations may only in a limited sense indicate risk. Combining results and comparing maps from different datasets, other than at the most superficial levels, needs care but the exploration described here provides methods to ensure valid use.

David Nicholls, Christopher Robertson
and Beat Naef-Daenzer

ANNEX 4 LIST OF PUBLISHED TRACKING STUDIES OF ALBATROSSES AND PETRELS

Species	Colony	Incubation	Chick-rearing	Adult non-breeding
Wandering Albatross (*Diomedea exulans*)	South Georgia	A	Arnould *et al.* 1996, Croxall and Prince 1996, Nicholls *et al.* 2002, Prince *et al.* 1992, 1998, 1999, Xavier *et al.* 2003, 2004	Prince *et al.* 1998, A
	Prince Edward	Nel *et al.* 2002	Nel *et al.* 2002	
	Crozet	Weimerskirch *et al.* 1993, 1994, 1997a, 1997b, Weimerskirch 1998	Weimerskirch *et al.* 1993, 1994, 1997a, 1997b, Weimerskirch 1998, Shaffer *et al.* 2003	Nicholls *et al.* 1995, Weimerskirch and Wilson 2000
	Macquarie	B	B	
	At sea			Nicholls *et al.* 1995, Murray *et al.* 2002, 2003a
Tristan Albatross (*Diomedea dabbenena*)	Gough	Cuthbert *et al.* 2004	Cuthbert *et al.* 2004	C
Antipodean Albatross (*Diomedea antipodensis*)	Antipodes	Nicholls *et al.* 2002	Nicholls *et al.* 2002	Murray *et al.* 2003b, Nicholls *et al.* 1996, 2000
	Campbell	N		
Antipodean (Gibson's) Albatross (*Diomedea antipodensis gibsoni*)	Auckland	Walker *et al.* 1995 N	Walker *et al.* 1995	Murray *et al.* 2002, 2003b, Nicholls *et al.* 2000
Amsterdam Albatross (*Diomedea amsterdamensis*)	Amsterdam and St. Paul	Waugh and Weimerskirch 2003		
Southern Royal Albatross (*Diomedea epomophora*)	Campbell Auckland	Troup *et al.* 2000, Waugh *et al.* 2002		
Northern Royal Albatross (*Diomedea sanfordi*)	Chatham	Nicholls *et al.* 1994, 2002, Robertson C. and Nicholls 2000	Nicholls *et al.* 1994, 2002, Robertson C. and Nicholls 2000	Nicholls *et al.* 1994, 2002, Robertson C. and Nicholls 2000
	Taiaroa Head	Robertson C. and Nicholls 2000	Robertson C. and Nicholls 2000	Robertson C. and Nicholls 2000
Waved Albatross (*Phoebastria irrorata*)	Galapagos	Anderson *et al.* 1998, 2003	Anderson *et al.* 2003	
Short-tailed Albatross (*Phoebastria albatrus*)	Izu (Torishima) Senkaku	E	E	E
Black-footed Albatross (*Phoebastria nigripes*)	Midway and North-western Hawaii	O	Fernández *et al.* 2001, Hyrenbach *et al.* 2002	
	Izu (Torishima) Bonin, Japan Senkaku			
Laysan Albatross (*Phoebastria immutabilis*)	Midway and North-western Hawaii	O	Fernández *et al.* 2001, Hyrenbach *et al.* 2002	
	Bonin, Japan			
	Mexico (Guadalupe)	O	O	
Shy Albatross (*Thalassarche cauta*)	Tasmania (Albatross, Mewstone, Pedra Branca)	Brothers *et al.* 1998, Gales *et al.* 2000, Hedd *et al.* 2001	Brothers *et al.* 1998, Gales *et al.* 2000, Hedd *et al.* 2001	Brothers *et al.* 1998, Gales *et al.* 2000
White-capped Albatross (*Thalassarche steadi*)	Auckland Antipodes			
Salvin's Albatross (*Thalassarche salvini*)	Bounty Snares			
Chatham Albatross (*Thalassarche eremita*)	Chatham	Nicholls and Robertson C. 2000, Robertson C. *et al.* 2000a	Nicholls and Robertson C. 2000, Robertson C. *et al.* 2000a	Nicholls and Robertson C. 2000, Robertson C. *et al.* 2000a
Buller's Albatross (*Diomedea bulleri*)	Snares	Sagar and Weimerskirch 1996, Stahl and Sagar 2000b	Stahl and Sagar 2000b	
	Solander	Stahl and Sagar 2000a	Stahl and Sagar 2000a	Stahl and Sagar 2000a
	Chatham			
Black-browed Albatross (*Thalassarche melanophrys*)	Falkland Islands (Malvinas)	Grémillet *et al.* 2000, Huin 2002	Huin 2002	Grémillet *et al.* 2000
	South Georgia	Phillips *et al.* 2003, 2004b	Bevan *et al.* 1995, Phillips *et al.* 2003, 2004b, Prince *et al.* 1998, 1999, Veit and Prince 1997, Wood *et al.* 2000	Prince *et al.* 1998 A
	Chile (Diego Ramirez)	Robertson C. *et al.* 2000b, F	Robertson C. *et al.* 2000b, F	
	Crozet		Weimerskirch 1998	
	Kerguelen	Pinaud and Weimerskirch 2002	Cherel and Weimerskirch 1995, Pinaud and Weimerskirch 2002, Waugh and Weimerskirch 1998, Weimerskirch *et al.* 1997c	
	Heard			
	Macquarie	B	B	
	Antipodes			

Species	Colony	Incubation	Chick-rearing	Adult non-breeding
Campbell Albatross **(*Thalassarche impavida*)**	Campbell		Waugh and Weimerskirch 1998, Waugh *et al.* 1999	
Grey-headed Albatross **(*Thalassarche chrysostoma*)**	South Georgia	Phillips *et al.* 2004b	Bevan *et al.* 1995, Catry *et al.* in press a and b, Phillips *et al.* 2004b, Prince *et al.* 1998, 1999, Rodhouse *et al.* 1996, Veit and Prince 1997, Wood *et al.* 2000, Xavier *et al.* 2003	A
	Chile (Diego Ramirez)	Robertson C. *et al.* 2000b	Robertson C. *et al.* 2000b	
	Prince Edward	Nel *et al.* 2000, 2001	Nel *et al.* 2000, 2001	
	Crozet			
	Kerguelen			
	Campbell		Waugh *et al.* 1999	
	Macquarie	B	B	
Indian Yellow-nosed Albatross **(*Thalassarche carteri*)**	Prince Edward			
	Crozet			
	Amsterdam and St. Paul		Weimerskirch 1998, G	
	Kerguelen			
Atlantic Yellow-nosed Albatross **(*Thalassarche chlororhynchos*)**	Gough	C	C	C
	Tristan da Cunha			
Sooty Albatross **(*Phoebetria fusca*)**	Gough	C	C	C
	Tristan da Cunha			
	Prince Edward		H	
	Crozet	Weimerskirch 1998	Weimerskirch 1998	
	Kerguelen			
	Amsterdam and St Paul			
Light-mantled Albatross **(*Phoebetria palpebrata*)**	South Georgia		Phillips *et al.* in press	A
	Prince Edward			
	Crozet	Weimerskirch 1998		
	Kerguelen			
	Heard			
	Macquarie	Weimerskirch and Robertson G. 1994		
	Auckland			
	Campbell			
	Antipodes			
Southern Giant-petrel **(*Macronectes giganteus*)**	Chile			
	Argentina	Quintana and Dell'Arciprete 2002, J	Quintana and Dell'Arciprete 2002, J	
	Falkland Islands (Malvinas)			
	South Georgia	González-Solís *et al.* 2000a, 2000b	González-Solís *et al.* 2000a, 2000b	
	South Orkney and S. Shetland			
	Antarctic Peninsula	Patterson and Fraser 2000, I	Patterson and Fraser 2000, I	I
	Gough			
	Prince Edward			
	Crozet			
	Kerguelen			
	Heard			
	Macquarie			
Northern Giant-petrel **(*Macronectes halli*)**	South Georgia	González-Solís *et al.* 2000a, 2000b	González-Solís *et al.* 2000a, 2000b	
	Prince Edward Islands			
	Crozet			
	Kerguelen			
	Macquarie			
	Auckland			
	Campbell			
	Antipodes			
	Chatham			
	Stewart			
Northern Fulmar **(*Fulmarus glacialis*)**	Greenland			Falk and Møller 1995
	Bjørnøya		Weimerskirch *et al.* 2001	
White-chinned Petrel **(*Procellaria aequinoctialis*)**	Falkland Islands (Malvinas)			
	South Georgia	Berrow *et al.* 2000, Weimerskirch *et al.* 1999	Berrow *et al.* 2000	Berrow *et al.* 2000, A
	Prince Edward			
	Crozet	Weimerskirch *et al.* 1999	Catard *et al.* 2000	
	Kerguelen			
	Auckland			
	Campbell			
	Antipodes			

Species	Colony	Incubation	Chick-rearing	Adult non-breeding
Spectacled Petrel (*Procellaria conspicillata*)	Inaccessible			
Black Petrel (*Procellaria parkinsoni*)	Little and Great Barrier Islands	K	K	
Westland Petrel (*Procellaria westlandica*)	New Zealand (Punakaiki)	L	Freeman *et al.* 1997, 2001, L	
Grey Petrel (*Procellaria cinerea*)				
Cory's Shearwater (*Calonectris diomedea*)	Crete Salvages	 Mougin and Jouanin 1997		Ristow *et al.* 2000
Pink-footed Shearwater (*Puffinus creatopus*)	Chile (Mocha)	Guicking *et al.* 2001		
Great Shearwater (*Puffinus gravis*)				
Sooty Shearwater (*Puffinus griseus*)	Snares		Weimerskirch and Shaffer 2003	
Short-tailed Shearwater (*Puffinus tenuirostris*)	SE Australia (Montague, NSW; French, Vic.)		Klomp and Schultz 1998, 2000	Nicholls *et al.* 1998

Unpublished data and studies in progress

A. British Antarctic Survey
B. Tasmanian Parks and Wildlife Services
C. Royal Society for the Protection of Birds *and* University of Cape Town
D. Lincoln University, New Zealand *and* CNRS, France
E. Yamashima Institute, Japan *and* US Fish and Wildlife Services
F. Australian Antarctic Division, Universidad Austral de Chile *and* Instituto Antarctico Chileno
G. CNRS, France
H. Directorate of Marine and Coastal Management, South Africa
I. Polar Oceans Research Group (PORG), USA
J. Centro Nacional Patagónico, Argentina
K. Wildlife Management International Limited
L. Lincoln University, New Zealand (Amanda Freeman, Kerry-Jane Wilson)
M. DPIWE, Tasmania (Rosemary Gales and Aleks Terauds)
N. DOC, New Zealand (Kath Walker, Graeme Elliott)
O. Tagging of Pacific Pelagics (TOPP)

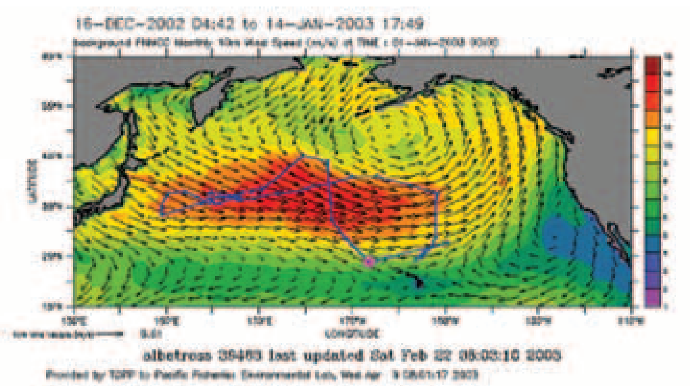
ANNEX 5 TAGGING OF PACIFIC PELAGICS (TOPP)

Programme overview

Tagging of Pacific Pelagics (TOPP) is a large multidisciplinary research program that combines the efforts of fish, shark, squid, and marine bird, mammal, and reptile biologists with the oceanographic community to study how the physical processes of the oceans affect species distributions, abundances, and movement patterns (Block *et al.* 2003). A central objective of TOPP is to devise better predictive tools to model ecosystem dynamics of the North Pacific Ocean and possibly other oceans in the future. TOPP also aims to increase public awareness of ocean life by developing outreach programs to educate students, teachers, and the general public about the lives of organisms that most people rarely see in a lifetime.

To study pelagic predators, TOPP investigators are using the animals as ocean explorers to obtain an “organism eye” view of the pelagic realm. Thus, animals are equipped with state of the art microprocessor-based data collection devices (see Table 1 for details on seabirds) to sense and record a variety of parameters of the ocean environment (e.g. temperature, conductivity, and light) in which they inhabit. Data are either transmitted via the Advanced Research Global Observation Satellite (Argos) uplink or animals are recaptured at a later date for device recovery and data retrieval. In addition, TOPP investigators are using a variety of remote sensing tools (e.g. AVHRR, SeaWifs, QuickScat) that are combined with data collected on the animals to obtain a clearer picture of the physical and biological processes that influence where pelagic organisms find food. In essence, this information will provide a much greater resolution of the “hotspots” that cause marine predators to aggregate in specific oceanic regions.

A final element of the TOPP program is to develop a suite of analytical tools that can be used to quantify, qualify, visualise, and archive data in a more integrative and dynamic way. One tool already under development is a Live Access Server (LAS), which is a database that contains information collected on the animals as well as environmental data collected via remote sensing. When visualised together (Figure 1), a clearer view of the physical features that influence where animals travel can be obtained. For example, Figure 1 shows the movement pattern of a Laysan Albatross tracked with satellite telemetry from Tern Island, Northwest Hawaiian Islands. The track is overlaid on top of the average wind vectors and barometric pressure for the time period in which the animal was tracked. We believe that the LAS is a tool that will provide researchers, environmental managers and policy makers with the information necessary to regulate, manage, and conserve pelagic ecosystems of the North Pacific Ocean.



The role of seabirds in the TOPP Program

Pelagic seabirds are major marine predators that search for food over both meso- and broad-scale ocean habitats (Hyrenbach *et al.* 2002, Fritz *et al.* 2003). The physical forcing of water aggregates their prey, so it is conceivable that seabirds seek out particular oceanographic features to find food. Seabirds also form an integral part of the TOPP program because many species overlap spatially, temporally, and trophically with other TOPP organisms. Therefore, it is possible to investigate the interactions between seabirds and other TOPP organisms by tracking multiple species at the same time. Another and perhaps more compelling reason why the TOPP program is studying seabirds is that they operate over very large spatial scales within a minimum amount of time because they can fly rapidly over the sea surface (400-500 km day^{-1} in albatrosses). ***Thus, seabirds can sample the marine environment quickly, so their response to changes in oceanographic features occurs over short temporal scales compared to most other TOPP organisms.***

TOPP is also studying seabirds because many species forage in locations that overlap with areas heavily used by human activities. For example, Laysan and Black-footed Albatrosses forage in areas that are prime fishing grounds for the longline fishing fleets. Thus birds are exposed to risks of entanglement with hooks or nets. The information gained by studying seabirds directly or indirectly affected by interactions with humans follows one of the main directives of TOPP’s parent program, the Census of Marine Life (CoML), which is a large international organisation interested in conserving marine life.

Currently, there are four seabird species being studied in the TOPP program. This includes Laysan and Black-footed Albatrosses tracked from Tern Island, Northwest Hawaiian Islands, and Laysan Albatrosses from Guadalupe Island, Mexico. Investigators are also conducting preliminary studies on Sooty Shearwaters (*Puffinus griseus*) at Snares Island, New Zealand and Pink-footed Shearwaters (*P. creatopus*) at the Juan Fernandez Islands, Chile. Although the shearwaters breed in the southern hemisphere, they are known to migrate into the North Pacific in between breeding seasons. At this time, it is believed that the birds remain in the North Pacific for several months. Therefore, TOPP investigators are testing the use of archival geolocation tags to track the migratory flight patterns of the shearwaters during the non-breeding periods.

Scott Shaffer and Dan Costa

Table 1. Electronic tags deployed on seabirds in TOPP.

Tag	Cost	Location Quality	Duration of use	Size (grams)	Species
Argos PTT	$2,500	0.1–60 km	30-40 d	15–30	Albatrosses
GPS	$1,500	3–10 m	30+ d	60	Albatrosses
Archival	$1,000	~ 185 km	2 yrs	6	Albatrosses and Shearwaters

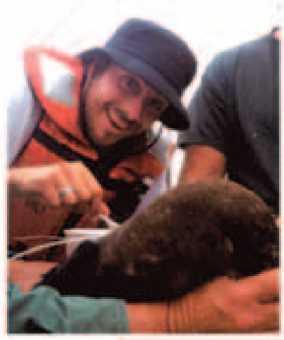
ANNEX 6 EXAMPLES OF DATA ACCESS AND TERMS OF USE WEB PAGES

6.1 Example of data provider profile page

Logout

Profile

Dr. David Hyrenbach



Title	Research Scientist
Organisation	Duke University Marine Laboratory acronym: DUML
Address (line 1)	135 Duke Marine Lab Road
Address (line 2)	
City	Beaufort
State	NC
Zip	28516
Country	USA
Phone	+1 (252) 504-7576
Fax	+1 (252) 504-7648
Email	khyrenba@duke.edu
URL	http://moray.ml.duke.edu//david_hyrenbach.shtml
Comments	

Edit My Profile

Datasets

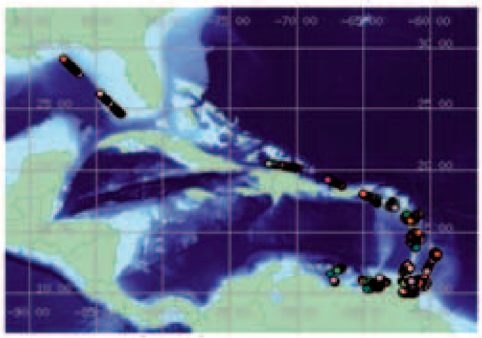
ID	Title	Taxonomy	Metadata	Published	Owner	Actions
7	Duke Marine Lab Albatross Tagging	X	X	X	David Hyrenbach	

+ Add New Dataset (PROVIDES LINKS TO DATA SUBMISSION / META-DATA CREATION TOOLS)

6.2 Example of data set documentation page

Title	Duke Marine Lab Albatross Tagging
ID	7
# of Records	657
Date, Begin	1997-Jul-10
Date, End	1999-Sep-20
Latitude, Min	23.30
Latitude, Max	43.37
Longitude, Min	-156.27
Longitude, Max	-113.24

View Species Recorded
(LINK TO SPECIES-SPECIFIC PAGE)



larger image (ZOOM IN)
interactive map (LINK TO MAPPING TOOLS)

View Metadata (LINK TO DATA SET META-DATA PAGE)

Download data as text (comma-separated values *.csv) (OPTION TO DOWNLOAD THE DATA)

Data Source
David Hyrenbach, at Duke University Marine Lab (LINK TO DATA PROVIDER(S) PAGE(S))

Abstract
Argos satellite tracking of post-breeding Black-footed Albatrosses during their dispersal at-sea off southern California. A total of 4 female and 1 male birds in adult (age 3) plumage, but of unknown provenance / and reproductive status, were tracked during summer (July–September).

Purpose
This objective of this pilot study was to assess the feasibility of capturing and tagging albatrosses at-sea from an oceanographic vessel. These data were used to assess the susceptibility of the satellite-tracked birds to the Japanese Eastern Pacific Ocean (EPO) pelagic longline fishery, by quantifying the temporal and spatial overlap of the telemetry tracks and fishing effort. Additionally, differences in nocturnal / diurnal activity patterns (ranging patterns, movement rates) were used to investigate the influence of diel and lunar cycles on albatross foraging behaviour.

Contacts (PROVIDES ADDITIONAL CONTACT INFORMATION AND A LOG OF DATASET MODIFICATIONS)

Name	Role	Date modified
Hyrenbach, David	Data Collector	–
Hyrenbach, David	Data Provider	–

6.3 Example of electronic "terms of use" form

1) Contact Information

a) Main Data Set Contact (Provider 1):	b) Data User:
Title	Title
Name	Name
Organisation	Organisation
Address	Address
City	City
State	State
Zip	Zip
Country	Country
Phone	Phone
Fax	Fax
Email	Email

Names of additional data provider(s):

Provider 2:
Provider 3:
Provider 4:
Provider 5:
Provider 6:

2) Agreement

a) Terms of Use

By using any Procellariiform tracking dataset, users agree to the following terms and conditions:

1) Not to use data contained herein in any publication, product, or commercial application without prior written **consent** from the original data provider(s). While initial inquiries may be conducted by electronic mail, users and providers will formalise their agreement using standardised electronic "terms of use" archived by the database manager(s). This form will document the type of data, the duration, and the anticipated products involved in the collaboration.
2) Once consent has been obtained, users shall adhere to the following conditions:
   - The original data provider(s) must be given **co-authorship** of any product including "recent" data, gathered during the previous 10 years, unless the original data provider declines authorship. Ultimately, inclusion as an author is decided by the data provider(s).
   - Authorship will be **optional** for products involving "historical" data gathered more than 10 years in the past, in which case, authorship decisions will be at the discretion of the user(s).
   - To **cite** both the original data provider(s) and the Procellariiform Tracking dataset appropriately after approval of use is obtained. More specifically, journal editors have suggested that the version of the database and the date the system was accessed be included in the citation. Additionally, the version of the specific database, as described in the meta-data, will be essential to determine the level of data filtering and processing.
3) No data user shall hold Argos Inc., the Procellariiform tracking database or the original data provider(s) **liable** for errors in the data. While every effort has been made to ensure the integrity and quality of the database, **BirdLife International** (or whomever maintains the database) cannot guarantee the accuracy of the datasets contained herein.

b) Comments:

- Main Data Set Contact (Provider 1):

- Data User:

3) Request Statement

a) Data Specifications: Please mark all applicable fields

Date Set Number / Title:

Geographic Scope: Range of latitude: Range of longitude:

Temporal Scope: Start date (YYMMDD): End date (YYMMDD):

Location Types: All available ☐ Geo-location ☐ GPS ☐ Argos ☐

Genders: All birds ☐ Known only ☐ Males only ☐ Females only ☐

Comments:

b) Data Use: Please mark all applicable fields

Professional Use:

Scientific Presentation ☐

Publication: Popular journal ☐ Technical report ☐ Book ☐ Peer-reviewed journal ☐

Grant proposal ☐

Other use:

Material be posted on the internet: None ☐ Figures ☐ Tables ☐ Text ☐

Time limit: Start date (YYMMDD): End date (YYMMDD):

Co-authorship Provider 2: Yes (compulsory) ☐ Yes (optional) ☐ No ☐

Co-authorship Provider 3: Yes (compulsory) ☐ Yes (optional) ☐ No ☐

Co-authorship Provider 4: Yes (compulsory) ☐ Yes (optional) ☐ No ☐

Co-authorship Provider 5: Yes (compulsory) ☐ Yes (optional) ☐ No ☐

Co-authorship Provider 6: Yes (compulsory) ☐ Yes (optional) ☐ No ☐

c) Approval:

We agree with the terms of use outlined above. We understand that this agreement facilitates the one-time use of the data as described above, and that it precludes the dissemination of any additional analyses or derived products, without further consensual agreement. That is, any use beyond the scope outlined in this document will be stipulated in additional data use agreements.

We hereby agree to abide by the terms of use described in this form.

Data Contact (Name, Date) ______________________ [Review before final submit]

Date User (Name, Date) ______________________ [Review before final submit]

Database Manager (Date Filed) ______________________ User Password ______________________

ANNEX 7 GAP ANALYSIS

Table 1. Summary of breeding and non-breeding PTT tracking data obtained, in relation to size of colony[1].

	All sites						Sites containing over 1% of global population						Sites containing over 5% of global population					
Species	No. Sites	Tracked	% Sites	5 Popn	No. hours	No. indivs	No. tracks	No. Sites	Tracked	% Sites	5 Popn	No. hours	No. indivs	No. tracks	No. Sites	Tracked	% Sites	5 Popn	No. hours	No. indivs	No. tracks
Breeding																					
Amsterdam Albatross	1	1	100%	100%	5,160	?	15	1	1	100%	100%	5,160	?	15	1	1	100%	100%	5,160	?	15
Antipodean Albatross	2							1							1						
Antipodean (Gibson's) Albatross	1	1	100%	100%	1,711	3	3	1	1	100%	100%	1,711	3	3	1	1	100%	100%	1,711	3	3
Atlantic Yellow-nosed Albatross	2							2							2						
Black-browed Albatross	10	5	50%	100%	63,611	>45	480	3	3	100%	99%	51,977	>39	447	3	3	100%	99%	51,977	>39	447
Black-footed Albatross	4	1	25%	97%	2,689	14	17	3	1	33%	97%	2,689	14	17	1	1	100%	97%	2,689	14	17
Buller's Albatross	4	2	50%	42%	31,541	47	229	3	2	67%	42%	31,541	47	229	3	2	67%	42%	31,541	47	229
Campbell Albatross	1							1							1						
Chatham Albatross	1	1	100%	100%	8,136	9	16	1	1	100%	100%	8,136	9	16	1	1	100%	100%	8,136	9	16
Grey-headed Albatross	7	5	71%	87%	54,683	>47	331	6	4	67%	87%	50,670	>41	322	6	4	67%	87%	50,670	>41	32[2]
Indian Yellow-nosed Albatross	5	1	20%	70%	10,526	?	34	3	1	33%	70%	10,526	?	34	3	1	33%	70%	10,526	?	34
Laysan Albatross	4	2	50%	100%	8,266	34	37	1	1	100%	100%	8,266	14	17	1	1	100%	100%	8,266	14	17
Light-mantled Albatross	9	1	11%	9%	3,662	7	10	8	1	13%	9%	3,662	7	10	6	1	17%	9%	3,662	7	10
Northern Royal Albatross	2	2	100%	100%	7,255	16	31	1	1	100%	99%	6,370	13	28	1	1	100%	99%	6,370	13	28
Salvin's Albatross	3							1							1						
Short-tailed Albatross	3							2							2						
Shy Albatross	4	1	25%	14%	21,643	?	64	2	1	50%	14%	21,643	?	64	2	1	50%	14%	21,643	?	64
Sooty Albatross	7	1	14%	17%	8,194	?	26	5	1	20%	17%	8,194	?	26	4	1	25%	17%	8,194	?	26
Southern Royal Albatross	2	1	50%	99%	2,973	7	7	1	1	100%	99%	2,973	7	7	1	1	100%	99%	2,973	7	7
Tristan Albatross	2	1	50%	100%	11,451	38	128	1	1	100%	100%	11,451	38	128	1	1	100%	100%	11,451	38	128
Wandering Albatross	5	4	80%	100%	96,466	>132	442	4	4	100%	100%	96,466	>132	442	4	4	100%	100%	96,466	>132	442
Waved Albatross	2							1							1						
Northern Giant-petrel	9	1	11%	38%	3,921	18	18	8	1	13%	38%	3,921	18	18	5	1	20%	38%	3,921	18	18
Southern Giant-petrel	14	2	14%	20%	11,640	20	20	10	2	20%	20%	11,640	20	20	8	1	13%	15%	3,352	11	11
White-chinned Petrel	9	2	22%	?%	7,919	>9	39	?	2	?%	?%	7,919	>9	39	?	1	?%	?%	3,314	9	23
Non-breeding																					
Amsterdam Albatross	1							1							1						
Antipodean Albatross	2	1	50%	100%	1,823	3	13	1	1	100%	100%	1,823	3	13	1	1	100%	100%	1,823	3	13
Antipodean (Gibson's) Albatross	1	1	100%	100%	4,075	3	3	1	1	100%	100%	4,075	3	3	1	1	100%	100%	4,075	3	3
Atlantic Yellow-nosed Albatross	2							2							2						
Black-browed Albatross	10	2	20%	83%	2,661	3	3	3	2	67%	83%	2,661	3	3	3	2	67%	83%	2,661	3	3
Black-footed Albatross	4	1	25%	97%	1,846	6	8	3	1	33%	97%	1,846	6	8	1	1	100%	97%	1,846	6	8
Buller's Albatross	4	2	50%	42%	17,632	18	234	3	2	67%	42%	17,632	18	234	3	2	67%	42%	17,632	18	234
Campbell Albatross	1							1							1						
Chatham Albatross	1	1	100%	100%	20,520	11	19	1	1	100%	100%	20,520	11	19	1	1	100%	100%	20,520	11	19
Grey-headed Albatross	7	2	29%	74%	596	2	2	6	2	33%	74%	596	2	2	6	2	33%	74%	596	2	2
Indian Yellow-nosed Albatross	5							3							3						
Laysan Albatross	4							1							1						
Light-mantled Albatross	9							8							6						
Northern Royal Albatross	2	2	100%	100%	8,699	7	31	1	1	100%	99%	2,566	4	15	1	1	100%	99%	2,566	4	15
Salvin's Albatross	3							1							1						
Short-tailed Albatross	3	1	33%	91%	2,616	7	7	2	1	50%	91%	2,616	7	7	2	1	50%	91%	2,616	7	7
Shy Albatross	4	1	25%	14%	3,712	?	8	2	1	50%	14%	3,712	?	8	2	1	50%	14%	3,712	?	8
Sooty Albatross	7							5							4						
Southern Royal Albatross	2							1							1						
Tristan Albatross	2							1							1						
Wandering Albatross	5	3	60%	86%	9,196	8	8	4	3	75%	86%	9,196	8	8	4	3	75%	86%	9,196	8	8
Waved Albatross	2							1							1						
Northern Giant-petrel	9							8							5						
Southern Giant-petrel	14							10							8						
White-chinned Petrel	9							?							?						

[1] Colony sizes from Arata *et al.* (2003), BirdLife International (2004b), Gales (1998), Lawton *et al.* (2003), Patterson *et al.* (in press), Robertson C. *et al.* (2003b) and Tickell (2000).

Table 2. Breeding PTT tracking data obtained from the various colonies[1].

				PTT tracking data			
Species	**Site**	**Annual no. breeding pairs**	**% global population**	**No. of hours**	**No. of individuals**	**No. of tracks**	**% tracking data (in hours)**
Amsterdam Albatross	Ile Amsterdam	17	100%	5,160		15	100%
Antipodean Albatross	Antipodes Islands	5,148	100%				
	Campbell Island	6	0%				
Antipodean (Gibson's) Albatross	Auckland Islands	7,319	100%	1,711	3	3	100%
Atlantic Yellow-nosed Albatross	Gough Island	7,500	23%				
	Tristan da Cunha Islands	25,750	77%				
Black-browed Albatross	Antipodes Islands	115	0%				0%
	Campbell Island	16	0%				0%
	Chile	122,870	18%	30,863		165	49%
	Falkland Islands (Malvinas)	380,000	62%	13,396	18	198	21%
	Heard and McDonald Islands	729	0%				0%
	Iles Crozet	880	0%				0%
	Iles Kerguelen	4,270	1%	7,678		26	12%
	Macquarie Island	182	0%	3,956	6	7	6%
	Snares Islands	1	0%				0%
	South Georgia	100,332	16%	7,718	21	84	12%
Black-footed Albatross	Hawaiian Islands	62,575	97%	2,689	14	17	100%
	Izu Shoto	914	1%				0%
	Ogasawara Gunto (Bonin Islands)	1,103	2%				0%
	Senkaku Retto	25	0%				0%
Buller's Albatross	Chatham Islands	18,150	58%				0%
	Three Kings	20	0%				0%
	Snares Islands	8,465	27%	24,063	37	180	76%
	Solander Islands	4,800	15%	7,478	10	49	24%
Campbell Albatross	Campbell Island	26,000	100%				
Chatham Albatross	Chatham Islands	4,000	100%	8,136	9	16	100%
Grey-headed Albatross	Campbell Island	6,400	6%	1,271	5	5	2%
	Chile	16,408	15%	22,288		67	41%
	Iles Crozet	5,940	6%				0%
	Iles Kerguelen	7,905	7%				0%
	Macquarie Island	84	0%	4,013	6	9	7%
	Prince Edward Islands	7,717	7%	1,894		6	3%
	South Georgia	61,582	58%	25,217	36	244	46%
Indian Yellow-nosed Albatross	Ile Amsterdam	25,000	70%	10,526		34	100%
	Ile St. Paul	12	0%				0%
	Iles Crozet	4,430	12%				0%
	Iles Kerguelen	50	0%				0%
	Prince Edward Islands	6,000	17%				0%
Laysan Albatross	Hawaiian Islands	554,318	100%	4,474	14	17	54%
	Izu Shoto	1	0%				0%
	Mexico	350	0%	3,792	20	20	46%
	Ogasawara Gunto (Bonin Islands)	30	0%				0%
Light-mantled Albatross	Antipodes Islands	169	1%				0%
	Auckland Islands	5,000	23%				0%
	Campbell Island	1,600	7%				0%
	Heard and McDonald Islands	350	2%				0%
	Iles Crozet	2,421	11%				0%
	Iles Kerguelen	4,000	18%				0%
	Macquarie Island	2,000	9%	3,662	7	10	100%
	Prince Edward Islands	241	1%				0%
	South Georgia	6,250	28%				0%
Northern Royal Albatross	Chatham Islands	2,060	99%	6,370	13	28	88%
	Taiaroa Head	18	1%	885	3	3	12%
Salvin's Albatross	Bounty Islands	76,352	99%				
	Iles Crozet	4	0%				
	Snares Islands	587	1%				
Short-tailed Albatross	Hawaiian Islands	1	0%				
	Izu Shoto	220	95%				
	Senkaku Retto	11	5%				
Shy Albatross	Antipodes Islands	18	0%				0%
	Auckland Islands	72,233	85%				0%
	Chatham Islands	1	0%				0%
	Tasmania	12,250	14%	21,643		64	100%
Sooty Albatross	Gough Island	5,000	38%				0%
	Ile Amsterdam	350	3%				0%
	Ile St. Paul	20	0%				0%
	Iles Crozet	2,248	17%	8,194		26	100%
	Iles Kerguelen	4	0%				0%
	Prince Edward Islands	2,755	21%				0%
	Tristan da Cunha Islands	2,747	21%				0%

Table 2 ... continued. Breeding PTT tracking data obtained from the various colonies[1].

Species	Site	Annual no. breeding pairs	% global population	PTT tracking data No. of hours	No. of individuals	No. of tracks	% tracking data (in hours)
Southern Royal Albatross	Auckland Islands	72	1%				0%
	Campbell Island	7,800	99%	2,973	7	7	100%
Tristan Albatross	Gough Island	798	100%	11,451	38	128	100%
	Tristan da Cunha Islands	3	0%				0%
Wandering Albatross	Iles Crozet	2,062	26%	48,870		204	51%
	Iles Kerguelen	1,094	14%	1,742		11	2%
	Macquarie Island	10	0%				0%
	Prince Edward Islands	2,707	34%	8,142	17	20	8%
	South Georgia	2,001	25%	37,712	115	207	39%
Waved Albatross	Isla de la Plata	10	0%				
	Islas Galápagos	18,200	100%				
Northern Giant-petrel	Antipodes Islands	300	3%				0%
	Auckland Islands	100	1%				0%
	Campbell Island	240	2%				0%
	Chatham Islands	2,150	19%				0%
	Iles Crozet	1,060	9%				0%
	Iles Kerguelen	1,400	12%				0%
	Macquarie Island	1,110	10%				0%
	Prince Edward Islands	540	5%				0%
	South Georgia	4,310	38%	3,921	18	18	100%
Southern Giant-petrel	Antarctic Continent	290	1%				0%
	Antarctic Peninsula	6,500	21%				0%
	Argentina	1,350	4%	8,288	9	9	71%
	Chile	290	1%				0%
	Falkland Islands (Malvinas)	3,100	10%				0%
	Gough Island	50	0%				0%
	Heard and McDonald Islands	4,400	14%				0%
	Iles Crozet	1,060	3%				0%
	Iles Kerguelen	4	0%				0%
	Macquarie Island	2,300	7%				0%
	Prince Edward Islands	1,790	6%				0%
	South Georgia	4,650	15%	3,352	11	11	29%
	South Orkney Islands	3,400	11%				0%
	South Sandwich Islands	1,550	5%				0%
White-chinned Petrel	Antipodes Islands	50,000	?%				0%
	Auckland Islands	50,000	?%				0%
	Campbell Island	?	?%				0%
	Iles Crozet	50,000	?%	4,605		16	58%
	Iles Kerguelen	200,000	?%				0%
	Falkland Islands (Malvinas)	?	?%				0%
	Macquarie Island	?	?%				0%
	Prince Edward Islands	?	?%				0%
	South Georgia	2,000,000	?%	3,314	9	23	42%

[1] Colony sizes from Arata *et al.* (2003), BirdLife International (2004b), Gales (1998), Lawton *et al.* (2003), Patterson *et al.* (in press), Robertson C. *et al.* (2003b) and Tickell (2000).

Table 3. Non-breeding PTT tracking data obtained from the various colonies[1].

Species	Site	Annual no. breeding pairs	% global population	PTT tracking data No. of hours	No. of individuals	No. of tracks	% tracking data (in hours)
Amsterdam Albatross	Ile Amsterdam	17	100%				
Antipodean Albatross	Antipodes Islands	5,148	100%	1,823	3	13	100%
	Campbell Island	6	0%				0%
Antipodean (Gibson's) Albatross	Auckland Islands	7,319	100%	4,075	3	3	100%
Atlantic Yellow-nosed Albatross	Gough Island	7,500	23%				
	Tristan da Cunha Islands	25,750	77%				
Black-browed Albatross	Antipodes Islands	115	0%				0%
	Campbell Island	16	0%				0%
	Chile	122,870	18%				0%
	Falkland Islands (Malvinas)	380,000	62%	689	1	1	26%
	Heard and McDonald Islands	729	0%				0%
	Iles Crozet	880	0%				0%
	Iles Kerguelen	4,270	1%				0%
	Macquarie Island	182	0%				0%
	Snares Islands	1	0%				0%
	South Georgia	100,332	16%	1,972	2	2	74%
Black-footed Albatross	Hawaiian Islands	62,575	97%	1,846	6	8	100%
	Izu Shoto	914	1%				0%
	Ogasawara Gunto (Bonin Islands)	1,103	2%				0%
	Senkaku Retto	25	0%				0%

Table 3 ... continued. Non-breeding PTT tracking data obtained from the various colonies[1].

				PTT tracking data			
Species	Site	Annual no. breeding pairs	% global population	No. of hours	No. of individuals	No. of tracks	% tracking data (in hours)
Buller's Albatross	Chatham Islands	18,150	58%				0%
	Three Kings	20	0%				0%
	Snares Islands	8,465	27%	8,197	9	97	46%
	Solander Islands	4,800	15%	9,435	9	137	54%
Campbell Albatross	Campbell Island	26,000	100%				
Chatham Albatross	Chatham Islands	4,000	100%	20,520	11	19	100%
Grey-headed Albatross	Campbell Island	6,400	6%				0%
	Chile	16,408	15%	165	1	1	28%
	Iles Crozet	5,940	6%				0%
	Iles Kerguelen	7,905	7%				0%
	Macquarie Island	84	0%				0%
	Prince Edward Islands	7,717	7%				0%
	South Georgia	61,582	58%	431	1	1	72%
Indian Yellow-nosed Albatross	Ile Amsterdam	25,000	70%				
	Ile St. Paul	12	0%				
	Iles Crozet	4,430	12%				
	Iles Kerguelen	50	0%				
	Prince Edward Islands	6,000	17%				
Laysan Albatross	Hawaiian Islands	554,318	100%				
	Izu Shoto	1	0%				
	Mexico	350	0%				
	Ogasawara Gunto (Bonin Islands)	30	0%				
Light-mantled Albatross	Antipodes Islands	169	1%				
	Auckland Islands	5,000	23%				
	Campbell Island	1,600	7%				
	Heard and McDonald Islands	350	2%				
	Iles Crozet	2,421	11%				
	Iles Kerguelen	4,000	18%				
	Macquarie Island	2,000	9%				
	Prince Edward Islands	241	1%				
	South Georgia	6,250	28%				
Northern Royal Albatross	Chatham Islands	2,060	99%	2,566	4	15	29%
	Taiaroa Head	18	1%	6,133	3	15	71%
Salvin's Albatross	Bounty Islands	76,352	99%				
	Iles Crozet	4	0%				
	Snares Islands	587	1%				
Short-tailed Albatross	Hawaiian Islands	1	0%				0%
	Izu Shoto	220	95%	2,616	7	7	100%
	Senkaku Retto	11	5%				0%
Shy Albatross	Antipodes Islands	18	0%				0%
	Auckland Islands	72,233	85%				0%
	Chatham Islands	1	0%				0%
	Tasmania	12,250	14%	3,712	8	8	100%
Sooty Albatross	Gough Island	5,000	38%				
	Ile Amsterdam	350	3%				
	Ile St. Paul	20	0%				
	Iles Crozet	2,248	17%				
	Iles Kerguelen	4	0%				
	Prince Edward Islands	2,755	21%				
	Tristan da Cunha Islands	2,747	21%				
Southern Royal Albatross	Auckland Islands	72	1%				
	Campbell Island	7,800	99%				
Tristan Albatross	Gough Island	798	100%				
	Tristan da Cunha Islands	3	0%				
Wandering Albatross	Iles Crozet	2,062	26%	2,418	1	1	26%
	Iles Kerguelen	1,094	14%				0%
	Macquarie Island	10	0%				0%
	Prince Edward Islands	2,707	34%	3,161	3	3	34%
	South Georgia	2,001	25%	3,617	4	4	39%
Waved Albatross	Ecuador	10	0%				
	Islas Galápagos	18,200	100%				
Northern Giant-petrel	Antipodes Islands	300	3%				
	Auckland Islands	100	1%				
	Campbell Island	240	2%				
	Chatham Islands	2,150	19%				
	Iles Crozet	1,060	9%				
	Iles Kerguelen	1,400	12%				
	Macquarie Island	1,110	10%				
	Prince Edward Islands	540	5%				
	South Georgia	4,310	38%				

Table 3 ... continued. Non-breeding PTT tracking data obtained from the various colonies[1].

Species	Site	Annual no. breeding pairs	% global population	PTT tracking data No. of hours	PTT tracking data No. of individuals	PTT tracking data No. of tracks	% tracking data (in hours)
Southern Giant-petrel	Antarctic Continent	290	1%				
	Antarctic Peninsula	6,500	21%				
	Argentina	1,350	4%				
	Chile	290	1%				
	Falkland Islands (Malvinas)	3,100	10%				
	Gough Island	50	0%				
	Heard and McDonald Islands	4,400	14%				
	Iles Crozet	1,060	3%				
	Iles Kerguelen	4	0%				
	Macquarie Island	2,300	7%				
	Prince Edward Islands	1,790	6%				
	South Georgia	4,650	15%				
	South Orkney Islands	3,400	11%				
	South Sandwich Islands	1,550	5%				
White-chinned Petrel	Antipodes Islands	50,000	?%				
	Auckland Islands	50,000	?%				
	Campbell Island	?	?%				
	Iles Crozet	50,000	?%				
	Iles Kerguelen	200,000	?%				
	Falkland Islands (Malvinas)	2,500	?%				
	Macquarie Island	?	?%				
	Prince Edward Islands	?	?%				
	South Georgia	2,000,000	?%				

[1] Colony sizes from Arata *et al.* (2003), BirdLife International (2004b), Gales (1998), Lawton *et al.* (2003), Patterson *et al.* (in press), Robertson C. *et al.* (2003b) and Tickell (2000).

ANNEX 8 MARINE MAMMAL TRACKING DATABASE

Project Title: A Database For The Study Of Marine Mammal Behaviour: A Tool To Define Their Critical Habitat And Behaviour

Principal Investigators: Drs. Daniel P. Costa and Scott A. Shaffer

Background

In recent years, the US Navy has come under pressure to evaluate the effects of its fleet activities on marine organisms, particularly marine mammals. Consequently, the Office of Naval Research created a program called Effects of Sound on the Marine Environment (ESME) to evaluate and model the influence of sound propagation on marine mammal species. As part of this effort, it was important to survey the scientific literature to collate information from all studies that focused on diving behaviour and/or tracking of free-ranging marine mammals. The data compiled from this survey were placed into a database that was used to model the impact and response of marine mammals to various sound fields.

Our long-term goal was to compile a comprehensive database that could be used alone or in combination with other disciplines (*e.g.,* oceanography, fisheries science, etc.) to develop predictive models for defining the critical habitat of marine mammals. The first goal was to compile a bibliography of all published research on diving behaviour and movement patterns of marine mammals. The second goal was to create a database, which incorporated all data from the publications. The third goal was to identify and catalogue where available, unpublished data with respect to species, investigator, data type, and their potential availability. The fourth goal was to host a workshop with all major investigators from the international community to discuss the possibility of creating a common data-reporting scheme for diving behaviour and movement patterns of marine mammals.

Our search for published papers, reports, book chapters, and books totalled to 448 references (413 references on diving behaviour and 35 on movement patterns). The bibliography contained references dating back to the 1960s to Nov 2002. The data from all available publications were extracted and entered into a Microsoft Access 2000 database. The specific diving behaviours of marine mammals included such parameters as the diving depth, duration, surface time, and diving frequency. We also incorporated the metadata that included details about the animals studied such as species, age, sex, reproductive season, and number of individuals tracked, etc. Lastly, the database included parameters about the locations of animals (e.g., hemisphere, major ocean basins, oceanic zones) and the type of equipment used to monitor diving and movement patterns. The database has 1,815 entries (i.e. single animals) comprised of 24 pinniped and 16 cetacean species, plus the dugong and sea otter. The majority of species are from high latitudes (67%), and the greatest representation is from pinnipeds (1,560 entries), of which, Antarctic fur seals (288 entries), Weddell seals (258 entries), and harbour seals (247 entries) comprise the majority of entries. For cetaceans, there are only 241 entries of which, the majority are from harbour porpoises (42 entries) and white whales (49 entries).

In December 2001, we held a workshop that focused on the feasibility, development, and implementation of a common approach to archive diving and tracking data of marine mammals. This included discussions focused on specific issues such as data formats, standards, metadata, and the potential for a central or common access archive. The workshop was a similar effort to that of the Procellariiform Tracking workshop and it included a total of 45 researchers from five countries including the U.S., Canada, Scotland, Australia, and Japan. Among all the participants, there was **unanimous** support for standardising the way data are reported in publications. Everyone felt this would make it easier to compare data collected by various groups. Concerning the creation of a central data archive, participants of the workshop were **unanimously** supportive but it was suggested that a *Metadata archive* be created initially. This Metadata archive would only contain information about 1) the instruments used, 2) the animals studied (e.g. age, mass, number, sex), 3) the synthesised published data, and 4) the complete contact information of the primary investigator. Thus, no proprietary data would be included. However, it was agreed that the creation of this type of an archive would be extremely useful and that it would expedite the exchange of information among different labs. In terms of creating a data repository for raw or unpublished data, there was **unanimous but conditional** support among the participants. This was largely attributed to three main factors: 1) proprietary control of raw unpublished data, 2) concern over the ability to maintain the data archive from a logistical and financial standpoint, and 3) data access and security. Lastly, our workshop received international notoriety by being featured in the journal *Nature* (volume 415, page 4, 2002).

Currently, there are similar efforts underway to accomplish what we originally set out to do. For example, the OBIS-SeaMAP program has developed a database that is a repository for similar types of data that we compiled. In the near future, we will port our database over the SeaMAP program. Lastly, we plan to submit a review paper this year that outlines the results of our work and offers directions for future studies. This database was funded by a grant from the Office of Naval Research (N00014-00-1-0880) to D.P. Costa.

Dan Costa and Scott Shaffer

ANNEX 9 SEABIRD TRACKING AND DISTRIBUTION: POTENTIAL CONTRIBUTIONS TO THE AGREEMENT ON THE CONSERVATION OF ALBATROSSES AND PETRELS (ACAP)

ACAP was designed to address the multitude of threats currently facing albatrosses and petrel populations, both on land and at sea. Therefore amongst its high level objectives, arising from the overall obligation to achieve and maintain a favourable conservation status for albatrosses and petrels, are mitigation of adverse influences, both at breeding colonies (e.g. elimination and control of non-native injurious taxa) and in marine habitats (e.g. incidental mortality). Both these aims require the development and use of effective conservation measures (another objective of ACAP).

In respect of marine habitats, ACAP's conservation objectives include:

- Conservation (and restoration) of habitats.
- Sustainability of marine living resources on which albatrosses and petrels depend.
- Avoidance of pollution.
- Development of management plans for the most important foraging and migratory habitats.
- Conservation of marine areas critical to survival of albatrosses/petrels with unfavourable conservation status.

The last two of these clearly require identification and delimitation of critical habitats, making the present BirdLife International initiative of considerable potential importance to the success of ACAP.

The tasks and responsibilities of the ACAP Advisory Committee—the group charged with the ACAP Action Plan—include, amongst a very extensive list of topics:

- Identifying known and suspected threats and best practice mitigation.
- Defining foraging ranges and migration routes.
- Assessing distribution and effort of interacting fisheries.
- Provision of data on albatross/petrel interactions with fisheries.

These four tasks lie at the heart of addressing threats to albatrosses and petrels in the marine environment.

The work being undertaken within the BirdLife Seabird Programme—and particularly in this project—is obviously highly relevant to these aims. The seabird tracking database is likely to be a key tool for furthering the work of ACAP.

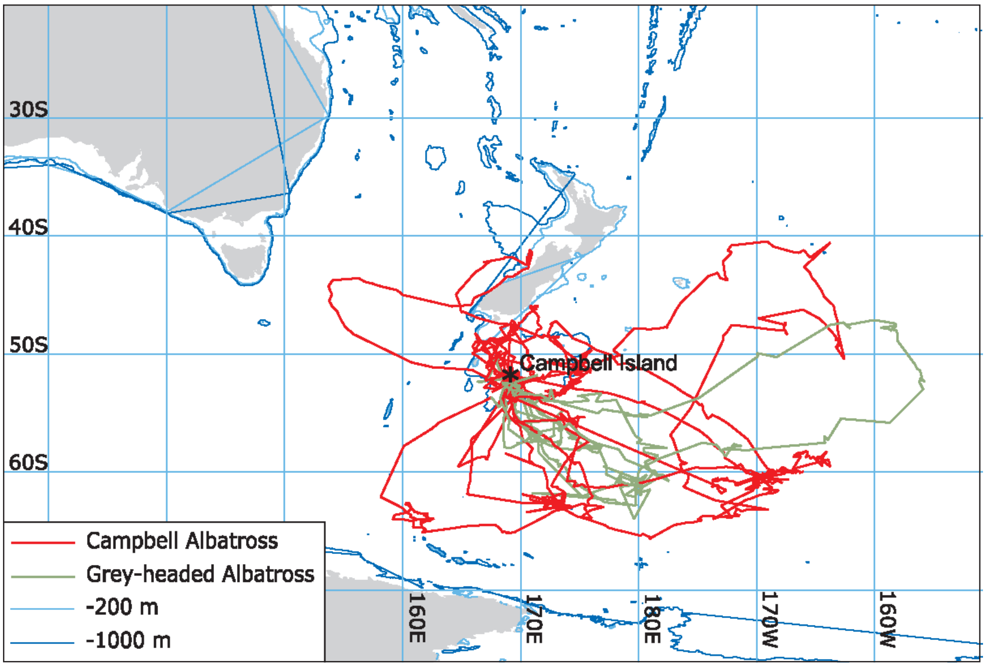
John Croxall

ANNEX 10 ERRATUM: CAMPBELL ALBATROSS *THALASSARCHE IMPAVIDA*

At the last stage before final proof, the editors were notified that of the 14 tracks from Campbell Island submitted to the database as Grey-headed Albatross *Thalassarche chrysostoma*, ten were of Campbell Albatross.

The main database has now been updated to reflect this. Data tables in this report have also been updated to indicate the true number of Grey-headed Albatross tracks submitted to the workshop. However time constraints prevented updating fully the following tables and figures: Figure 4.4, Figure 5.1, Figure 5.5, Figure 5.6, Table 5.1, Table 5.2, Figure 5.8, Figure 5.9, Figure 5.10, Table 5.3, Table 5.4, Figure 5.11, Figure 5.12, Figure 5.13, Table 5.5, Table 5.6, Figure 5.12, Figure 5.16, Table 5.7.

The effect on maps of Grey-headed Albatross distribution of these mis-classifications is, however, very small. A map showing the distribution of the tracks from Campbell Island (Grey-headed Albatross *Thalassarche chrysostoma* and Campbell Albatross *Thalassarche impavida*) is provided below.



Campbell and Grey-headed Albatrosses tracked from Campbell Island (Waugh *et al.* 1999).

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INDEX

Adams Island 44,47,75,76
Albatross,
- Amsterdam 12,75,80,87
- Antipodean 1,12,39,40,43,44,45,46,47,54,55,56,57,58,60,61,63,67,75,76,80,87,88,89
- Atlantic Yellow-nosed 1,38,59,67,70,81,87,88,89
- Black-browed 1,3,6,12,14,15,16,22,23,24,33,34,36,37,38,40–45,54,55,56,57,58,59,60,61,62,63,66,67,69,75,77,80,87,88,89
- Black-footed 1,12,47,48,49,54,55,56,57,58,62,63,67,75,76,80,83,84,87,88,89,96
- Buller’s 1,6,7,8,12,19,26,27,39,40,43,44,45,46,47,54,55,56,57,58,60,61,63,67,75,77,80,87,88,90,95,97
- Campbell 1,24,45,67,70,81,87,88,90,94
- Chatham 1,12,28,29,31,39,40,43,44,45,46,47,54,56,58,60,61,62,67,75,77,80,87,88,90,96,97
- Gibson’s 12,75,76,80,87
- Grey-headed 1,3,12,20,27,28,35,36,37,38,41–47,54–63,66,67,75,76,77,80,87,88,89,90,94–98
- Indian Yellow-nosed 1,12,41,42,54,55,56,57,58,59,61,62,63,67,76,81,87,88,90
- Laysan 1,12,47,48,49,54,55,56,57,58,62,63,67,75,80,83,87,88,90,95
- Light-mantled 1,12,38,42,43,44,45,54,55,56,57,58,60,63,67,76,81,87,88,90,97,98
- Northern Royal 1,3,12,29,30,32,39,40,43,44,45,46,47,54,55,56,57,58,60,61,62,63,67,75,76,79,80,87,88,90,96,97
- Salvin’s 1,40,42,45,67,70,80,87,88,90,97
- Short-tailed 1,12,47,48,49,58,63,67,76,80,82,87,88,90,96,97
- Shy 1,12,23,30,43,44,45,46,47,54,55,56,57,58,60,61,63,66,67,75,76,80,87,88,90,95,96
- Sooty 12,38,41,42,54,55,56,57,58,63,76,81,87,88,90,97,98
- Southern Royal 1,12,43,44,45,54,55,56,57,58,60,62,63,67,75,80,87,89,90,98
- Tristan 12,13,14,36,37,38,54,55,56,57,58,59,61,62,63,67,75,80,87,89,90,95
- Wandering 1,3,5,6,7,11,12,13,18,21,25,36,37,38,39,40,41,42,45,46,47,53,54,55,56,57,58,59,61,62,63,67,69,75,76,80,87,89,90,95,96,97,98
- Waved 1,48,61,63,67,70,80,87,89,90,95
- White-capped 80

Albatross Island 23,30,31,44,47,54,57,58,60,61,75,76,96
Antarctic Continent 11,38,89,91
Antarctic Peninsula 76,77,81,89,91,97
Antarctic Polar Frontal Zone 15,20,24,27,38
Antipodes Islands 40,45,46,47,61,76,88,89,90,91,97
Argentina 33,36,38,51,63,64,74,76,77,78,81,82,89,91
Atlantic Ocean 95
Auckland Islands 44,45,47,54,57,58,60,61,75,76,88,89,90,91,98
Australia 23,26,31,43,45,46,51,52,58,60,61,63,64,73,74,77,78,82,92,95,96,97,98

Beauchêne Island 14,15,23,36,75,77
Benguela Current 33
Bird Island 17,18,20,24,25,27,28,33,35,36,40,61,75,76,77,96
Bonin Islands 88,89,90
Bounty Islands 45,88,90

Calonectris diomedea 51,82,96
Campbell Island 15,44,45,54,57,58,60,75,76,88,89,90,91,94,98
Chatham Islands 28,29,30,31,32,40,44,45,46,47,54,57,58,60,61,75,76,77,88,89,90
Chile 15,16,23,24,28,32,33,34,36,38,51,52,61,63,64,66,75,76,77,78,80,81,82,83,88,89,90,91,95,96,97

Diomedea
- *amsterdamensis* 75,80
- *antipodensis* 76,80
- *antipodensis gibsoni* 75,80
- *dabbenena* 13,75,80
- *epomophora* 75,80
- *exulans* 11,18,21,25,75,76,80
- *gibsoni* 76
- *sanfordi* 29,32,75,76,80

Falkland Islands 14,15,19,22,23,24,28,33,36,38,40,52,54,57,58,64,66,67,73,75,77,80,81,88,89,91,95,96,98
Fulmar, Northern 81,95,98
Fulmarus glacialis 81

Giant-petrel,
- Northern 1,3,12,17,18,36,37,38,42,45,55,56,63,67,76,81,87,89,90
- Southern 1,12,16,17,18,36,37,38,42,45,55,56,63,67,76,77,81,87,89,91

Gough Island 13,14,36,38,54,57,58,75,88,89,90,91

Hawaiian Islands 47,48,75,83,88,89,90,98
Heard and McDonald Islands 88,89,90,91
Humboldt Current 39,40,71

Ile Amsterdam 42,62,75,76,88,89,90
Ile St. Paul 88,90
Iles Crozet 5,6,7,11,13,21,25,42,53,54,57,58,75,76,88,89,90,91
Iles Kerguelen 24,25,42,54,57,58,75,88,89,90,91
Indian Ocean 11,25,32,35,40,41,42,43,47,52,53,56,57,58,59,61,64,71,76,96,97,98
Isla Arce 36,76
Isla de Guadalupe 48,54,57,58,75
Isla de la Plata 48,89
Isla Diego de Almagro 36,54,57,58,75
Isla Diego Ramirez 16
Isla Gran Robredo 36,76
Islas Galápagos 48,70,89,90
Islas Ildefonso 22,24,36,54,57,58,75,76
Izu Shoto 48,76,88,89,90

Japan 48,51,53,63,77,78,80,82,84,92

Kerguelen Shelf 23,24,25

Macquarie Island 24,25,44,45,54,57,58,60,75,76,88,89,90,91
Macronectes
- *giganteus* 1,76,77,81,97
- *halli* 1,16,76,81,96,97

Malvinas 14,15,16,19,22,23,24,28,33,34,36,38,40,52,54,57,58,64,66,67,73,75,77,80,81,88,89,91
Marion Island 13,25,40,42,54,57,58,75,76,96
Mewstone 23,30,31,44,47,54,57,58,60,61,75,76,80
Mexico 48,63,64,75,80,83,88,90

New Zealand 6,24,25,26,28,29,32,33,40,43,44,45,46,47,51,52,58,60,61,62,63,70,74,75,76,77,78,82,83,95,97,98

Ogasawara Gunto (Bonin Islands) 48,88,89,90

Pacific Ocean 35,47,49,59,79,83,84,95
- North 47,83
- South-east 28,36

Patagonian Shelf 14,18,24,25,32,33,35,38,39,40,51,79,96,97
Pedra Branca 23,30,31,44,47,54,57,58,60,61,75,76,80
Peruvian Current 32
Petrel,
- Black 82
- Grey 43,82
- Spectacled 82
- Westland 82
- White-chinned 12,36,38,40,43

Phoebastria
- *albatrus* 1,76,80
- *immutabilis* 75,80
- *irrorata* 80
- *nigripes* 75,76,80

Phoebetria
- *fusca* 81
- *palpebrata* 1,76,81

Prince Edward Islands 11,25,28,42,62,75,76,81,88,89,90,91
Procellaria
- *aequinoctialis* 76,81
- *cinerea* 82

conspicillata 82
parkinsoni 82
westlandica 82
Puffinus
creatopus 82,83
gravis 82
griseus 82,83
tenuirostris 82

Saunders Island 14,15,23,24,34,36,75,77
Scotia Arc 38
Senkaku Retto 48,88,89,90
Shearwater,
Cory's 51,82
Great 82
Little 51
Pink-footed 82,83
Short-tailed 82
Sooty 82,83
Snares Islands 6,7,8,19,26,27,44,45,47,54,57,58,60,61,75,77,88,89,90
Solander Islands 26,40,44,45,47,75,77,88,90
South America 11,18,24,31,32,33,36,37,38,39,40,51,63,97
South Georgia 13,15,16,17,18,19,20,24,25,27,28,33,35,36,38,39,40,52,54,57,58,61,64,67,75,76,77,80,81,88,89,90,91,95,96,97,98
South Island 6,20,25,26,29,44,46
South Orkney Islands 20,27,38,89,91
South Sandwich Islands 28,38,89,91
Southern Ocean 16,28,43,51,62,63,96,97,98

Taiaroa Head 29,30,32,40,44,45,47,54,57,58,60,61,75,76,80,88,90
Tasman Sea 6,19,20,26,44,45,46,61,96
Tasmania 6,20,23,26,30,31,44,45,46,47,66,74,75,76,77,78,80,82,88,90,96
Tern Island 47,48,54,57,58,75,83
Thalassarche
bulleri 75,77
carteri 76,81
cauta 23,30,75,76,80
chlororhynchos 81
chrysostoma 20,27,35,76,77,81,94
eremita 28,31,75,77,80
impavida 24,81,94
melanophrys 14,15,23,24,33,75,77,80
melanophys 6
salvini 80
steadi 80
Three Kings 45,88,90
Torishima 48,76,80
Tristan da Cunha Islands 38,88,89,90

TRACKING OCEAN WANDERERS

The global distribution of albatrosses and petrels

Results from the Global Procellariiform Tracking Workshop, 1–5 September, 2003, Gordon's Bay, South Africa

Effective reduction of the threat to albatrosses and petrels requires accurate knowledge of their distribution throughout their life-cycle stages and annual migrations. Such data are invaluable in identifying important sea areas for foraging and migration, and in assessing the potential susceptibility of birds to mortality from interaction with fishing vessels. These birds also provide an indication of other changes in marine systems, such as climate change.

This report presents the results of a pioneering initiative, led by BirdLife International, in which scientists from around the world have collaborated to assemble and analyse a global database that includes over 90% of the world's remote-tracking data of albatrosses and petrels.

These data:
- make a unique contribution to defining key areas and critical habitats for albatrosses;
- identify national (e.g. within Exclusive Economic Zones) and international (e.g. through Regional Fisheries Management Organisations) responsibilities for the conservation of albatrosses and petrels;
- will be used to assess overlap and interaction between albatrosses and petrels and commercial fisheries, especially longline fisheries in which bycatch is the major threat to most albatross populations.

The data, and the results presented in this report, will be a key tool for the conservation of albatrosses and petrels. In particular:
- they will be of immense assistance in developing and prioritising the work of the international Agreement on the Conservation of Albatrosses and Petrels, designed to protect albatross and petrel habitats at land and at sea;
- they will facilitate the development of area and fishery-specific measures to reduce and eliminate the killing of seabirds in commercial fishing operations.

BirdLife will seek to stimulate development of, and links to, similar databases for other pelagic marine animals, especially other seabirds, marine mammals, turtles and migratory fish.

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