THE CONSERVATION STATUS AND PRIORITIES FOR ALBATROSSES AND LARGE PETRELS

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ABSTRACT

Seabirds are amongst the most globally-threatened of all groups of birds, and conservation issues specific to albatrosses (Diomedeidae) and large petrels (*Procellaria* spp. and giant petrels *Macronectes* spp.) led to drafting of the multi-lateral Agreement on the Conservation of Albatrosses and Petrels (ACAP). Here we review the taxonomy, breeding and foraging distributions, population status and trends, threats and priorities for the 29 species covered by ACAP. Nineteen (66%) are listed as threatened by IUCN, and 11 (38%) are declining. Most have extensive at-sea distributions, and the greatest threat is incidental mortality (bycatch) in industrial pelagic or demersal longline, trawl or artisanal fisheries, often in both national and international waters. Mitigation measures are available that reduce bycatch in most types of fisheries, but some management bodies are yet to make these mandatory, levels of implementation and monitoring of compliance are often inadequate, and there are insufficient observer programmes collecting robust data on bycatch rates. Intentional take, pollution (including plastic ingestion), and threats at colonies affect fewer species than bycatch; however, the impacts of disease (mainly avian cholera) and of predation by introduced species, including feral cats (*Felis catus*), rats (*Rattus* spp.) and house mice (*Mus musculus*), are severe for some breeding populations. Although major progress has been made in recent years in reducing bycatch rates and in controlling or eradicating pests at breeding sites, unless conservation efforts are intensified, the future prospects of many species of albatrosses and large petrels will remain bleak.

Keywords: anthropogenic impacts; conservation management; invasive species, non-target species, population trends; regional fisheries management organisations.

INTRODUCTION

According to the IUCN Red List criteria, which relate to population size, trends, and the extent and fragmentation of breeding distributions, seabirds are amongst the most threatened of all groups of birds (Croxall et al. 2012). Albatrosses and petrels are long-lived, have high adult survival rates, delayed sexual maturity and low fecundity; all lay single-egg clutches, and nine species (all of which are albatrosses) breed biennially if successful in raising a chick (Warham 1990). Given these extreme life-history attributes, changes in adult mortality have a much greater impact on population trajectories than variation in other demographic parameters, including breeding success, proportion of deferring breeders, juvenile survival and recruitment (Arnold et al. 2006; Croxall and Rothery 1991; Moloney et al. 1994; Véran et al. 2007). All species have wide at-sea distribution during the breeding and nonbreeding seasons; these extensive foraging ranges overlap with, and so put them at potential risk from multiple fisheries in national and international waters (Baker et al. 2007; Delord et al. 2010; Phillips et al. 2006).

Incidental mortality of seabirds in fisheries (hereafter "bycatch"), particularly of albatrosses and petrels, became a major conservation concern in the late 1980s (Brothers 1991; Murray et al. 1993; Weimerskirch and Jouventin 1987). Initial evidence came from numerous recoveries in longline fisheries of wandering albatrosses (*Diomedea exulans*) ringed at South Georgia (Islas Georgias del Sur) (Croxall and Prince 1990), and estimates of very high bycatch from the Japanese tuna fishery off Australia (Brothers 1991). Although based on very small samples, the inferred mortality coincided with declines in albatross populations in the sub-Antarctic, and so it was strongly suspected that fisheries bycatch was a critical factor (Croxall and Prince 1990; Prince et al. 1994b; Weimerskirch and Jouventin 1987). High rates of seabird bycatch were subsequently confirmed in a wide range of longline fisheries (Brothers et al. 1999b; Gales 1998; Tasker et al. 2000). Although attention focused initially on industrial longlining, bycatch by trawl and artisanal fleets have also been identified as major sources of mortality for many albatrosses and petrels (Croxall et al. 2012; Favero et al. 2010; Maree et al. 2014; Sullivan et al. 2006b).

Solving a conservation problem as pervasive as bycatch for species as wide-ranging as albatrosses and large petrels requires concerted management actions that cover both national and international waters. This motivated the development of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) as a daughter agreement of the Convention on Migratory Species (Bonn Convention), and its ratification in 2004 (Cooper et al. 2006). Although bycatch remains the main threat to many species and hence the contributing factors and demographic consequences are principal foci in this review, albatrosses and petrels also face a range of other threats on land and at sea, including impacts of invasive species, degradation or loss of nesting habitat, disease, pollution and climate change (see below). Consequently, the Action Plan of ACAP addresses topics that include habitat conservation and restoration, management of human activities, research and monitoring, education and public awareness, collation of information and implementation (ACAP 2001; Cooper et al. 2006). The purpose of this paper is to review the taxonomy, breeding and at-sea distributions, population status and trends, and marine and terrestrial threats to the 22 albatrosses and seven large petrels (*Macronectes* and *Procellaria* spp.) listed under ACAP, and report recent progress in addressing those threats and the priority conservation actions for the future. In order to maintain taxonomic and geographic coherence, the review does not cover the two species of shearwater added to the ACAP list since 2009 (Balearic shearwater *Puffinus mauretanicus* and pink-footed shearwater *P. creatopus*). Unless indicated otherwise by a supporting citation, data in tables and figures reflect published and unpublished data submitted to the ACAP database, available at www.acap.aq.

TAXONOMY

Although >80 albatross taxa have been formally described since the mid 1700s (Robertson and Nunn 1998), many were based on specimens collected at sea from unknown breeding locations and later revealed to be age-related plumage morphs of previously-described species. Taxonomic confusion was compounded by a scarcity of information on breeding behaviour and distribution, strong natal philopatry which precluded recognition of genuine physiological or behavioural barriers to gene flow (because contact between individuals from disparate populations is rare), and unusually low levels of genetic divergence even between what appear to be very different species (Nunn et al. 1996; Nunn and Stanley 1998). This reduces the power of genetic studies to delineate species boundaries (Burg and Croxall 2001, 2004; Double et al. 2003).

The taxonomic debate surrounding albatrosses was revisited when a new taxonomy was proposed by Robertson & Nunn (1998). This largely applied the Phylogenetic Species Concept and recognised 24 albatross species; however, some decisions were controversial (Penhallurick 2012; Penhallurick and Wink 2004; Rheindt and Austin 2005). Although the recommendation to re-establish four genera (resurrecting *Phoebastria* and *Thalassarche*) has been universally accepted, there is no current consensus at the species level; subsequent taxonomic treatises, field guides and reviews recognised between 13 and 24 albatross species (e.g. Brooke 2004; Chambers et al. 2009; Christidis and Boles 2008; Onley and Scofield 2007; Penhallurick and Wink 2004; Shirihai 2002). Acknowledging that taxonomic confusion could hamper conservation, ACAP established a Taxonomy Working Group with a remit to develop a defendable species list based upon peer-reviewed literature and a transparent decision-making process. This group largely follows guidelines in Helbig et al. (2002) which apply a relaxed version of the General Lineage Species Concept, focusing on diagnostic characteristics and evidence for distinct evolutionary trajectories. After assessing the splits advocated by Robertson and Nunn (1998), the conclusion was that two (Pacific albatross *Thalassarche bulleri platei* and Gibson's albatross *Diomedea antipodensis gibsoni*) of the 24 terminal albatross taxa could not be justified as separate species based on available data. The recognition of 22 albatross species by ACAP was later endorsed by Birdlife International (2015), the official IUCN Red List Authority.

Most regional or global taxonomic authorities now recognise 21 or 22 albatross species, depending on whether shy (*Thalassarche cauta*) and white-capped albatross (*T. steadi*) are considered – which they are by ACAP - to be separate species (BirdLife International 2015; Gill and Donsker 2016; Tennyson 2010). The argument by a minority for a return to 13 or 14 albatross species is based largely around percentage sequence divergence (Christidis and Boles 2008; Penhallurick and Wink 2004). Unsurprisingly, the sequence divergence between sister taxa in the 14-species taxonomy is greater than for the 22-species taxonomy; indeed, divergence is very low between many sister taxa in the latter (<1% cytochrome b, Chambers et al. 2009;

Nunn et al. 1996; Nunn and Stanley 1998). However, this alone should not preclude recognition at the species level because neutral mitochondrial markers are insensitive to rapid radiations (Chambers et al. 2009; Rheindt and Austin 2005). Moreover, no one level of sequence divergence can define a species event; this is particular pertinent for albatrosses, as molecular evolution is highly variable within the Procellariiformes and larger species show slower rates (Nunn and Stanley 1998).

The other taxonomic dispute concerns northern (*Macronectes halli*) and southern giant (*M. giganteus*) petrels, which are morphologically similar and show low sequence divergence (Nunn and Stanley 1998; Penhallurick and Wink 2004). However, a rare white plumage phase only occurs in the southern giant petrel, and this species has a different bill tip colour and in areas of sympatry breeds about 6 weeks later than its congener (Bourne and Warham 1966; Brown et al. 2015). Few now argue against separate species status (but see Penhallurick and Wink 2004). Finally, spectacled petrel (*Procellaria conspicillata*) was at one time considered to be a subspecies of white-chinned petrel (*P. aequinoctialis*), but has since been accorded species status, reflecting vocal, plumage, structural and genetic differences (Ryan 1998; Techow et al. 2009).

GEOGRAPHIC DISTRIBUTION

Breeding Sites

The global breeding distributions of the albatrosses and large petrels vary greatly in geographic extent. Breeding sites, as listed by ACAP, are usually an entire, distinct island or islet, or rarely, section of a large island (>3,000km^2), and each species-site combination is included separately, i.e., two species breeding in the same area constitute two breeding sites. If the few sites with tiny populations (<10 breeding pairs) are excluded, five albatrosses (wandering, grey-headed *Thalassarche chrysostoma*, black-browed *T. melanophris*, sooty *Phoebetria fusca* and light-mantled *P. palpebrata* albatrosses), the two giant petrels, and two of the *Procellaria* petrels (white-chinned and grey petrels *P. cinerea*) have a circumpolar breeding distribution, with populations in every Southern Ocean basin; eight albatrosses (Antipodean *Diomedea antipodensis*, Buller's *T. bulleri*, Campbell *T. impavida*, Chatham *T. eremita*, white-capped, northern royal *D. sanfordi*, southern royal *D. epomophora* and Salvin's albatrosses *T. salvini*) and two *Procellaria* petrels (Westland *Procellaria westlandica* and black *P. parkinsoni* petrels) breed only around New Zealand; two albatrosses (Tristan *D. dabbenena* and Atlantic yellow-nosed albatrosses *T. chlororhynchos*), and spectacled petrel breed only on islands in the Atlantic Ocean; two albatrosses (Indian yellow-nosed *T. carteri* and Amsterdam albatrosses *D. amsterdamensis*) only in the Indian Ocean; three albatrosses (Laysan *Phoebastria immutabilis*, black-footed *P. nigripes* and short-tailed albatrosses *P. albatrus*) only in the North Pacific; shy albatross only in Tasmania, and; waved albatross *P. irrorata* only regularly in the Galápagos islands (Fig. 1). Seven albatross and three *Procellaria* petrel species are endemic to a single island or island group (Fig. 1). Almost all breeding colonies are on remote islands, ranging in size from tiny rocky islets to Grande Terre, Kerguelen Islands (6,675 km^2) and the South Island, New Zealand.

The ACAP database includes virtually all the existing census data for the 29 species in this review, and allows the identification of internationally important breeding sites - single islands or, in a few cases, peninsulas or small island groups - that hold >1% of the global population (Appendix A). Using this definition, and bearing in mind the caveats that there are no census data for around 22% of breeding sites (particularly those of the burrow-nesting *Procellaria* petrels and light-mantled albatross), and some counts are of low reliability or more than a decade old, most albatrosses and larger petrels breed at relatively few sites; for 16 of the 29 species, there are only 1-3 sites with >1% of global numbers. Only for a minority of albatrosses (8 of 22 species) are there ≥5 breeding sites with >1% of the global population, and only for the five albatrosses and the two giant petrels that have circumpolar breeding distributions (see above) are there ≥9 sites that hold >1% of global numbers. No species breeds at ≥3 sites that each hold >10% of the global population. The restricted breeding distribution of many species increases their vulnerability to localised threats (see below), and is reflected in the assignment by IUCN of some albatrosses and *Procellaria* petrels to a threat category of Vulnerable even though the global populations are not thought to be decreasing (see below).

At-sea distribution

Albatrosses and large petrels are exceptionally wide-ranging, frequently travelling 100s to 1000s of km on a single foraging trip that can extend to a straight-line distance of >2000 km from the colony (Peron et al. 2010b; Phillips et al. 2004; Weimerskirch et al. 1993). This reflects trip durations during incubation and chick-rearing that can be of 2-3 weeks, although it is more common for the adult to return and feed its chick after 2-4 days, especially during brood-guard (Phillips et al. 2005a; Torres et al. 2013). As the degree of central-place foraging constraint varies with breeding phase, so too does the extent of at-sea distributions; this is sometimes associated with a change in habitat use from oceanic, distant shelf or shelf-slope regions in the pre-laying and incubation periods, to neritic waters much closer to the colony in brood-guard, and then a return to more distant waters for the remainder of chick-rearing (Phillips et al. 2006; Wakefield et al. 2011; Weimerskirch et al. 1993). During chick-rearing, parents may adopt a dual foraging strategy, involving the alternation of long and short trips as they balance the demands of chick provisioning with self-maintenance (Weimerskirch et al. 1994).

Almost all the albatross and large petrel species have been tracked at some stage while breeding, and many during the nonbreeding season (although only in recent years and many data are unpublished), whereas there are relatively few tracks from juveniles and immatures (De Grissac et al. 2016; Dias et al. 2014). During the nonbreeding period, many species make a directed, long-distance migration to a productive upwelling, shelf or frontal system, sometimes in a different ocean basin, and return to the colony can involve a circumnavigation of the Antarctic continent (Croxall et al. 2005). There are, however, numerous exceptions and contrasting strategies. Thus, Atlantic yellow-nosed albatrosses from Tristan da Cunha and Gough, and black-browed albatrosses from South Georgia migrate a few thousand km east across the south Atlantic Ocean to the Benguela Upwelling system, where they overlap with nonbreeding white-chinned petrels from colonies in the Indian Ocean, and some white-capped and shy albatrosses that have travelled much longer distances west from the Auckland Islands and Tasmania, respectively (Peron et al. 2010b; Phillips et al. 2005b). In contrast, white-chinned petrels, also from South Georgia, migrate only to the Patagonian Shelf or the Humboldt Upwelling; in the former, they overlap with wintering black-browed albatrosses from the Falklands (Malvinas) and northern royal albatrosses from New Zealand, and in the latter with several species of albatrosses and large petrels from New Zealand, including Salvin's, Buller's, Chatham and Antipodean albatrosses, black and Westland petrels (Landers et al. 2011; Nicholls et al. 2002; Phillips et al. 2006; Spear et al. 2003; Walker and Elliott 2006). Even within the same population, there is often extensive variation among individuals in movements and distribution (Croxall et al. 2005; Phillips et al. 2006; Phillips et al. 2005b).

Albatrosses and large petrels display diverse habitat preferences, reflecting the broad range of oceanographic conditions in waters around their scattered colonies, and the more distant regions used at others times of year. They can be specialists or generalists, reflected in the proportion of time spent utilising tropical, subtropical, sub-polar or polar, and continental shelf, island shelf, shelf-slope or oceanic waters at different times of year (Peron et al. 2010b; Phillips et al. 2006; Phillips et al. 2005b; Walker and Elliott 2006). Several species exhibit pronounced sexual segregation, with females tending to feed at lower latitudes or further from colonies than males, attributed to competition between sexes or habitat specialisation, and related in some, but not all species, to sexual size dimorphism (Bartle 1990; González-Solís et al. 2000; Weimerskirch et al. 1993). There can also be partial or complete spatial segregation between juveniles and adults (Alderman et al. 2010; Gutowsky et al. 2014; Weimerskirch et al. 2014). Even in areas of spatial overlap, species usually differ in at-sea activity patterns (e.g. frequency of landings, flight and resting bout durations), reflecting the distribution of preferred prey or degree of nocturnality, among others (Mackley et al. 2010; Phalan et al. 2007; Weimerskirch and Guionnet 2002). There are also large differences in diving capability; albatrosses and, given anatomical similarities, probably giant petrels, are much poorer divers than *Procellaria* petrels (Hedd et al. 1997; Prince et al. 1994a; Rollinson et al. 2014). Intra- and inter-specific variation in distribution, habitat preferences, dive depth and other aspects of behaviour have major implications for the degree of overlap and hence risk of bycatch in different fisheries (see below).

POPULATION STATUS AND TRENDS

The 29 species of albatrosses and large petrels (*Macronectes* and *Procellaria*) included here collectively comprise almost 3 million pairs breeding at 571 sites, across multiple jurisdictions. Trends vary between sites and species, but globally, over the 2 decades from 1993 to 2013, about 38% of these species declined, 28% increased, 28% were stable, and the trend for 7% (2 species) was unknown. Nineteen species

(66%) are considered to be threatened (Vulnerable, Endangered or Critically Endangered) by IUCN (Figure 2, Table 1). Three species qualify as Critically Endangered, all with very restricted breeding ranges. Two are declining: the Tristan albatross because of a combination of bycatch and predation of chicks by introduced house mice *Mus musculus* (Wanless et al. 2009), and the waved albatross because of bycatch and intentional take for human consumption (Anderson et al. 2008). The Amsterdam albatross is increasing as it recovers from degradation of its nesting habitat and impacts of longline fisheries (Inchausti and Weimerskirch 2001), but remains in perilously low numbers (31 breeding pairs; Table 1). A further five albatross species are Endangered; grey-headed and Indian yellow-nosed albatrosses because of rapid population decline at South Georgia and Amsterdam Island, respectively; sooty albatross seems to be declining based on limited data; Atlantic yellow-nosed albatross appears to be stable, but with low confidence in the trend data, and; the current trend for northern royal albatrosses is uncertain.

Eleven species (seven albatrosses and four *Procellaria* petrels) are Vulnerable; in some cases, this reflects restricted breeding range and not a declining population (Figure 2, Table 1; www.iucn.org). Eight of these species breed within the jurisdiction of one country, seven in New Zealand. The populations of four species (Chatham, Campbell, and southern royal albatrosses, and Westland petrel) are considered stable. Wandering and Antipodean albatross and black petrel are in decline. Although the short-tailed albatross is recovering rapidly from near-extinction because of careful management, the population remains at <6500 breeding pairs each year (Finkelstein et al. 2010). By comparison, the white-chinned petrel is far more abundant (c.1 million breeding pairs) but the limited trend data suggest a steep decline of the largest population (South Georgia) from the 1980s to the later 1990s, as a result of incidental mortality in fisheries (Phillips et al. 2006). Eight species are Near Threatened, two of which are increasing, the black-browed and black-footed albatrosses (Figure 2, Table 1). Limited trend data are available for light-mantled albatross (probably stable), white-capped albatross (trend uncertain), and grey petrel and shy albatross (declining). Laysan and Buller's albatrosses are stable. The two species of Least Concern are the northern and southern giant petrels, both of which are increasing.

There are no counts within the last decade for 64 breeding sites (of 12 albatross and four petrel species) that were known to hold >1% of the global population (Table 1), or for any site in 13 island groups (of 5 albatross and three petrel species) that together held >1% of the global population (Appendix B). In addition, the Prince Edward Islands potentially hold >1% of global~~large~~ numbers of grey petrels, but no estimate is available. Adult and juvenile survival rates, and breeding success are known from at least one site for all species except for adult survival (spectacled petrel), juvenile survival (Chatham, Salvin's, southern royal, white-capped, light-mantled and short-tailed albatrosses, and northern giant and spectacled petrel), and breeding success (Chatham and Salvin's albatrosses, and spectacled petrel), although in some cases, data have been collected but not published. Data~~These~~ gaps often reflect the logistical challenges of working at remote islands, and funding limitations given the large number of breeding sites in some jurisdictions.

THREATS: BYCATCH IN FISHERIES

Scale, contributing factors and impacts

Bycatch of seabirds in longline fisheries occurs when birds attack baited hooks and become hooked and drowned as the line sinks (Brothers 1991). In trawl fisheries, birds foraging on discards or offal (hereafter "discards") may be injured or killed on collision with net-monitoring and warp cables, dragged underwater and drowned when their wings become entangled around the warp, or become entangled in nets (Sullivan et al. 2006a; Watkins et al. 2008). Incidental capture in gillnet fisheries is due mostly to entanglement while diving for prey (Melvin et al. 1999; Waugh et al. 2011).

Bycatch is often unevenly distributed; biases can be towards males or females, adults or immatures, and depend on fishing area, gear type or season (Bugoni et al. 2011; Delord et al. 2005; Gales et al. 1998). Variation in the sex and age classes most at risk are often due to differences in foraging distributions at each stage of the annual (breeding and nonbreeding) cycle, and hence the relative overlap with high-risk fisheries (Alderman et al. 2011; Baker et al. 2007; Cuthbert et al. 2005; Delord et al. 2010). Bycatch rates of birds in different life-history stages have implications for demography and population trajectories, including time lags before detection and potential recovery (Dillingham and Fletcher 2011).

Although the volume and reliability of bycatch information are still severely limited for many areas and fisheries, particularly artisanal and gillnet, there has been a general improvement in the last decade, with better sampling coverage (Anderson et al. 2011; Richard and Abraham 2014; Žydelis et al. 2013). Regardless, the scale of bycatch is huge. An assessment for longline fisheries just in the Atlantic Ocean estimated c.48,500 seabirds were killed in 2003-2006 (Klaer 2012; Tuck et al. 2011). In the most recent estimate at the global level, >160,000, and potentially >320,000 seabirds are killed annually in longline fisheries, a large portion of which were albatrosses and large petrels (Anderson et al. 2011). Estimated annual global bycatch in gillnet fisheries is even higher, and although only a small proportion are procellariids, the impact on species such as the waved albatross may be severe (Žydelis et al. 2013).

Many operational, environmental and ecological factors influence the nature and extent of seabird bycatch (Gómez Laich et al. 2006; Klaer and Polacheck 1998). Albatrosses and larger petrels are particularly susceptible; they scavenge on food items near the sea surface, have a propensity to follow vessels, and possess large gapes so can ingest baited hooks (Brothers et al. 2010; Brothers et al. 1999a). They also have a competitive advantage over smaller birds when attempting to access bait and discards (Brothers 1991; Jimenez et al. 2011), although there are differences in feeding behaviour and vulnerability to capture among species of similar size (Brothers et al. 2010). The *Procellaria* petrels are more proficient divers, as are shearwaters *Ardenna* species, and in multi-species feeding assemblages can seize baited hooks at depths below those accessible to larger species; by returning those to the surface, bycatch of albatrosses is increased (Jimenez et al. 2012a). Bycatch in trawl fisheries is similarly influenced by species-specific differences in size and manoeuvrability; the large albatrosses are particularly susceptible to injury on warp cables (Favero et al. 2010; Sullivan et al. 2006a; Sullivan et al. 2006b; Watkins et al. 2008).

Although bycatch is now recognised as the most pervasive threat for albatrosses and large petrels, there are populations (spectacled petrel, and white-chinned petrels at Marion Island) which are increasing following the removal of terrestrial threats, despite ongoing mortality in fishing gear (Ryan et al. 2012; Ryan and Ronconi 2011). Although the nature of bycatch is fairly well understood, the link to population-level impacts has been harder to establish. However, a growing number of studies show negative relationships between fishing effort and adult survival or population trends (Rolland et al. 2010; Tuck et al. 2011; Véran et al. 2007). Assessing conservation implications (including critical areas and periods) requires estimation of bycatch rate or risk for each species in different fisheries based on the spatio-temporal overlap between fishing effort and bird distributions, as well as data on size and trends of affected populations (Small et al. 2013; Tuck 2011; Tuck et al. 2011). Analyses need to consider not only bycatch by multiple fleets across ocean basins (Baker et al. 2007), including Illegal, Unreported and Unregulated fishing operations, but the impact relative to other threats (Rivalan et al. 2010; Rolland et al. 2010; Wanless et al. 2009). It is not necessarily the most frequently-captured species that suffer the most severe population-level consequences (Jimenez et al. 2012b). The Amsterdam albatross has a small but increasing global population, but models show that bycatch of only six individuals per year would eventually drive the species to extinction (Rivalan et al. 2010). Impacts of bycatch can also vary regionally; the impact on wandering albatrosses is much higher for breeding populations in the Atlantic than Indian Ocean (Poncet et al. 2006; Ryan et al. 2009; Tuck et al. 2011), whereas the reverse is true for white-chinned petrels (Ryan et al. 2012). Finally, bycatch can be biased towards males or females, potentially reflecting differential access to bait mediated by sexual size dimorphism, or sex-specific differences in foraging distributions (Bugoni et al. 2011; Nel et al. 2002a). This exacerbates the impact on breeding numbers by reducing effective population sizes and fecundity (Mills and Ryan 2005).

Progress in mitigating threats from fisheries

A range of measures is available that can minimise bycatch, and improvements and novel approaches are still being researched. Although some approaches are widely-advocated, none is 100% effective in isolation. There is extensive variation in operational and gear characteristics among fisheries, and they may overlap with different assemblages of seabirds which vary in susceptibility to capture. Consequently, mitigation needs to be tailored carefully, and if introduced in combination with close monitoring of compliance has been very effective, for example in trawl, demersal or pelagic longline fisheries around South Georgia, New Zealand, South Africa and Hawaii (Anderson et al. 2011; Bull 2007, 2009; Croxall 2008; Løkkeborg 2011; Maree et al. 2014).

Mitigating seabird bycatch in pelagic longline is not as advanced as in demersal longline fisheries because of operational challenges to deploying bird-scaring lines, setting gear at night and attaching weighted swivels on branch-lines. Notwithstanding these difficulties, the efficacy of these approaches has been demonstrated through experimental studies, especially when used in combination, and without affecting target catch rates (Bull 2009; Løkkeborg 2011; Melvin et al. 2014; Robertson et al. 2013). In addition, ~~Despite this, and the availability of~~ 'safe-leads' are available that~~to~~ reduce the risk of injuries to crew (Sullivan et al. 2012), but there has been limited adoption by the pelagic longline industry (Baker pers. obs.). However, if appropriate mitigation is implemented, bycatch may be reduced significantly (Anderson et al. 2011; Gilman et al. 2014). Bycatch can also decline because of shifts or reductions in fishing effort, or ~~as a by-product of~~ changes in ~~distribution of fishing activities, or in~~ operational procedures that were not targeted specifically at bycatch reduction (Favero et al. 2013; Nel et al. 2002b; Robertson et al. 2014; Tuck et al. 2011). Best-practice bycatch mitigation has been adopted relatively recently by most tuna Regional Fisheries Management Organisations (tRFMOs), but reductions in mortality can only be confirmed if there are vast improvements in observer coverage and data collection standards (see below).

Seabird mortalities associated with trawl fisheries are generally limited to the period when discarding is taking place (Favero et al. 2010; Maree et al. 2014; Pierre et al. 2012; Sullivan et al. 2006b). Therefore, avoiding release of discards while the warp cables are in the water would eliminate bycatch in most trawl fisheries. Complete retention of discards may not be operationally achievable, but management during shooting and hauling, and releasing batched waste at other times can reduce the attendance of seabirds, thereby mitigating associated risk (Pierre et al. 2012). The combination of improved discard management and the use of bird-scaring lines has reduced trawl bycatch significantly (Maree et al. 2014; Melvin et al. 2011; Pierre et al. 2012; Sullivan et al. 2006b). Efforts to address bycatch in gillnet fisheries are far less advanced, with very little concerted action to-date (Žydelis et al. 2013). Consequently, there is no current best-practice and an urgent need for further research.

ACAP routinely reviews bycatch mitigation measures and provides advice appropriate to each gear type. This advice needs to be complemented by increased awareness, education and training for operators, and appropriate regulations by management authorities. The Food and Agricultural Organization of the United Nations (FAO) has developed technical guidelines on reducing incidental catch of seabirds in capture fisheries that encourage adoption of National Plans of Action (NPOA-Seabirds) (FAO 2008). To date, 14 states and other entities have formally adopted NPOA-Seabirds or their broad equivalent. In addition, BirdLife International and ACAP has jointly developed a series of fact sheets, available in several languages, which provide detailed information on each of the main mitigation measures, including technical specifications and implementation guidelines (http://www.acap.aq/en/resources/bycatch-mitigation/mitigation-fact-sheets). BirdLife International's Albatross Task Force has also achieved considerable success in building capacity on board vessels to refine mitigation measures (Croxall et al. 2012).

THREATS: INTENTIONAL TAKE OR KILLING AT SEA

Historically, albatrosses and petrels were deliberately caught at sea for human consumption, or shot from vessels for sport or scientific purposes (Robertson and Gales 1998). More recently, intentional killing of seabirds to reduce the depredation of live bait in hook-and-line fisheries has been recorded off Brazil (Bugoni et al. 2008). Both incidental and intentional catches ~~of waved albatrosses~~ in Peruvian artisanal longline and gillnet fisheries are thought to have contributed to reduced adult survival, changes in sex ratios and population declines of waved albatrosses in the late 1990s and early 2000s (Alfaro Shigueto et al. 2016; Anderson et al. 2008). Washing-up of broken wings provides circumstantial evidence for intentional take, although this may relate to the processing for food of bycaught birds, rather than ~~vessels~~ actively targeting ~~seabirds, and~~. Tthere is also circumstantial evidence from floating carcasses for intentional capture of black-browed albatrosses for food by squid-fishing vessels on the southern Patagonian Shelf (Reid et al. 2006). It is extremely difficult to quantify intentional take and its impact on populations, because the practise is likely to cease as soon as independent observers are on board. The factors underlying intentional take are different to those associated with bycatch, and require alternative solutions, including a greater focus on socio-economic and cultural issues (Alfaro Shigueto et al. 2016). Although it represents a less pervasive threat to albatrosses and petrels than bycatch, efforts need to be directed towards a better understanding of the contributing factors to allow effective conservation interventions.

THREATS: POLLUTION, DEBRIS AND DISCARDED FISHING GEAR

As albatrosses and large petrels are long-lived top predators, they are potentially at high risk from bioaccumulation of marine pollutants through food chains. This applies even to species that feed in remote areas, as pollutants dispersed by long-range atmospheric transport continue to cycle in food webs for many years (Cossa et al. 2011; Nriagu and Pacyna 1988; Riget et al. 2010). In addition, global emissions of mercury are predicted to increase, and although levels of some legacy (cf. emerging) persistent organic pollutants (POPs) are declining, there remains a high risk from new and emerging organic contaminants (Riget et al. 2010; Streets et al. 2009).

Concentrations of mercury, cadmium, arsenic and POPs in the tissues of albatrosses and petrels are related to trophic level, and also influenced by the degree of background contamination in foraging areas ~~(Reid et al. 2006)~~, and type of prey, including the proportion of squid, which have high cadmium levels in their digestive glands, and of mesopelagic taxa, which tend to have higher mercury burdens (Anderson et al. 2009; Anderson et al. 2010; Becker et al. 2002; Harwani et al. 2011; Stewart et al. 1999). There is evidence for increases in several pollutants, including mercury and organochlorines in the tissues of albatrosses in both the Northern and Southern hemispheres (Becker et al. 2002; Finkelstein et al. 2006). In black-footed albatrosses, these were associated with an alteration of immune function (Finkelstein et al. 2007), and the levels of PCBs and DDE were considered sufficient to increase the risk of eggshell thinning and reduce egg viability (Ludwig et al. 1998).

Mercury levels in adults and chicks of some species of albatrosses and large petrels can be well above the threshold associated with toxic impacts in terrestrial birds, yet cause no obvious deleterious effects (Blevin et al. 2013). This relates to the abilities to excrete mercury into feathers during moult, and into eggs by females, and in some species to demethylate mercury to its less toxic inorganic form (which can be sequestered in internal tissues); consequently, although mercury may increase in albatrosses from hatching to recruitment, the concentration then declines to a lower, stable level once adults have established a consistent moult pattern, and hence does not correlate with age in breeding adults (Tavares et al. 2013). Similarly, the toxicity of cadmium may be reduced by binding onto protein (metallothionein), and there is no evidence that cadmium concentrations increase with age to harmful levels (Stewart and Furness 1998). By comparison, lead poisoning had an obvious deleterious effect on up to 5% of Laysan albatross chicks on Midway Atoll; however, this is an exceptional situation as the lead did not originate from prey but from ingestion of the paint used on old buildings in nesting areas (Finkelstein et al. 2003).

No published study suggests other than minor effects of oil spills on albatrosses or large petrels. Plastics have been found in their stomach contents, often mistaken for floating prey and ingested accidently, including when scavenging behind fishing vessels, or, in the North Pacific Ocean, ingested incidentally along with adhering egg masses from flying fish (Cherel and Klages 1998; Fry et al. 1987; James and Stahl 2000). Although in theory this may suppress appetite and partially or completely block the gut, there is little evidence for serious problems except possibly at the Hawaiian islands, where Laysan albatross chicks with high volumes of plastic in their proventriculus were significantly lighter at fledging (Sievert and Sileo 1993). Plastics may become contaminated by toxic substances during manufacture, and floating plastic pellets in the marine environment adsorb toxic chemicals, including POPs (Colabuono et al. 2010; Mato et al. 2001). Plastic ingestion therefore increases the likelihood of contamination, particularly for chicks that tend to accumulate plastic particles in the gut until fledging. Albatrosses and large petrels are also at risk of ingesting discarded fishing gear, including hooks and line in offal, although the amount ingested shows substantial regional variation (Nel and Nel 1999; Phillips et al. 2010; Ryan et al. 2016). A recent analysis of a 16-year dataset revealed that the amount of gear associated with wandering albatrosses was an order of magnitude higher than in other albatrosses and giant petrels, with a recent peak reflecting the adoption of a new longline system that resulted in greater discarding of hooks (Phillips et al. 2010). Despite the complete digestion of many hooks by chicks, fledging success remained high; however, whether toxic effects could be manifested after independence was unknown.

THREATS: ALIEN SPECIES AT BREEDING SITES

Impacts of alien species

Invasive alien species have had a destructive effect on wildlife worldwide, particularly birds and other fauna on islands which have not evolved effective natural defences against mammalian ground predators (Courchamp et al. 2003). The most widespread alien species with the greatest impacts on seabirds tend to be predators, but invasive herbivores and plants can cause habitat deterioration, and introduced pathogens and insect vectors can become serious problems for animal health (Courchamp et al. 2003; Frenot et al. 2005). Of the mammalian predators, the most common threats to albatrosses and large petrels at breeding sites are feral cats *Felis catus,* brown rats *Rattus norvegicus* and black rats *Rattus rattus* (Table 2).

The impacts of invasive alien mammals are highly variable. There is evidence for predation of adult Laysan albatrosses by Polynesian rats *R. exulans*, several albatross and *Procellaria* petrel species by cats, royal albatross and Westland petrel chicks by stoats *Mustela erminea*, white-capped and light-mantled albatross, and Westland and black petrel chicks by feral pigs *Sus scrofa*, and adult and young Westland and black petrels by dogs *Canus lupus familiaris* (Croxall 1991; Croxall et al. 1984; Kepler 1967; Ratz et al. 1999; Taylor 2000). Recent studies where the house mouse ~~*Mus musculus*~~ is the only introduced mammal have demonstrated predation on various albatross and petrel species at Marion and Gough islands (Cuthbert et al. 2013; Davies et al. 2016; Dilley et al. 2015; Dilley et al. 2013; Dilley et al. 2016; Wanless et al. 2009) Other introduced mammals that threaten ACAP species because of severe habitat degradation include pigs and reindeer *Rangifer tarandus* at a few sites (Table 2).

Population-level impacts of predation by alien species on albatrosses and large petrels are less common than might be anticipated. Although rat predation can cause widespread breeding failure in the burrow-nesting *Procellaria* petrels, no study has demonstrated a link between rat presence and population decline in the larger, surface-nesting albatrosses or giant petrels (Jones et al. 2008). In contrast, predation of Tristan albatross chicks by house mice at Gough Island is so common that this species, which is currently in rapid decline, would be unable to recover even if birds ceased to be killed in fisheries (Wanless et al. 2009). Although alien grazing mammals are ~~still~~ present at several breeding sites of ACAP species, the associated habitat destruction appears only to have a substantial effect on distribution and, potentially, numbers of *Procellaria* petrels.

Progress in managing alien species

Given the major problems posed by alien species, there are ongoing management regimes aimed at local control of predators, including cats, mustelids or rats, at several breeding sites, including those of Westland petrel and royal albatrosses on the South Island of New Zealand, white-chinned petrels at Possession Island, and Laysan albatross in Hawai'i (Taylor 2000; Young et al. 2013). The number of high profile campaigns to eradicate alien mammals from islands is increasing, including nine past or ongoing eradications at breeding sites of ACAP species since the first ACAP Meeting of the Parties in 2004 (Appendix E). These include the successful campaign (10 years from planning to completion, at a cost of $AUD 24 million) to eradicate European rabbits *Oryctolagus cuniculus*, black rats and house mice from Macquarie Island using a combination of rabbit calicivirus, aerial baiting, and hunting by a team with trained detector dogs. There has also been a three-phase campaign (baiting completed in March 2015) to eradicate brown rats and house mice from the 11,300 ha mainland of South Georgia, which if successful, would be by far the largest island ever cleared of rodents (Appendix E). It is important to recognise that these campaigns can result in substantial non-target mortality; >2500 birds died as a result of primary, secondary or tertiary ingestion of brodifacoum at Macquarie, including >760 northern and southern giant petrels, with substantial impacts on their local populations; however, non-target mortality was reduced by a range of mitigation measures, and it is anticipated that both populations will recover (Parks and Wildlife Service 2014). Feasibility plans have also been produced for a number of other ACAP breeding sites, and in some cases planning is well advanced and eradications are scheduled for the next few years (Appendix E).

THREATS: –PATHOGENS

The remoteness of their terrestrial breeding sites and their highly pelagic marine distributions likely shield albatrosses and large petrels from contact with pathogens in general. However, the associated immunological naivety may favour the rapid spread of pathogens should they be introduced to typically-dense breeding aggregations (Descamps et al. 2012), particularly if ongoing environmental changes increases the probability of establishment. Information on hosts, pathogens and disease epidemiology in ACAP species is incomplete, sampling is patchy in terms of geographic and species coverage, and very limited during the nonbreeding season, and there is a paucity of data on overall health and the ecological impacts of diseases. Potential pathogens have been recorded in 18 (62%) of the 29 albatrosses and large petrels (Uhart et al. 2014, Appendix C). Bacteria, viruses, protozoa, gastrointestinal parasites, ectoparasites and fungi were detected, respectively, in 7 (24%), 5 (17%), 4 (14%), 3 (10%), 13 (49%) and 1 species (3%). Seventeen different bacteria were recorded, most commonly avian cholera *Pasteurella multocida* (in four species) and *Salmonella* sp. (in two species). Only two viruses were isolated; pox viruses (in five species) and a new Phlebovirus (HIGV) in ticks from shy albatrosses. Recorded incidences reflect differences in research effort rather than environmental factors, with most studies focused on the black-browed albatross or southern giant petrel (16 and 15 papers, respectively).

The greatest risk appears to be from avian cholera~~*P. multocida*~~, which is responsible for mortality events in several seabird species in Antarctica (Leotta et al. 2001; Leotta et al. 2003), and at Amsterdam Island, where it causes recurrent reproductive failure in Indian yellow-nosed and sooty albatrosses, and could potentially spread to the small population of the endemic, critically endangered Amsterdam albatross (Rolland et al. 2009). Amongst viruses, only poxviruses have been associated with disease or death, primarily in chicks or fledglings (five ACAP species, see Appendix C). Poxvirus outbreaks seem to be recurrent at some breeding sites, and sick birds often recover from the infection (Young and VanderWerf 2008). Poxviruses and *P. multocida* are highly contagious and can be spread to remote locations by movements of animals, including scavenging birds, and human visitors. In terms of parasite infestations, only ticks and mites in black-browed and Laysan albatrosses, respectively, have been linked to disease or death (Uhart et al. 2014). However, this could change if ameliorating climatic conditions enable the establishment of insect vectors at higher latitudes.

THREATS: CLIMATE CHANGE

An increasing number of studies in recent years have focused on potential impacts of climatic variation on seabirds, including ACAP species, demonstrating effects of~~including~~ annual changes in sea surface temperature (SST) and marine productivity, and of global cycles (El Niño Southern Oscillation, North Atlantic Oscillation), ~~on~~

~~seabirds, including ACAP species~~ (for reviews see Barbraud et al. 2011; Barbraud et al. 2012; Thomson et al. 2015). On land, warmer conditions can cause heat stress in chicks, and changes in rainfall and wind patterns can increase the risk of exposure. Higher SST, especially at foraging grounds, usually has negative effects on demographic parameters, especially breeding success, although the relationships can be non-linear. In contrast, black-browed albatrosses from Kerguelen benefited from increased SST, with evidence for contrasting responses to conditions in breeding *vs* non-breeding areas~~ (Barbraud et al. 2011)~~. Although juvenile survival can be reduced under warmer conditions, there is little evidence for a comparable effect on adult survival in albatrosses and petrels. Modelling suggests that responses to future climatic change will be species-specific, with few impacts predicted for northern species but steep declines for species in the Southern Ocean as a consequence of increased SST and decreased sea ice extent.

There have been shifts in distribution and breeding phenology of seabirds in response to climate change (Peron et al. 2010a; Weimerskirch et al. 2012). For example, changes in winds pattern have modified the distribution of wandering albatrosses in the Indian Ocean, and resulted in improved body condition and breeding success. Other impacts of climate change that may be deleterious are~~include~~ changes to weather, including rainfall patterns, that could lead to increased surface erosion and loss of nesting habitat because of landslips (Ryan 1993). Sea level rise is also likely to increase susceptibility of albatross colonies on low atoll islands in the Pacific Ocean to submersion during storm events (Storlazzi et al. 2013). Warming conditions might also lead to a potential increase in risk of transmission of diseases because of greater nutritional or environmental stress in infected birds, and increasing abundance or the establishment of new vectors. Apart from the obvious global interest in minimizing climate change by reducing greenhouse gas emissions, direct impacts on land may be reduced by improving habitat management to reduce erosion, or establishment of new colonies at suitable sites by translocation or attracting recruits using decoys or tape playback (Deguchi et al. 2014).

THREAT PRIORITISATION

ACAP has adopted standardised, objective systems for the assessment of threats to albatrosses and petrels, both at sea and on land (Appendix D). On land, the threats affecting the greatest number and proportion of breeding sites, and proportion of the global population of each species, relate to habitat destruction and predation by introduced mammals, although some other threats present at just a few sites are severe (Tables 2 and 3). The two species affected at the most breeding sites awere grey petrel and white-chinned petrel, which are burrow nesting, mainly because of predation or habitat destruction by introduced mammals (Table 3). Management interventions that would remove threats were prioritised based on a score that combined vulnerability (reflecting global population size, proportion of global population and population trend at the site), threat magnitude, and likelihood of success (Table 4). The analysis was only of important global breeding sites (>1% of the global population), and scores for threats that applied to more than one species in the same area were summed. On this basis, by far the two highest priorities were on islands where there was a major threat to an endemic species or very large proportion of the global population; to eradicate house mice from Gough Island and to mitigate impacts of avian cholera at Ile Amsterdam. The scores for the other threats from alien species all differed from each other by ≤2, and were therefore in a large group considered to be Lower priority. Indicative costs are provided in Table 4 based on expert opinion, but were not used in the prioritisation process. The bulk of the costs are associated with planning and mobilisation, and hence economies of scale would be substantial if an eradication campaign targeted more than one species at the same island or island group. In most cases, there would also be value in removing introduced vertebrates from islands that were formerly occupied or stand a good chance of being colonised by species of conservation concern (Rauzon 2007; Towns and Broome 2003).

ACAP has also developed a framework for the assessment and prioritisation of at-sea (fisheries) threats. Currently, a total of 87 fisheries-seabird population combinations is identified as being of high priority for conservation action. However, many of the fisheries affect multiple seabird species and populations, and the combined list of priorities includes 28 seabird populations and 27 fisheries (Appendix F).

FUTURE CHALLENGES FOR ALBATROSS AND PETREL CONSERVATION

Despite considerable improvements in recent decades in knowledge of ecology, distribution, population sizes and demography of albatrosses and large petrels, many gaps remain. These gaps include information on population size, trends and threats at major breeding sites, and on at-sea distributions and levels of interaction with fisheries of immature birds, and of adults during the nonbreeding season. Although conservation management has been better targeted in recent years, these species still face a wide range of often very serious threats in marine and terrestrial environments. To address the most pervasive threat - bycatch - will require wider and more effective implementation and, in some cases, further development of best-practice mitigation measures in national (particularly gillnet, trawl and artisanal) and international fisheries (particularly pelagic longline), and much better information on bycatch rates and levels of compliance. More research is required on the effects of introduced vertebrates on burrow-nesting petrels and other less easily-observed species. Although there have been successful, high-profile eradications of alien species from islands in recent years, and further campaigns are planned or warranted, there remains a need for better representation of the underlying science in the peer-reviewed literature in order to improve methodologies, reduce risk of failure, and minimise the poisoning of non-target species (Phillips 2010). Other threats that require more research to better understand current effects and predict future impacts include those from oceanographic and other changes in the wider ecosystem (requiring more data on diet, distribution and demography), infectious diseases (including the establishment of systematic monitoring to determine baseline occurrence of pathogenic organisms) and pollutants. Allocating more resources to research and to advocating for improved management and monitoring of fisheries and other threats may provide the only means of securing a positive future for albatrosses and large petrels.

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References

Agreement on the Conservation of Albatrosses and Petrels, 2001. Australian Treaty Series [2004] ATS 5. Drafted at Canberra on 19 June 2001, entered into force generally 1 February 2004.

Alderman, R., Gales, R., Hobday, A.J., Candy, S.G., 2010. Post-fledging survival and dispersal of shy albatross from three breeding colonies in Tasmania. Marine Ecology Progress Series 405, 271-285.

Alderman, R., Gales, R., Tuck, G.N., Lebreton, J.D., 2011. Global population status of shy albatross and an assessment of colony-specific trends and drivers. Wildlife Research 38, 672-686.

Alfaro Shigueto, J., Mangel, J., Valenzuela, K., Arias-Schreiber, M., 2016. The intentional harvest of waved albatrosses *Phoebastria irrorata* by small-scale offshore fishermen from Salaverry port, Peru. Pan-American Journal of Aquatic Sciences 11, 70-77.

Anderson, D.J., Huyvaert, K.P., Awkerman, J.A., Proaño, C.B., Milstead, W.B., Jiménez-Uzcátegui, G., Cruz, S., Grace, J.K., 2008. Population status of the Critically Endangered waved albatross *Phoebastria irrorata*, 1999 to 2007. Endangered Species Research 5, 185-192.

Anderson, O.R., Small, C.J., Croxall, J.P., Dunn, E.K., Sullivan, B.J., Yates, O., Black, A.D., 2011. Global seabird bycatch in longline fisheries. Endangered Species Research 14, 91-106.

Anderson, O.R.J., Phillips, R.A., McDonald, R.A., Shore, R.F., McGill, R.A.R., Bearhop, S., 2009. Influence of trophic position and foraging range on mercury levels within a seabird community. Marine Ecology Progress Series 375, 277-288.

Anderson, O.R.J., Phillips, R.A., Shore, R.F., McGill, R.A.R., McDonald, R.A., Bearhop, S., 2010. Element patterns in albatrosses and petrels: Influence of trophic position, foraging range, and prey type. Environmental Pollution 158, 98-107.

Arnold, J.M., Brault, S., Croxall, J.P., 2006. Albatross population in peril: a population trajectory for Black-browed Albatrosses at South Georgia. Ecological Applications 16, 419-432.

Baker, G.B., Double, M.C., Gales, R., Tuck, G.N., Abbott, C.L., Ryan, P.G., Petersen, S.L., Robertson, C.J.R., Alderman, R., 2007. A global assessment of the impact of fisheries-related mortality on shy and white-capped albatrosses: Conservation implications. Biological Conservation 137, 319-333.

Barbraud, C., Rivalan, P., Inchausti, P., Nevoux, M., Rolland, V., Weimerskirch, H., 2011. Contrasted demographic responses facing future climate change in Southern Ocean seabirds. Journal of Animal Ecology 80, 89-100.

Barbraud, C., Rolland, V., Jenouvrier, S., Nevoux, M., Delord, K., Weimerskirch, H., 2012. Effects of climate change and fisheries bycatch on Southern Ocean seabirds: a review. Marine Ecology Progress Series 454, 285-307.

Bartle, J.A., 1990. Sexual segregation of foraging zones in procellariiform birds: implications of accidental capture on commercial fishery longlines of grey petrels (*Procellaria cinerea*). Notornis 37, 146-150.

Becker, P.H., Gonzalez-Solis, J., Behrends, B., Croxall, J., 2002. Feather mercury levels in seabirds at South Georgia: influence of trophic position, sex and age. Marine Ecology Progress Series 243, 261-269.

BirdLife International, 2015. The BirdLife checklist of the birds of the world, with conservation status and taxonomic sources. BirdLife International, Cambridge.

Blevin, P., Carravieri, A., Jaeger, A., Chastel, O., Bustamante, P., Cherel, Y., 2013. Wide range of mercury contamination in chicks of Southern Ocean seabirds. PLoS ONE 8, e54508.

Bourne, W.R.P., Warham, J., 1966. Geographical variation in giant petrels of the genus *Macronectes*. Ardea 54, 45-67.

Brooke, M.d.L., 2004. Albatrosses and petrels across the world. Oxford University Press, Oxford.

Brothers, N., 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. Biological Conservation 55, 255-268.

Brothers, N., Duckworth, A.R., Safina, C., Gilman, E.L., 2010. Seabird bycatch in pelagic longline fisheries is grossly underestimated when using only haul data. PLoS ONE 5, e12491.

Brothers, N., Gales, R., Reid, T., 1999a. The influence of environmental variables and mitigation measures on seabird catch rates in the Japanese tuna longline fishery within the Australian Fishing Zone, 1991-1995. Biological Conservation 88, 85-101.

Brothers, N.P., Cooper, J., Løkkeberg, S., 1999b. The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation. FAO Fisheries Circular No. 937. Food and Agriculture Organisation of the United Nations, Rome.

Brown, R.M., Techow, N.M.S.M., Wood, A.G., Phillips, R.A., 2015. Hybridization and Back-Crossing in Giant Petrels (*Macronectes giganteus* and *M. halli*) at Bird Island, South Georgia, and a summary of hybridization in seabirds. PLoS ONE 10, e0121688.

Bugoni, L., Griffiths, K., Furness, R.W., 2011. Sex-biased incidental mortality of albatrosses and petrels in longline fisheries: differential distributions at sea or differential access to baits mediated by sexual size dimorphism? Journal of Ornithology 152, 261-268.

Bugoni, L., Neves, T.S., Leite, N.O.J., Carvalho, D., Sales, G., Furness, R.W., Stein, C.E., Peppes, F.V., Giffoni, B.B., Monteiro, D.S., 2008. Potential bycatch of seabirds and turtles in hook-and-line fisheries of the Itaipava Fleet, Brazil. Fisheries Research 90, 217-224.

Bull, L.S., 2007. Reducing seabird bycatch in longline, trawl and gillnet fisheries. Fish and Fisheries 8, 31-56.

Bull, L.S., 2009. New mitigation measures reducing seabird by-catch in trawl fisheries. Fish and Fisheries 10, 408-427.

Burg, T.M., Croxall, J.P., 2001. Global relationships amongst black-browed and grey-headed albatrosses: analysis of population structure using mitochondrial DNA and microsatellites. Molecular Ecology 10, 2647-2660.

Burg, T.M., Croxall, J.P., 2004. Global population structure and taxonomy of the wandering albatross species complex. Molecular Ecology 13, 2345-2355.

Chambers, G.K., Moeke, C., Steel, R., Trueman, J.W.H., 2009. Phylogenetic analysis of the 24 named albatross taxa based on full mitochondrial cytochrome b DNA sequences. Notornis 56, 82-94.

Cherel, Y., Klages, N., 1998. A review of the food of albatrosses, In Albatross biology and conservation. eds G. Robertson, R. Gales. Surrey Beatty, Chipping Norton.

Christidis, L., Boles, W.E., 2008. Systematics and Taxonomy of Australian Birds. CSIRO Publishing, Melbourne.

Colabuono, F.I., Taniguchi, S., Montone, R.C., 2010. Polychlorinated biphenyls and organochlorine pesticides in plastics ingested by seabirds. Marine Pollution Bulletin 60, 630-634.

Cooper, J., Baker, G.B., Double, M.C., Gales, R., Papworth, W., Tasker, M.L., Waugh, S.M., 2006. The Agreement on the Conservation of Albatrosses and Petrels: rationale, history, progress and the way forward. Marine Ornithology 34, 1-5.

Cossa, D., Heimbuerger, L.-E., Lannuzel, D., Rintoul, S.R., Butler, E.C.V., Bowie, A.R., Averty, B., Watson, R.J., Remenyi, T., 2011. Mercury in the Southern Ocean. Geochimica Et Cosmochimica Acta 75, 4037-4052.

Courchamp, F., Chapuis, J.-L., Pascal, M., 2003. Mammal invaders on islands: impact, control and control impact. Biological Reviews 78, 347-383.

Croxall, J.P., 1991. Seabird status and conservation: a supplement. International Council for Bird Preservation, Cambridge.

Croxall, J.P., 2008. The role of science and advocacy in the conservation of Southern Ocean albatrosses at sea. Bird Conservation International 18, S13-S29.

Croxall, J.P., Butchart, S.H.M., Lascelles, B., Stattersfield, A.J., Sullivan, B., Symes, A., Taylor, P., 2012. Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International 22, 1-34.

Croxall, J.P., Evans, P.G.H., Schreiber, R.W., 1984. Status and conservation of the World's seabirds. International Council for Bird Preservation, Cambridge.

Croxall, J.P., Prince, P.A., 1990. Recoveries of wandering albatrosses *Diomedea exulans* ringed at South Georgia 1958-1986. Ringing and Migration 11, 43-51.

Croxall, J.P., Rothery, P., 1991. Population regulation of seabirds: implications of their demography for conservation, In Bird Population Studies: Relevance to conservation and management. eds C.M. Perrins, J.D. Lebreton, G.J.M. Hirons, pp. 272-296. Oxford University Press, New York.

Croxall, J.P., Silk, J.R.D., Phillips, R.A., Afanasyev, V., Briggs, D.R., 2005. Global circumnavigations: Tracking year-round ranges of nonbreeding albatrosses. Science 307, 249-250.

Cuthbert, R., Hilton, G.D., Ryan, P.G., Tuck, G.N., 2005. At-sea distribution of breeding Tristan albatrosses *Diomedea dabbenena* and potential interactions with pelagic longline fishing in the South Atlantic Ocean. Biological Conservation 121, 345-355.

Cuthbert, R.J., Louw, H., Parker, G., Rexer-Huber, K., Visser, P., 2013. Observations of mice predation on dark-mantled sooty albatross and Atlantic yellow-nosed albatross chicks at Gough Island. Antarctic Science 25, 763-766.

Davies, D., Dilley, B.J., Bond, A.L., Cuthbert, R.J., Ryan, P.G., 2016. Trends and tactics of mouse predation on Tristan Albatross *Diomedea dabbenena* chicks at Gough Island, South Atlantic Ocean. Avian Conservation and Ecology.

De Grissac, S., Börger, L., Guitteaud, A., Weimerskirch, H., 2016. Contrasting movement strategies among juvenile albatrosses and petrels. Scientific Reports 6.

Deguchi, T., Suryan, R.M., Ozaki, K., Jacobs, J.F., Sato, F., Nakamura, N., Balogh, G.R., 2014. Translocation and hand-rearing of the short-tailed albatross *Phoebastria albatrus*: early indicators of success for species conservation and island restoration. Oryx 48, 195-203.

Delord, K., Cotté, C., Péron, C., Marteau, C., Pruvost, P., Gasco, N., Duhamel, G., Cherel, Y., Weimerskirch, H., 2010. At-sea distribution and diet of an endangered top predator: relationship between White-chinned Petrels and commercial longline fisheries. Endangered Species Research 13, 1-16.

Delord, K., Gasco, N., Weimerskirch, H., Barbraud, C., Micol, T., 2005. Seabird mortality in the Patagonian toothfish longline fishery around Crozet and Kerguelen Islands, 2001-2003. CCAMLR Science 12, 53-80.

Descamps, S., Jenouvrier, S., Gilchrist, H.G., Forbes, M.R., 2012. Avian cholera, a threat to the viability of an Arctic seabird colony. PLoS ONE 7, e29659.

Dias, M.P., Lascelles, B., Small, C., Phillips, R.A., 2014. Seabird Tracking Data – Gap Analysis, In Second Meeting of the Population and Conservation Status Working Group. Agreement on the Conservation of Albatrosses and Petrels, Punta del Este, Uruguay.

Dilley, B.J., Davies, D., Bond, A.L., Ryan, P.G., 2015. Effects of mouse predation on burrowing petrel chicks at Gough Island. Antarctic Science 27, 543-553.

Dilley, B.J., Davies, D., Connan, M., Cooper, J., De Villiers, M., Swart, L., Vandenabeele, S., Ropert-Coudert, Y., Ryan, P.G., 2013. Giant petrels as predators of albatross chicks. Polar Biology 36, 761-766.

Dilley, B.J., Schoombie, S., Schoombie, J., Ryan, P.G., 2016. 'Scalping' of albatross fledglings by introduced mice spreads rapidly at Marion Island. Antarctic Science 28, 73-80.

Dillingham, P.W., Fletcher, D., 2011. Potential biological removal of albatrosses and petrels with minimal demographic information. Biological Conservation 144, 1885-1894.

Double, M.C., Gales, R., Reid, T., Brothers, N., Abbott, C.L., 2003. Morphometric comparison of Australian shy and New Zealand white-capped albatrosses. Emu 103, 287-294.

FAO, 2008. Report of the Expert Consultation on Best Practice Technical Guidelines for IPOA/NPOA–Seabirds. Bergen Norway, 2–5 September 2008, In FAO Fisheries and Aquaculture Report. FAO, Rome.

Favero, M., Blanco, G., Copello, S., Seco Pon, J.P., Patterlini, C., Mariano-Jelicich, R., Garcia, G., Paula Beron, M., 2013. Seabird bycatch in the Argentinean demersal longline fishery, 2001-2010. Endangered Species Research 19, 187-199.

Favero, M., Blanco, G., García, G., Copello, S., Seco Pon, J.P., Frere, E., Quintana, F., Yorio, P., Rabuffetti, F., Cañete, G., Gandini, M., 2010. Seabird mortality associated with ice trawlers in the Patagonian shelf: effect of discards on the occurance of interactions with fishing gear. Animal Conservation 14, 131-139.

Finkelstein, M., Keitt, B.S., Croll, D.A., Tershy, B., Jarman, W.M., Rodriguez-Pastor, S., Anderson, D.J., Sievert, P.R., Smith, D.R., 2006. Albatross species demonstrate regional differences in North Pacific marine contamination. Ecological Applications 16, 678-686.

Finkelstein, M.E., Grasman, K.A., Croll, D.A., Tershy, B.R., Keitt, B.S., Jarman, W.M., Smith, D.R., 2007. Contaminant-associated alteration of immune function in black-footed albatross (*Phoebastria nigripes*), a North Pacific predator. Environmental Toxicology and Chemistry 26, 1896-1903.

Finkelstein, M.E., Gwiazda, R.H., Smith, D.R., 2003. Lead poisoning of seabirds: Environmental risks from leaded paint at a decommissioned military base. Environmental Science & Technology 37, 3256-3260.

Finkelstein, M.E., Wolf, S., Goldman, M., Doak, D.F., Sievert, P.R., Balogh, G., Hasegawa, H., 2010. The anatomy of a (potential) disaster: Volcanoes, behavior, and population viability of the short-tailed albatross (*Phoebastria albatrus*). Biological Conservation 143, 321-331.

Frenot, Y., Chown, S.L., Whinam, J., Selkirk, P.M., Convey, P., Skotnicki, M., Bergstrom, D.M., 2005. Biological invasions in the Antarctic: extent, impact and implications. Biological Reviews 80, 45-72.

Fry, D.M., Fefer, S.I., Sileo, L., 1987. Ingestion of plastic debris by Laysan albatrosses and wedge-tailed shearwaters in the Hawaiian Islands. Marine Pollution Bulletin 18, 339-343.

Gales, R., 1998. Albatross populations: status and threats, In Albatross biology and conservation. eds G. Robertson, R. Gales, pp. 20-45. Surrey Beatty and Sons, Chipping Norton.

Gales, R., Brothers, N., Reid, T., 1998. Seabird mortality in the Japanese tuna longline fishery around Australia. Biological Conservation 86, 37-56.

Gill, F., Donsker, D.E., 2016. IOC World Bird List (v 6.2), http://www.worldbirdnames.org/.

Gilman, E., Passfield, K., Nakamura, K., 2014. Performance of regional fisheries management organizations: ecosystem-based governance of bycatch and discards. Fish and Fisheries 15, 327-351.

Gómez Laich, A.G., Favero, M., Mariano-Jelicich, R., Blanco, G., Cañete, G., Arias, A., Rodriguez, P.S., Brachetta, H., 2006. Environmental and operational variability affecting the mortality of Black-browed Albatrosses associated with long-liners in Argentina. Emu 106, 21-28.

González-Solís, J., Croxall, J.P., Wood, A.G., 2000. Sexual size dimorphism and sexual segregation in foraging strategies of northern giant petrels, *Macronectes halli*, during incubation. Oikos 90, 390-398.

Gutowsky, S.E., Tremblay, Y., Kappes, M.A., Flint, E.N., Klavitter, J., Laniawe, L., Costa, D.P., Naughton, M.B., Romano, M.D., Shaffer, S.A., 2014. Divergent post-breeding distribution and habitat associations of fledgling and adult Black-footed Albatrosses *Phoebastria nigripes* in the North Pacific. Ibis 156, 60-72.

Harwani, S., Henry, R.W., Rhee, A., Kappes, M.A., Croll, D.A., Petreas, M., Park, J.-S., 2011. Legacy and contemporary persistent organic pollutants in North Pacific albatross. Environmental Toxicology and Chemistry 30, 2562-2569.

Hedd, A., Gales, R., Brothers, N., Robertson, G., 1997. Diving behaviour of the shy albatross *Diomedea cauta* in Tasmania: initial findings and dive recorder assessment. Ibis 139, 452-460.

Helbig, A.J., Knox, A.K., Parkin, D.T., Sangster, G., Collinson, M., 2002. Guidelines for assigning species rank. Ibis 144, 518-525.

Inchausti, P., Weimerskirch, H., 2001. Risks of decline and extinction of the endangered Amsterdam albatross and the projected impact of long-line fisheries. Biological Conservation 100, 377-386.

James, G.D., Stahl, J.C., 2000. Diet of southern Buller's albatross (*Diomedea bulleri bulleri*) and the importance of fishery discards during chick rearing. New Zealand Journal of Marine and Freshwater Research 34, 435-454.

Jimenez, S., Domingo, A., Abreu, M., Brazeiro, A., 2011. Structure of the seabird assemblage associated with pelagic longline vessels in the southwestern Atlantic: implications for bycatch. Endangered Species Research 15, 241-241.

Jimenez, S., Domingo, A., Abreu, M., Brazeiro, A., 2012a. Bycatch susceptibility in pelagic longline fisheries: are albatrosses affected by the diving behaviour of medium-sized petrels? Aquatic Conservation-Marine and Freshwater Ecosystems 22, 436-445.

Jimenez, S., Domingo, A., Abreu, M., Brazeiro, A., 2012b. Risk assessment and relative impact of Uruguayan pelagic longliners on seabirds. Aquatic Living Resources 25, 281-295.

Jones, H.P., Tershy, B.R., Zavaleta, E.S., Croll, D.A., Keitt, B.S., Finkelstein, M.E., Howald, G.R., 2008. Severity of the effects of invasive rats on seabirds: a global review. Conservation Biology 22, 16-26.

Kepler, C.B., 1967. Polynesian rat predation on nesting Laysan Albatrosses and other Pacific seabirds. The Auk 84, 426-430.

Klaer, N., Polacheck, T., 1998. The influence of environmental factors and mitigation measures on by-catch rates of seabirds by Japanese longline fishing vessels in the Australian region. Emu 98, 305-316.

Klaer, N.L., 2012. Estimates of total seabird bycatch by Atlantic pelagic longline fisheries from 2003 to 2006. Marine Fisheries Review 74, 14-20.

Landers, T.J., Rayner, M.J., Phillips, R.A., Hauber, M.E., 2011. Dynamics of seasonal movements by a trans-Pacific migrant, the Westland petrel *Procellaria westlandica*. Condor 113, 71-79.

Leotta, G., Cerda, R., Coria, N., Montalti, D., 2001. Preliminary studies on some avian diseases in Antarctic birds. Polish Polar Research 22, 227-231.

Leotta, G.A., Rivas, M., Chinen, I., Vigo, G.B., Moredo, F.A., Coria, N., Wolcott, M.J., 2003. Avian cholera in a southern giant petrel (*Macronectes giganteus*) from Antarctica. Journal of Wildlife Diseases 39, 732-735.

Løkkeborg, S., 2011. Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries-efficiency and practical applicability. Marine Ecology Progress Series 435, 285-303.

Ludwig, J.P., Summer, C.L., Auman, H.J., Gauger, V., Bromley, D., Giesy, J.P., Rolland, R., Colborn, T., 1998. The roles of organochlorine contaminants and fisheries bycatch in recent population changes of black-footed and Laysan albatrosses in the North Pacific Ocean, In Albatross Biology and Conservation. eds G. Robertson, R. Gales. Surrey Beatty & Sons, Chipping Norton.

Mackley, E.K., Phillips, R.A., Silk, J.R.D., Wakefield, E.D., Afanasyev, V., Fox, A.D., Furness, R.W., 2010. Free as a bird? Activity patterns of albatrosses during the nonbreeding period. Marine Ecology Progress Series 406, 291-303.

Maree, B.A., Wanless, R.M., Fairweather, T.P., Sullivan, B.J., Yates, O., 2014. Significant reductions in mortality of threatened seabirds in a South African trawl fishery. Animal Conservation 17, 520-529.

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C., Kaminuma, T., 2001. Plastic resin pellets as a transport medium for toxic chemicals in the marine environment. Environmental Science & Technology 35, 318-324.

Melvin, E.F., Dietrich, K.S., Fitzgerald, S., Cardoso, T., 2011. Reducing seabird strikes with trawl cables in the pollock catcher-processor fleet in the eastern Bering Sea. Polar Biology 34, 215-226.

Melvin, E.F., Guy, T.J., Read, L.B., 2014. Best practice seabird bycatch mitigation for pelagic longline fisheries targeting tuna and related species. Fisheries Research 149, 5-18.

Melvin, E.F., Parrish, J.K., Conquest, L.L., 1999. Novel tools to reduce seabird bycatch in coastal gillnet fisheries. Conservation Biology 13, 1386-1397.

Mills, M.S.L., Ryan, P.G., 2005. Modelling impacts of long-line fishing: what are the effects of pair-bond disruption and sex-biased mortality on albatross fecundity? Animal Conservation 8, 359-367.

Moloney, C.L., Cooper, J., Ryan, P.G., Siegfried, W.R., 1994. Use of a population model to assess the impact of longline fishing on Wandering Albatross *Diomedea exulans* populations. Biological Conservation 70, 195-203.

Murray, T.E., Bartle, J.A., Kalish, S.R., Taylor, P.R., 1993. Incidental capture of seabirds by Japanese southern bluefin tuna long line vessels in New Zealand waters, 1988-1992. Bird Conservation International 3, 181-210.

Nel, D.C., Nel, J.L., 1999. Marine debris and fishing gear associated with seabirds at sub-Antarctic Marion Island, 1997/97 and 1997/98: in relation to longline fishing activity. CCAMLR Science 6, 85-96.

Nel, D.C., Ryan, P.G., Nel, J.L., Klages, N.T.W., Wilson, R.P., Robertson, G., 2002a. Foraging interactions between wandering albatrosses *Diomedea exulans* breeding on Marion Island and long-line fisheries in the southern Indian Ocean. Ibis 144(on-line), E141-E154.

Nel, D.C., Ryan, P.G., Watkins, B.P., 2002b. Seabird mortality in the Patagonian toothfish longline fishery around the Prince Edward Islands, 1996-2000. Antarctic Science 14, 151-161.

Nicholls, D.G., Robertson, C.J.R., Prince, P.A., Murray, M.D., Walker, K.J., Elliott, G.P., 2002. Foraging niches of three *Diomedea* albatrosses. Marine Ecology Progress Series 231, 269-277.

Nriagu, J.O., Pacyna, J.M., 1988. Quantitative assessment of worldwide contamination of air, water and soils by trace metals. Nature 333, 134-139.

Nunn, G.B., Cooper, J., Jouventin, P., Robertson, C.J.R., Robertson, G.G., 1996. Evolutionary relationships among extant albatrosses (Procellariiformes: Diomedeidae) established from complete Cytochrome-B gene sequences. Auk 113, 784-801.

Nunn, G.B., Stanley, S.E., 1998. Body size effects and rates of cytochrome b evolution in tube-nosed seabirds. Molecular Biology & Evolution 15, 1360-1371.

Onley, D., Scofield, P., 2007. Albatrosses, Petrels and Shearwaters of the World. Christopher Helm, London.

Parks and Wildlife Service, 2014. Evaluation Report: Macquarie Island Pest Eradication Project, August 2014.

Penhallurick, J., 2012. The number of albatross (Diomedeidae) species. The Open Ornithology Journal 5, 32-41.

Penhallurick, J., Wink, M., 2004. Analysis of the taxonomy and nomenclature of the Procellariiformes based on complete nucleotide sequences of the mitochondrial cytochrome *b* gene. Emu 104, 125-147.

Peron, C., Authier, M., Barbraud, C., Delord, K., Besson, D., Weimerskirch, H., 2010a. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16, 1895-1909.

Peron, C., Delord, K., Phillips, R.A., Charbonnier, Y., Marteau, C., Louzao, M., Weimerskirch, H., 2010b. Seasonal variation in oceanographic habitat and behaviour of white-chinned petrels *Procellaria aequinoctialis* from Kerguelen Island. Marine Ecology Progress Series 416, 267-288.

Phalan, B., Phillips, R.A., Silk, J.R.D., Afanasyev, V., Fukuda, A., Fox, J., Catry, P., Higuchi, H., Croxall, J.P., 2007. Foraging behaviour of four albatross species by night and day. Marine Ecology Progress Series 340, 271-286.

Phillips, R.A., 2010. Eradications of invasive mammals from islands: why, where, how and what next? Emu 110, i-vii.

Phillips, R.A., Ridley, C., Reid, K., Pugh, P.J.A., Tuck, G.N., Harrison, N., 2010. Ingestion of fishing gear and entanglements of seabirds: monitoring and implications for management. Biological Conservation 143, 501-512.

Phillips, R.A., Silk, J.R.D., Croxall, J.P., 2005a. Foraging and provisioning strategies of the light-mantled sooty albatross at South Georgia: competition and co-existence with sympatric pelagic predators. Marine Ecology Progress Series 285, 259-270.

Phillips, R.A., Silk, J.R.D., Croxall, J.P., Afanasyev, V., 2006. Year-round distribution of white-chinned petrels from South Georgia: relationships with oceanography and fisheries. Biological Conservation 129, 336-347.

Phillips, R.A., Silk, J.R.D., Croxall, J.P., Afanasyev, V., Bennett, V.J., 2005b. Summer distribution and migration of nonbreeding albatrosses: individual consistencies and implications for conservation. Ecology 86, 2386-2396.

Phillips, R.A., Silk, J.R.D., Phalan, B., Catry, P., Croxall, J.P., 2004. Seasonal sexual segregation in two *Thalassarche* albatrosses: competitive exclusion, reproductive role specialization or foraging niche divergence? Proceedings of the Royal Society, London B 271, 1283-1291.

Pierre, J.P., Abraham, E.R., Richard, Y., Cleal, J., Middleton, D.A.J., 2012. Controlling trawler waste discharge to reduce seabird mortality. Fisheries Research 131, 30-38.

Poncet, S., Robertson, G., Phillips, R.A., Lawton, K., Phalan, B., Trathan, P.N., Croxall, J.P., 2006. Status and distribution of wandering, black-browed and grey-headed albatrosses breeding at South Georgia. Polar Biology 29, 772-781.

Prince, P.A., Huin, N., Weimerskirch, H., 1994a. Diving depths of albatrosses. Antarctic Science 6, 353-354.

Prince, P.A., Rothery, P., Croxall, J.P., Wood, A.G., 1994b. Population dynamics of black-browed and grey-headed albatrosses *Diomedea melanophris* and *D. chrysostoma* at Bird Island, South Georgia. Ibis 136, 50-71.

Ratz, H., Moller, H., Fletcher, D., 1999. Predator identification from bite marks on penguin and albatross chicks. Marine Ornithology 27, 149-156.

Rauzon, M.J., 2007. Island restoration: exploring the past, anticipating the future. Marine Ornithology 35, 97-107.

Reid, T., Yates, O., Crofts, S., 2006. Interactions between seabirds and jigging vessels in the Falkland Islands and on the high seas. Falklands Conservation, Stanley.

Rheindt, F.E., Austin, J.J., 2005. Major analytical and conceptual shortcomings in a recent taxonomic revision of the Procellariiformes - a reply to Penhallurick and Wink (2004). Emu 105, 181-186.

Richard, Y., Abraham, E., 2014. Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006-07 to 2012-13, Wellington, New Zealand.

Riget, F., Bignert, A., Braune, B., Stow, J., Wilson, S., 2010. Temporal trends of legacy POPs in Arctic biota, an update. Science of the Total Environment 408, 2874-2884.

Rivalan, P., Barbraud, C., Inchausti, P., Weimerskirch, H., 2010. Combined impacts of longline fisheries and climate on the persistence of the Amsterdam Albatross *Diomedia* (sic) *amsterdamensis* Ibis 152, 6-18.

Robertson, C.J., Nunn, G.B., 1998. Towards a new taxonomy for albatrosses, In Albatross biology and conservation. eds G. Robertson, R. Gales, pp. 13-19. Surrey Beatty & Sons, Chipping Norton.

Robertson, G., Candy, S.G., Hall, S., 2013. New branch line weighting regimes to reduce the risk of seabird mortality in pelagic longline fisheries without affecting fish catch. Aquatic Conservation-Marine and Freshwater Ecosystems 23, 885-900.

Robertson, G., Moreno, C., Arata, J.A., Candy, S.G., Lawton, K., Valencia, J., Wienecke, B., Kirkwood, R., Taylor, P., Suazo, C.G., 2014. Black-browed albatross numbers in Chile increase in response to reduced mortality in fisheries. Biological Conservation 169, 319-333.

Rolland, V., Barbraud, C., Weimerskirch, H., 2009. Assessing the impact of fisheries, climate and disease on the dynamics of the Indian yellow-nosed albatross. Biological Conservation 142, 1084-1095.

Rolland, V., Weimerskirch, H., Barbraud, C., 2010. Relative influence of fisheries and climate on the demography of four albatross species. Global Change Biology 16, 1910-1922.

Rollinson, D.P., Dilley, B.J., Ryan, P.G., 2014. Diving behaviour of white-chinned petrels and its relevance for mitigating longline bycatch. Polar Biology 37, 1301-1308.

Ryan, P., 1993. The ecological consequences of an exceptional rainfall event at Gough Island. South African Journal of Science 89, 309-311.

Ryan, P.G., 1998. The taxonomic and conservation status of the Spectacled Petrel Procellaria conspicillata. Bird Conservation International 8, 223-235.

Ryan, P.G., de Bruyn, P.N., Bester, M.N., 2016. Regional differences in plastic ingestion among Southern Ocean fur seals and albatrosses. Marine Pollution Bulletin 104, 207-210.

Ryan, P.G., Dilley, B.J., Jones, M.G.W., 2012. The distribution and abundance of White-chinned Petrels (*Procellaria aequinoctialis*) breeding at the sub-Antarctic Prince Edward Islands. Polar Biology 35, 1851-1859.

Ryan, P.G., Jones, M.G.W., Dyer, B.M., Upfold, L., Crawford, R.J.M., 2009. Recent population estimates and trends in numbers of albatrosses and giant petrels breeding at the sub-Antarctic Prince Edward Islands. African Journal of Marine Science 31, 409-417.

Ryan, P.G., Ronconi, R.A., 2011. Continued increase in numbers of spectacled petrels *Procellaria conspicillata*. Antarctic Science 23, 332-336.

Shirihai, H., 2002. The complete guide to Antarctic wildlife. Princeton University Press, Oxford.

Sievert, P.R., Sileo, L., 1993. The effects of ingested plastic on growth and survival of albatross chicks, In The status, ecology, and conservation of marine birds of the North Pacific. eds K. Vermeer, K.T. Briggs, K.H. Morgan, D. Siegel-Causey, pp. 212-217. Canadian Wildlife Service Special Publication, Ottawa.

Small, C., Waugh, S.M., Phillips, R.A., 2013. The justification, design and implementation of Ecological Risk Assessments of the effects of fishing on seabirds. Marine Policy 37, 192-199.

Spear, L.B., Ainley, D.G., Webb, S.W., 2003. Distribution, abundance and behaviour of Buller's, Chatham Island and Salvin's albatrosses off Chile and Peru. Ibis 145, 253-269.

Stewart, F.M., Furness, R.W., 1998. The influence of age on cadmium concentrations in seabirds. Environmental Monitoring and Assessment 50, 159-171.

Stewart, F.M., Phillips, R.A., Bartle, J.A., Craig, J., Shooter, D., 1999. The influence of phylogeny, diet, moult and sex on heavy metal concentrations in New Zealand Procellariiformes. Marine Ecology Progress Series 178, 295-305.

Storlazzi, C.D., Berkowitz, P., Reynolds, M.H., Logan, J.B., 2013. Forecasting the impact of storm waves and sea-level rise on Midway Atoll and Laysan Island within the Papahānaumokuākea Marine National Monument—a comparison of passive versus dynamic inundation models. US Geological Survey.

Streets, D.G., Zhang, Q., Wu, Y., 2009. Projections of global mercury emissions in 2050. Environmental Science & Technology 43, 2983-2988.

Sullivan, B.J., Brickle, P., Reid, T.A., Bone, D.G., Middleton, D.A.J., 2006a. Mitigation of seabird mortality on factory trawlers: trials of three devices to reduce warp cable strikes. Polar Biology 29, 745-753.

Sullivan, B.J., Kibel, P., Robertson, G., Kibel, B., Goren, M., Candy, S.G., Wienecke, B., 2012. Safe Leads for safe heads: safer line weights for pelagic longline fisheries. Fisheries Research 134, 125-132.

Sullivan, B.J., Reid, T.A., Bugoni, L., 2006b. Seabird mortality on factory trawlers in the Falkland Islands and beyond. Biological Conservation 131, 495-504.

Tasker, M.L., Camphuysen, C.J., Cooper, J., Garthe, S., Montevecchi, W.A., Blaber, S.J.M., 2000. The impacts of fishing on marine birds. ICES Journal of Marine Science 57, 531-547.

Tavares, S., Xavier, J.C., Phillips, R.A., Pereira, M.E., Pardal, M.A., 2013. Influence of age, sex and breeding status on mercury accumulation patterns in the wandering albatross *Diomedea exulans*. Environmental Pollution 181, 315-320.

Taylor, G.A., 2000. Action plan for seabird conservation in New Zealand. Part A: threatened seabirds, In Threatened Species Occasional Publication No. 16. p. 236. Department of Conservation, Wellington.

Techow, N., Ryan, P.G., O'Ryan, C., 2009. Phylogeography and taxonomy of White-chinned and Spectacled Petrels. Molecular Phylogenetics and Evolution 52, 25-33.

Tennyson, A.J.D., 2010. Procellariiformes, Sphenisciformes, In Checklist of the Birds of New Zealand, Norfolk and Macquarie Islands, and the Ross Dependency, Antarctica (4th ed.). eds B.J. Gill, B.D. Bell, G.K. Chambers, D.G. Medway, R.L. Palma, R.P. Scofield, A.J.D. Tennyson, T.H. Worthy. Te Papa Press, Wellington.

Thomson, R.B., Alderman, R.L., Tuck, G.N., Hobday, A.J., 2015. Effects of Climate Change and Fisheries Bycatch on Shy Albatross (*Thalassarche cauta*) in Southern Australia. PLoS ONE 10, e0127006.

Torres, L.G., Sagar, P.M., Thompson, D.R., Phillips, R.A., 2013. Scaling down the analysis of seabird-fishery interactions. Marine Ecology Progress Series 473, 275-289.

Towns, D.R., Broome, K.G., 2003. From small Maria to massive Campbell: forty years of rat eradications from New Zealand islands. New Zealand Journal of Zoology 30, 377-398.

Tuck, G.N., 2011. Are bycatch rates sufficient as the principal fishery performance measure and method of assessment for seabirds? Aquatic Conservation: Marine and Freshwater Ecosystems 21, 412-422.

Tuck, G.N., Phillips, R.A., Small, C., Thompson, R.B., Klaer, N.L., Taylor, F., Wanless, R.M., Arrizabalaga, H., 2011. An assessment of seabird-fishery interactions in the Atlantic Ocean. ICES Journal of Marine Science 68, 1628-1637.

Uhart, M., Gallo, L., Quintana, F., 2014. Progress on updated review of pathogens described in ACAP species, p. 33, Punta del Este, Uruguay. http://www.acap.aq/en/working-groups/population-and-conservation-status-working-group/population-and-conservation-status-wg-meeting-2/pacswg2-meeting-documents.

Véran, S., Giminez, O., Flint, E.N., Kendall, W.L., Doherty, P.F.J., Lebreton, J.D., 2007. Quantifying the impact of longline fisheries on adult survival in the black-footed albatross. Journal of Applied Ecology 44, 942-952.

Wakefield, E.D., Phillips, R.A., Trathan, P.N., Arata, J., Gales, R., Huin, N., Robertson, G., Waugh, S., Weimerskirch, H., Matthiopoulos, J., 2011. Habitat preference, accessibility and competition limit the global distribution of breeding black-browed albatrosses. Ecological Monographs 81, 141-167.

Walker, K., Elliott, G., 2006. At-sea distribution of Gibson's and Antipodean wandering albatrosses, and relationships with longline fisheries. Notornis 53, 265-290.

Wanless, R.M., Ryan, P.G., Altwegg, R., Angel, A., Cooper, J., Cuthbert, R., Hilton, G.M., 2009. From both sides: Dire demographic consequences of carnivorous mice and longlining for the Critically Endangered Tristan albatrosses on Gough Island. Biological Conservation 142, 1710-1718.

Warham, J., 1990. The petrels: their ecology and breeding systems. Academic, London.

Watkins, B.P., Petersen, S.L., Ryan, P.G., 2008. Interactions between seabirds and deep-water hake trawl gear: an assessment of impacts in South African waters. Animal Conservation 11, 247-254.

Waugh, S.M., Filippi, D.P., Blyth, R., Filippi, P.F., 2011. Assessment of bycatch in gillnet fisheries. Report to the Convention on Migratory Species. Convention on Migratory Species, Bonn.

Weimerskirch, H., Chastel, O., Ackerman, L., Chaurand, T., Cuenot-Chaillet, F., Hindermeyer, X., Judas, J., 1994. Alternate long and short foraging trips in pelagic seabird parents. Animal Behaviour 47, 472-476.

Weimerskirch, H., Cherel, Y., Delord, K., Jaeger, A., Patrick, S.C., Riotte-Lambert, L., 2014. Lifetime foraging patterns of the wandering albatross: Life on the move! Journal of Experimental Marine Biology and Ecology 450, 68-78.

Weimerskirch, H., Guionnet, T., 2002. Comparative activity pattern during foraging of four albatross species. Ibis 144, 40-50.

Weimerskirch, H., Jouventin, P., 1987. Population dynamics of the wandering albatross, *Diomedea exulans*, of the Crozet Islands: causes and consequences of the population decline. Oikos 49, 315-322.

Weimerskirch, H., Louzao, M., de Grissac, S., Delord, K., 2012. Changes in wind pattern alter albatross distribution and life-history traits. Science 335, 211-214.

Weimerskirch, H., Salamolard, M., Sarrazin, F., Jouventin, P., 1993. Foraging strategy of wandering albatrosses through the breeding season: a study using satellite telemetry. Auk 110, 325-342.

Young, L., VanderWerf, E., Lohr, M., Miller, C., Titmus, A., Peters, D., Wilson, L., 2013. Multi-species predator eradication within a predator-proof fence at Ka'ena Point, Hawai'i. Biological Invasions 15, 2627-2638.

Young, L.C., VanderWerf, E.A., 2008. Prevalence of avian pox virus and effect on the fledging success of Laysan Albatross. Journal of Field Ornithology 79, 93-98.

Žydelis, R., Small, C., French, G., 2013. The incidental catch of seabirds in gillnet fisheries: a global review. Biological Conservation 162, 76-88.

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Table 1. Summary of status, trends, number of breeding sites and recent population estimate for albatrosses and large petrels (*Macronectes* and *Procellaria* spp.).

Species	**No. sites**[1]	**Single country endemic**	**Breeding Freq.**[2]	**Annual breeding pairs**	**Latest census year by site**	**Current trend 1993-2013**[3]	**Trend confidence**	**IUCN status (2015[4])**
Amsterdam albatross	1	France	B	31	2013	↑	High	CR
Tristan albatross	1	UK	B	1,650	2014	↓	High	CR
Waved albatross	3	Ecuador	A	9,615	2001-2013	↓	Low	CR
Atlantic yellow-nosed albatross	6	UK	A	33,650	1974-2011	↔	Low	EN
Grey-headed albatross	29		B	98,084	1982-2015	↓	Medium	EN
Indian yellow-nosed albatross	6		A	39,319	1984-2009	↓	Medium	EN
Northern royal albatross	5	NZ	B	5,782	1995-2013	?	-	EN
Sooty albatross	15		B	12,103	1974-2014	↓	Very Low	EN
Antipodean albatross	6	NZ	B	7,029	1995-2013	↓	Medium	VU
Black petrel	2	NZ	A	1,577	1998-2014	↓	Medium	VU
Campbell albatross	2	NZ	A	21,648	2012	↔	Low	VU
Chatham albatross	1	NZ	A	5,245	2011	↔	Medium	VU
Salvin's albatross	12	NZ	A	41,111	1986-2013	↓	Low	VU
Short-tailed albatross	2		A	661	2002-2014	↑	High	VU
Southern royal albatross	4	NZ	B	7,924	1989-2014	↔	Medium	VU
Spectacled petrel	1	UK	A	14,400	2010	↑	High	VU
Wandering albatross	35		B	8,359	1981-2015	↓	High	VU
Westland petrel	1	NZ	A	2,827	2011	↔	Low	VU
White-chinned petrel	74		A	1,160,152	1984-2013	↓	Very Low	VU
Black-browed albatross	65		A	691,046	1982-2015	↑	High	NT
Black-footed albatross	15		A	66,376	1995-2014	↑	High	NT
Buller's albatross	10	NZ	A	30,069	1971-2014	↔	Low	NT
Grey petrel	17		A	75,610	1981-2012	↓	Very Low	NT
Laysan albatross	17		A	610,496	1982-2014	↔	High	NT
Light-mantled albatross	71		B	12,082	1954-2014	↔	Very Low	NT
Shy albatross	3	Australia	A	14,353	2015	↓	Low	NT
White-capped albatross	5	NZ	?	100,525	1995-2013	?	-	NT
Northern giant petrel	50		A	10,594	1973-2014	↑	Medium	LC
Southern giant petrel	119		A	47,516	1958-2015	↑	Medium	LC

[1] ***Site:*** *usually an entire, distinct island or islet, or rarely, section of a large island (>3,000km^2). Each species-site combination is considered separately, i.e., two species breeding in the same area constitute two breeding sites ACAP database. <data.acap.aq>. 14 July 2015.*

[2] ***Breeding Frequency:*** *A = Annual, B = Biennial*

[3] ***Trend:*** *↑ increasing, ↓declining, ↔ stable, ? unknown*

[4] ***IUCN Status:*** *CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern. <www.iucnredlist.org>.*

Table 2. Number of breeding sites of albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) that are affected by different levels of threat.

Nature of Threat	Threat subcategory	Threat Species	Number of breeding sites[1] affected		
			Threat level[2]:		
			Low	High	All
Natural disaster	Sea-level rise	-	-	12	**12**
Contamination	Toxins - man made	-	1	-	**1**
Habitat loss or destruction	Habitat destruction by alien species	Reindeer	4	-	**4**
	Increased competition with native species	Australasian gannet	-	1	**1**
	Vegetation encroachment		2	-	**2**
Human disturbance	Military action		-	2	**2**
	Recreation/tourism		-	1	**1**
Pathogen	Pathogen	Avian pox virus	1	-	**1**
		Avian cholera	1	1	**2**
Predation by alien species	Predation by alien species	Dog	-	1	**1**
		Cat	11	2	**13**
		Pig	4	-	**4**
		House mouse	2	1	**3**
		Brown rat	6~~5~~	-	**6**
		Black rat	9	-	**9**
All			**41**	**21**	**62**

[1] ***Breeding site:*** *usually an entire, distinct island or islet, or rarely, section of a large island (>3,000km²). Each species-site combination is considered separately, i.e., two species breeding in the same area constitute two breeding sites. ACAP database. <data.acap.aq>. 14 July 2015.*

[2]See Appendix D for threat criteria.

Table 3. Percentage of breeding sites and global population of each species of albatross and large petrel (*Macronectes* and *Procellaria* spp.) that are affected by terrestrial threats. Species without listed threats are excluded. See Appendix D for threat criteria.

Species	No. of sites	% of breeding sites[1]							% of global population						
		Natural disaster	Contamination	Human disturbance	Pathogen	Predation by alien species	Habitat loss or destruction by alien species	All threats	Natural disaster	Contamination	Human disturbance	Pathogen	Predation by alien species	Habitat loss or destruction by alien species	All threats
Antipodean albatross	6	0	0	0	0	17	0	**17**	0	0	0	0	1	0	**1**
Tristan albatross	1	0	0	0	0	100	0	**100**	0	0	0	0	100	0	**100**
Southern royal albatross	4	0	0	0	0	25	0	**25**	0	0	0	0	<1	0	**<1**
Wandering albatross	35	0	0	0	0	6	0	**6**	0	0	0	0	29	0	**29**
Short-tailed albatross	2	50	0	0	0	0	0	**50**	92	0	0	0	0	0	**92**
Laysan albatross	17	35	0	6	0	18	0	**59**	100	0	<1	0	<1	0	**100**
Black-footed albatross	15	47	7	7	0	7	13	**60**	98	34	0	0	0	38	**98**
Sooty albatross	15	0	0	0	7	7	0	**14**	0	0	0	3	12	0	**15**
Indian yellow-nosed Albatross	6	0	0	0	17	0	0	**17**	0	0	0	69	0	0	**69**
Black-browed albatross	65	2	0	0	0	0	0	**2**	<1	0	0	0	0	0	**<1**
Shy albatross	3	0	0	0	33	0	33	**66**	0	0	0	67	0	2	**69**
White-capped albatross	5	0	0	0	0	20	0	**20**	0	0	0	0	6	0	**6**
White-chinned petrel	74	0	0	0	0	19	3	**19**	0	0	0	0	38	<1	**38**
Grey petrel	17	0	0	0	0	24	12	**24**	0	0	0	0	28	5	**28**
Southern giant petrel	119	1	0	0	0	0	0	**1**	?	0	0	0	0	0	**?**

[1] ***Breeding site:*** *usually an entire, distinct island or islet, or rarely, section of a large island (>3,000*km^2*). Each species-site combination is considered separately, i.e., two species breeding in the same area constitute two breeding sites. ACAP database. <data.acap.aq>. 14 July 2015.*

Table 4. Prioritisation of management interventions to address threats on islands with albatrosses and large petrels (*Macronectes* and *Procellaria* spp.). The prioritisation was only of threats at sites that hold >1% of the global population.

Island	Threat	Priority[1]	Explanation	Indicative cost ($AUD)[2]
Habitat loss or destruction/predation by alien species				
Gough Island	House mouse	High	Major threat to endemic species; medium feasibility of eradication	5.5 million
Grande Terre, Kerguelen	Reindeer	Lower	High feasibility of eradication	1-2 million
	Feral cat	Lower	Medium feasibility of eradication	>10 million
	Black rat	Lower	Medium feasibility of eradication	>25 million
Ile Saint Lanne Gramont, Kerguelen	Feral cat	Lower	High feasibility of eradication	420K
	Black rat	Lower	High feasibility of eradication	140K
South Georgia (Islas Georgias del Sur)	Brown rat[3]	Lower	Medium feasibility of eradication	15 million
Auckland Island	Feral cat	Lower	Medium feasibility of eradication	25 million
	Domestic pig	Lower	Medium feasibility of eradication	25 million
Marion Island	House mouse	Lower	Medium feasibility of eradication	30 million
Pathogen				
Ile Amsterdam	Avian cholera	High	Major threat to two species; low or unknown feasibility of eradication	Unknown
Increased competition with native species				
Pedra Branca	Australasian gannet	Lower	Low or unknown feasibility of eradication	100K

[1]High priority reflects major threat to an endemic species or very large proportion of the global population.
[2]Economies of scale would reduce overall costs of operations in same island group.
[3]Aerial baiting completed (2015).

Fig. 1. Breeding locations of (a) albatrosses in equatorial and north Pacific Ocean, (b) albatrosses in the Southern Ocean, and (c) *Macronectes* and *Procellaria* petrels in the Southern Ocean.

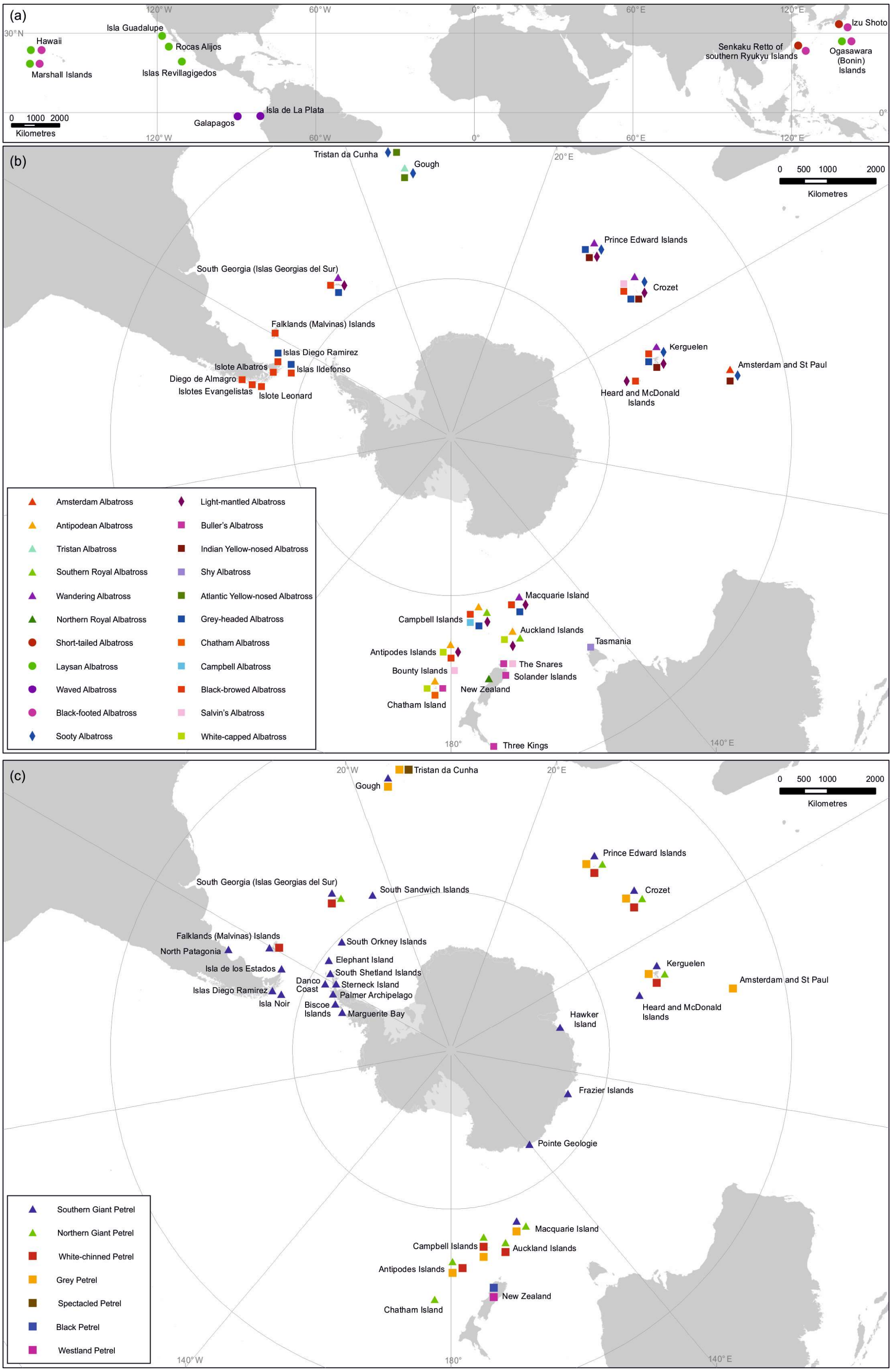
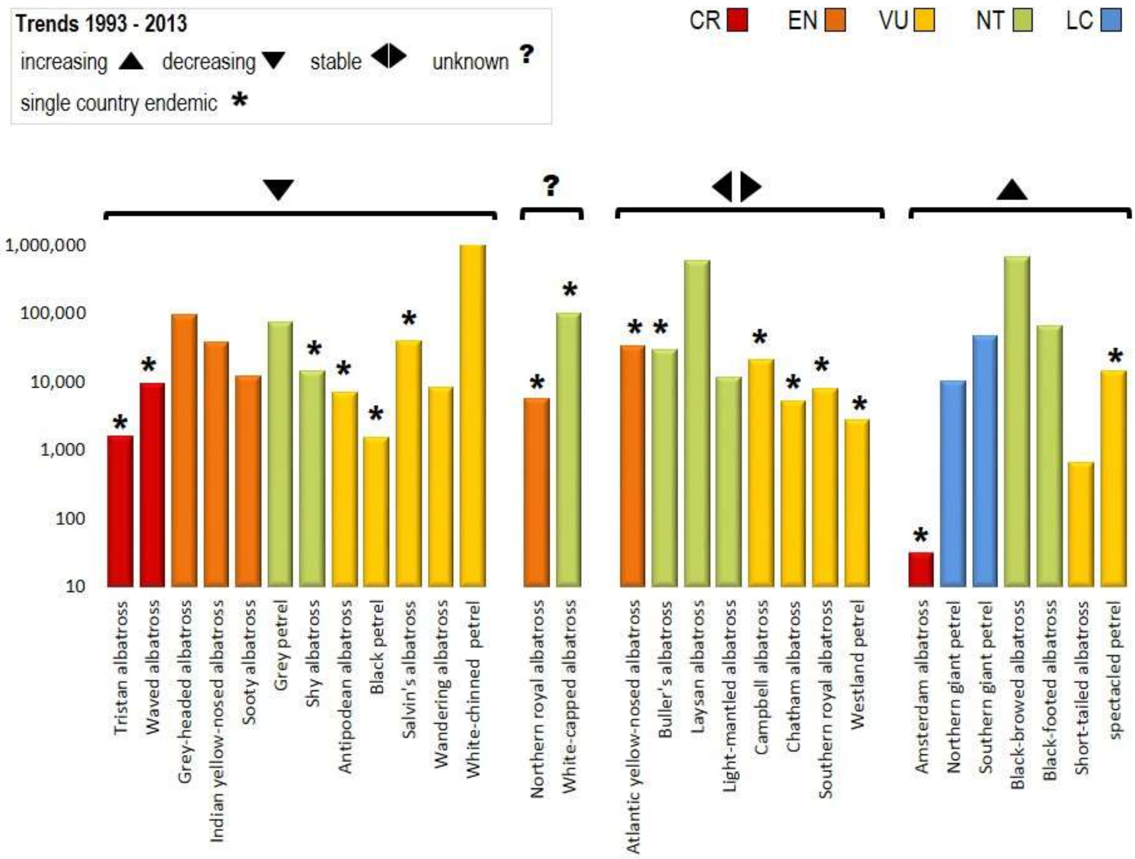


Fig. 2. Annual breeding population size, IUCN status and population trend (1993-2003) of albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) IUCN Status: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern. <www.iucnredlist.org>.



Appendix A: Supplementary Table 1. Breeding sites of albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) where the population is likely to exceed 1, 2, 5 and 10% of the global total for that species. The count date refers to the year in which the chicks fledge for species that breed over the austral summer. Note that some counts are old or of low accuracy.

Island group	Breeding site[1]	Species	Breeding pairs	Latest count date	1 %	2 %	5 %	10 %
Amsterdam and St Paul	Falaise d'Entrecasteaux	Indian yellow-nosed albatross	27,000	2006	Y	Y	Y	Y
Amsterdam and St Paul	Ile Amsterdam	Sooty albatross	394	2012	Y	Y	N	N
Amsterdam and St Paul	Plateau des tourbieres	Amsterdam albatross	31	2013	Y	Y	Y	Y
Antipodes Islands	Antipodes Island	Antipodean albatross	3,320	2013	Y	Y	Y	Y
Antipodes Islands	Antipodes Island	Northern giant petrel	233	2001	Y	Y	N	N
Antipodes Islands	Antipodes Island	Light-mantled albatross	250	1995	Y	N	N	N
Antipodes Islands	Antipodes Island	White-chinned petrel	58,725	2011	Y	Y	Y	N
Antipodes Islands	Antipodes Island	Grey petrel	48,960	2010	Y	Y	Y	Y
Auckland Islands	Adams Island	Antipodean albatross	3,277	2009	Y	Y	Y	Y
Auckland Islands	Adams Island	Light-mantled albatross	5,000	1973	Y	Y	Y	Y
Auckland Islands	Auckland Island	Antipodean albatross	72	1997	Y	N	N	N
Auckland Islands	Auckland Island	White-capped albatross	5,592	2013	Y	Y	Y	N
Auckland Islands	Disappointment Island	Antipodean albatross	352	1997	Y	Y	Y	N
Auckland Islands	Disappointment Island	White-chinned petrel	153,100	2015	Y	Y	Y	Y
Auckland Islands	Disappointment Island	White-capped albatross	94,727	2013	Y	Y	Y	Y
Bounty Islands	Depot Island	Salvin’s albatross	13,737	2013	Y	Y	Y	Y
Bounty Islands	Funnel Island	Salvin’s albatross	5,182	2013	Y	Y	Y	Y
Bounty Islands	Molly Cap	Salvin’s albatross	3,258	2013	Y	Y	Y	N
Bounty Islands	Penguin Island	Salvin’s albatross	1,044	2013	Y	Y	N	N
Bounty Islands	Proclamation Island	Salvin’s albatross	4,880	2013	Y	Y	Y	Y
Bounty Islands	Ruatara Island	Salvin’s albatross	5,012	2013	Y	Y	Y	Y
Bounty Islands	Spider Island	Salvin’s albatross	3,446	2013	Y	Y	Y	N
Bounty Islands	Tunnel Island	Salvin’s albatross	3,435	2013	Y	Y	Y	N
Campbell Islands	Campbell Island	Southern royal albatross	7,855	2008	Y	Y	Y	Y
Campbell Islands	Campbell Island	Northern giant petrel	234	1997	Y	Y	N	N
Campbell Islands	Campbell Island	Light-mantled albatross	1,600	1996	Y	Y	Y	N
Campbell Islands	Campbell Island	Grey-headed albatross	8,611	2012	Y	Y	Y	N
Campbell Islands	Campbell Island	Campbell albatross	21,648	2012	Y	Y	Y	Y
Chatham Island	The Big Sister	Northern royal albatross	1,893	2010	Y	Y	Y	Y
Chatham Island	The Big Sister	Northern giant petrel	336	1976	Y	Y	N	N
Chatham Island	The Big Sister	Buller’s albatross	1,500	1971	Y	Y	Y	N
Chatham Island	The Forty-fours	Northern royal albatross	2,692	2010	Y	Y	Y	Y
Chatham Island	The Forty-fours	Northern giant petrel	1,000	2005	Y	Y	Y	N
Chatham Island	The Forty-fours	Buller’s albatross	14,185	2010	Y	Y	Y	Y
Chatham Island	The Little (Middle) Sister	Northern royal albatross	1,159	2010	Y	Y	Y	Y
Chatham Island	The Little (Middle) Sister	Buller’s albatross	650	1996	Y	Y	N	N
Chatham Island	The Pyramid	Chatham albatross	5,245	2011	Y	Y	Y	Y

Crozet	Ile aux Cochons	Wandering albatross	1,060	1981	Y	Y	Y	Y
Crozet	Ile aux Cochons	Southern giant petrel	575	1982	Y	N	N	N
Crozet	Ile aux Cochons	Northern giant petrel	275	1976	Y	Y	N	N
Crozet	Ile aux Cochons	Sooty albatross	450	1976	Y	Y	N	N
Crozet	Ile de la Possession	Wandering albatross	371	2014	Y	Y	N	N
Crozet	Ile de la Possession	Northern giant petrel	474	2014	Y	Y	N	N
Crozet	Ile de la Possession	Light-mantled albatross	1,019	2014	Y	Y	Y	N
Crozet	Ile de l'Est	Wandering albatross	329	1982	Y	Y	N	N
Crozet	Ile de l'Est	Northern giant petrel	190	1981	Y	N	N	N
Crozet	Ile de l'Est	Sooty albatross	1300	1984	Y	Y	Y	Y
Crozet	Ile de l'Est	Light-mantled albatross	900	1984	Y	Y	Y	N
Crozet	Ile de l'Est	White-chinned petrel	33,145	2004	Y	Y	N	N
Crozet	Ile de l'Est	Grey petrel	5,500	1982	Y	Y	Y	N
Crozet	Ile de l'Est	Grey-headed albatross	3,750	1982	Y	Y	N	N
Crozet	Ile des Apotres	Wandering albatross	120	1982	Y	N	N	N
Crozet	Ile des Apotres	Northern giant petrel	150	1981	Y	N	N	N
Crozet	Ile des Apotres	Indian yellow-nosed albatross	1,230	1984	Y	Y	N	N
Crozet	Ile des Pingouins	Northern giant petrel	165	1981	Y	N	N	N
Crozet	Ile des Pingouins	Sooty albatross	250	1984	Y	Y	N	N
Crozet	Ile des Pingouins	Indian yellow-nosed albatross	5,800	1984	Y	Y	Y	Y
Crozet	Ile des Pingouins	Grey-headed albatross	2,000	1982	Y	Y	N	N
Diego de Almagro	Isla Diego de Almagro	Black-browed albatross	15,594	2002	Y	Y	N	N
Elephant Island	Elephant Island	Southern giant petrel	845	1972	Y	N	N	N
Falkland (Malvinas) Islands	Barren Island	Southern giant petrel	1504	2005	Y	Y	N	N
Falkland (Malvinas) Islands	Beauchene Island	Black-browed albatross	105,777	2011	Y	Y	Y	Y
Falkland (Malvinas) Islands	Bird Island	Black-browed albatross	15,719	2011	Y	Y	N	N
Falkland (Malvinas) Islands	George	Southern giant petrel	602	2005	Y	N	N	N
Falkland (Malvinas) Islands	Golden Knob (Elephant Cays)	Southern giant petrel	1,019	2005	Y	Y	N	N
Falkland (Malvinas) Islands	Governor (Beaver)	Southern giant petrel	723	2005	Y	N	N	N
Falkland (Malvinas) Islands	Grand Jason	Southern giant petrel	762	2005	Y	N	N	N
Falkland (Malvinas) Islands	Grand Jason	Black-browed albatross	89,489	2011	Y	Y	Y	Y
Falkland (Malvinas) Islands	New Island	Black-browed albatross	13,343	2011	Y	N	N	N
Falkland (Malvinas) Islands	North Island	Black-browed albatross	26,812	2011	Y	Y	N	N
Falkland (Malvinas) Islands	Penn (Beaver)	Southern giant petrel	1,543	2005	Y	Y	N	N
Falkland (Malvinas) Islands	Sandy Cay (Elephant Cays)	Southern giant petrel	10,936	2005	Y	Y	Y	Y
Falkland (Malvinas) Islands	Saunders Island	Black-browed albatross	16,722	2011	Y	Y	N	N
Falkland (Malvinas) Islands	Steeple Jason	Southern giant petrel	1,841	2012	Y	Y	N	N
Falkland (Malvinas) Islands	Steeple Jason	Black-browed albatross	183,135	2011	Y	Y	Y	Y

Falkland (Malvinas) Islands	West Point Island	Black-browed albatross	16,495	2011	Y	Y	N	N
Galapagos	Isla Espanola	Waved albatross	9,607	2001	Y	Y	Y	Y
Gough	Gough Island	Tristan albatross	1,650	2014	Y	Y	Y	Y
Gough	Gough Island	Sooty albatross	3,750	2011	Y	Y	Y	Y
Gough	Gough Island	Grey petrel	17,500	2001	Y	Y	Y	Y
Gough	Gough Island	Atlantic yellow-nosed albatross	5,300	2011	Y	Y	Y	Y
Hawaiian Islands	French Frigate Shoals	Black-footed albatross	4,944	2011	Y	Y	Y	N
Hawaiian Islands	Kure Atoll	Laysan albatross	24,366	2014	Y	Y	N	N
Hawaiian Islands	Kure Atoll	Black-footed albatross	2,854	2014	Y	Y	N	N
Hawaiian Islands	Laysan Island	Laysan albatross	134,835	2012	Y	Y	Y	Y
Hawaiian Islands	Laysan Island	Black-footed albatross	24,565	2012	Y	Y	Y	Y
Hawaiian Islands	Lisianski Island	Laysan albatross	26,500	1982	Y	Y	N	N
Hawaiian Islands	Lisianski Island	Black-footed albatross	2,126	2006	Y	Y	N	N
Hawaiian Islands	Midway Atoll	Laysan albatross	412,776	2014	Y	Y	Y	Y
Hawaiian Islands	Midway Atoll	Black-footed albatross	22,525	2014	Y	Y	Y	Y
Hawaiian Islands	Pearl and Hermes Reef	Laysan albatross	6,900	2003	Y	N	N	N
Hawaiian Islands	Pearl and Hermes Reef	Black-footed albatross	6,116	2003	Y	Y	Y	N
Heard and McDonald Islands	Heard Island	Southern giant petrel	3,500	2004	Y	Y	Y	N
Heard and McDonald Islands	Heard Island	Light-mantled albatross	350	1954	Y	Y	N	N
Isla de los Estados	Isla Observatorio	Southern giant petrel	500	2004	Y	N	N	N
Isla Noir	Isla Noir	Southern giant petrel	1,000	2005	Y	Y	N	N
Islas Diego Ramirez	Isla Bartolome	Grey-headed albatross	10,880	2003	Y	Y	Y	Y
Islas Diego Ramirez	Isla Bartolome	Black-browed albatross	43,928	2003	Y	Y	Y	N
Islas Diego Ramirez	Isla Gonzalo	Grey-headed albatross	4,413	2012	Y	Y	N	N
Islas Diego Ramirez	Isla Gonzalo	Black-browed albatross	8,706	2012	Y	N	N	N
Islas Ildefonso	Isla Grande	Black-browed albatross	32,640	2012	Y	Y	N	N
Islas Ildefonso	Isla Norte	Black-browed albatross	14,059	2013	Y	Y	N	N
Islas Ildefonso	Isla Sur	Black-browed albatross	6,912	2013	Y	N	N	N
Izu Shoto	Torishima	Short-tailed albatross	609	2014	Y	Y	Y	Y
Izu Shoto	Torishima	Black-footed albatross	2,060	2013	Y	Y	N	N
Kerguelen	Baie Larose	Northern giant petrel	125	1987	Y	N	N	N
Kerguelen	Courbet Peninsula	Wandering albatross	356	2014	Y	Y	N	N
Kerguelen	Courbet Peninsula	Northern giant petrel	750	1987	Y	Y	Y	N
Kerguelen	Golfe du Morbihan	Northern giant petrel	150	1987	Y	N	N	N
Kerguelen	Golfe du Morbihan	Grey petrel	3,400	2006	Y	Y	N	N
Kerguelen	Iles Nuageuses	Grey-headed albatross	7,860	1985	Y	Y	Y	N
Kerguelen	Rallier du Baty Peninsula	Wandering albatross	750	1987	Y	Y	Y	N
Kerguelen	Rallier du Baty Peninsula	Northern giant petrel	550	1987	Y	Y	Y	N
Macquarie Island	Macquarie Island	Southern giant petrel	1,834	2015	Y	Y	N	N
Macquarie Island	Macquarie Island	Northern giant petrel	1,487	2014	Y	Y	Y	Y
Macquarie Island	Macquarie Island	Light-mantled albatross	2,136	2014	Y	Y	Y	Y
New Zealand	Great Barrier Island	Black petrel	921	2014	Y	Y	Y	Y
New Zealand	Little Barrier Island	Black petrel	100	1998	Y	Y	Y	N

New Zealand	Punakaiki	Westland petrel	2,827	2011	Y	Y	Y	Y
North Patagonia	Isla Gran Robredo	Southern giant petrel	1,700	2005	Y	Y	N	N
Ogasawara (Bonin) Islands	Nakodojima	Black-footed albatross	967	2006	Y	N	N	N
Palmer Archipelago	Anvers Island	Southern giant petrel	582	1987-2010	Y	N	N	N
Prince Edward Islands	Marion Island	Wandering albatross	2,050	2014	Y	Y	Y	Y
Prince Edward Islands	Marion Island	Southern giant petrel	1,583	2014	Y	Y	N	N
Prince Edward Islands	Marion Island	Northern giant petrel	443	2014	Y	Y	N	N
Prince Edward Islands	Marion Island	Sooty albatross	1,469	2014	Y	Y	Y	Y
Prince Edward Islands	Marion Island	Light-mantled albatross	316	2014	Y	N	N	N
Prince Edward Islands	Marion Island	White-chinned petrel	24,000	2009	Y	Y	N	N
Prince Edward Islands	Marion Island	Grey-headed albatross	8,807	2014	Y	Y	Y	N
Prince Edward Islands	Prince Edward Island	Wandering albatross	1,800	2009	Y	Y	Y	Y
Prince Edward Islands	Prince Edward Island	Southern giant petrel	723	2009	Y	N	N	N
Prince Edward Islands	Prince Edward Island	Northern giant petrel	180	1991	Y	N	N	N
Prince Edward Islands	Prince Edward Island	Sooty albatross	1,210	2009	Y	Y	Y	N
Prince Edward Islands	Prince Edward Island	Indian yellow-nosed albatross	5,234	2009	Y	Y	Y	Y
Prince Edward Islands	Prince Edward Island	Grey-headed albatross	1,506	2009	Y	N	N	N
Senkaku Retto of southern Ryukyu Islands	Minami-kojima	Short-tailed albatross	52	2002	Y	Y	Y	N
Solander Islands	Great Solander Island	Buller's albatross	4,579	2002	Y	Y	Y	Y
Solander Islands	Little Solander Island	Buller's albatross	305	2014	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Albatross Island	Wandering albatross	144	2014	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Annenkov Island	Wandering albatross	193	2004	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Annenkov Island	Black-browed albatross	9,398	2004	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Barff	Southern giant petrel	543	1987	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Barff	White-chinned petrel	119,594	2007	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Bird Island	Wandering albatross	859	2014	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Bird Island	Southern giant petrel	521	1996	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Bird Island	Northern giant petrel	2,062	1996	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Bird Island	Grey-headed albatross	5,120	2004	Y	Y	Y	N
South Georgia (Islas Georgias del Sur)	Bird Island	Black-browed albatross	8,264	2004	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Cooper Island	Black-browed albatross	10,606	2004	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Hall Island	Grey-headed albatross	2,686	2004	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Main Island	Grey-headed albatross	5,177	2004	Y	Y	Y	N
South Georgia (Islas Georgias del Sur)	Main Island	Black-browed albatross	14,559	2004	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Northwest	Wandering albatross	114	2004	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Northwest	Southern giant petrel	703	1987	Y	N	N	N

South Georgia (Islas Georgias del Sur)	Northwest	Northern giant petrel	516	1981	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Northwest	White-chinned petrel	146,545	2007	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Nunez	Northern giant petrel	324	1987	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Nunez	White-chinned petrel	193,838	2007	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Paryadin Peninsula north	Grey-headed albatross	6,721	2004	Y	Y	Y	N
South Georgia (Islas Georgias del Sur)	Paryadin Peninsula south	Grey-headed albatross	22,058	2004	Y	Y	Y	Y
South Georgia (Islas Georgias del Sur)	Saddle Island	Northern giant petrel	192	1987	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Salisbury	White-chinned petrel	16,365	2007	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Sorn & Bernt coast	Grey-headed albatross	1,625	2004	Y	N	N	N
South Georgia (Islas Georgias del Sur)	South Coast	Southern giant petrel	574	1987	Y	N	N	N
South Georgia (Islas Georgias del Sur)	South Coast	Northern giant petrel	165	1987	Y	N	N	N
South Georgia (Islas Georgias del Sur)	Southeast	White-chinned petrel	43,355	2007	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Stromness and Cumberland	White-chinned petrel	64,361	2007	Y	Y	Y	N
South Georgia (Islas Georgias del Sur)	Trinity Island	Grey-headed albatross	3,309	2004	Y	Y	N	N
South Georgia (Islas Georgias del Sur)	Trinity Island	Black-browed albatross	13,960	2004	Y	Y	N	N
South Orkney Islands	Laurie Island	Southern giant petrel	624	2006, 2011	Y	N	N	N
South Orkney Islands	Powell Island	Southern giant petrel	613	1983	Y	N	N	N
South Orkney Islands	Signy Island	Southern giant petrel	1,093	1985	Y	Y	N	N
South Sandwich Islands	Candlemas Island	Southern giant petrel	1,818	2011	Y	Y	N	N
South Shetland Islands	King George Island	Southern giant petrel	1,728	1967-2014	Y	Y	N	N
South Shetland Islands	Nelson Island	Southern giant petrel	877	1985-2014	Y	N	N	N
Tasmania	Albatross Island (Tasmania)	Shy albatross	4,194	2015	Y	Y	Y	Y
Tasmania	Pedra Branca	Shy albatross	171	2015	Y	Y	N	N
Tasmania	The Mewstone	Shy albatross	9,988	2015	Y	Y	Y	Y
The Snares	Broughton Island	Buller's albatross	518	1997	Y	N	N	N
The Snares	North-East Island	Buller's albatross	8,047	2014	Y	Y	Y	Y
The Snares	Toru Islet	Salvin's albatross	829	2011	Y	Y	N	N
Tristan da Cunha	Inaccessible Island	Sooty albatross	501	2000	Y	Y	N	N
Tristan da Cunha	Inaccessible Island	Spectacled petrel	14,400	2010	Y	Y	Y	Y
Tristan da Cunha	Inaccessible Island	Atlantic yellow-nosed albatross	1,100	1983	Y	Y	N	N
Tristan da Cunha	Nightingale	Sooty albatross	150	1974	Y	N	N	N
Tristan da Cunha	Nightingale	Atlantic yellow-nosed albatross	4,000	2007	Y	Y	Y	Y
Tristan da Cunha	Tristan da Cunha	Sooty albatross	2,500	1974	Y	Y	Y	Y
Tristan da Cunha	Tristan da Cunha	Atlantic yellow-nosed albatross	23,000	1974	Y	Y	Y	Y

[1] ***Breeding site:*** *usually an entire, distinct island or islet, or rarely, section of a large island (>3,000km²). Each species-site combination is considered separately, i.e., two species breeding in the same area constitute two breeding sites. ACAP database. <data.acap.aq>. 14 July 2015.*

Appendix B: Supplementary Table 2. Island groups holding >1% of the total global population of albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) where the last estimate of breeding numbers for any site is >10 years old (prior to 2004). The date of the estimate refers to the year in which the chicks fledge for species that breed over the austral summer.

Species	Island group	Number of sites[1]	Annual breeding pairs	Most recent estimate	% known global population
Indian yellow-nosed albatross	Crozet	2	7,030	1984	18
Light-mantled albatross	Antipodes	4	253	1995	2
	Kerguelen	3	3,000-5,000	1987	19-31
	Heard and McDonald	2	350	1954	2
	Campbell	8	1,658	1996	10
Grey-headed albatross	Kerguelen	2	7,905	1985	8
	Crozet	4	5,940	1982	6
Black-browed albatross	Diego de Almagro	1	15,594	2002	2
Short-tailed albatross	Senkaku Retto	1	52	2002	8
Grey petrel	Gough	1	10,000-25,000	2001	13-33
Northern giant petrel	Campbell	3	234	1997	2
	Antipodes	1	233	2001	2
Southern giant petrel	Elephant	2	870	1972	2

[1] ***Site:*** *usually an entire, distinct island or islet, or rarely, section of a large island (>3,000km²).* ACAP database. <data.acap.aq>. 14 July 2015.

Appendix C: Supplementary Table 3. Number of pathogens reported in albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) by pathogen type and collection site. SA - subantarctic, A - Antarctic, O - other). Summarized from Uhart, M., Gallo, L. and Quintana, F. Progress on updated review of pathogens described in ACAP species. PaCSWG2, Doc 04. 2014. http://www.acap.aq/en/working-groups/population-and-conservation-status-working-group/population-and-conservation-status-wg-meeting-2/pacswg2-meeting-documents

Species	Virus			Bacteria			Protozoa			Gastrointestinal parasite			Ectoparasite			Fungi		
	O	A	SA	O	A	SA	O	A	SA	O	A	SA	O	A	SA	O	A	SA
Black-browed albatross	1			1		1			1		1		2		7			
Southern giant petrel		1			9			1			3			2	6			
Laysan albatross	1			4									2					
Shy albatross	1		1												2			
Black petrel	1																	
Grey-headed albatross				2					1						5	1		
Indian yellow-nosed albatross						2												
Amsterdam albatross						1												
Sooty albatross						1												
Wandering albatross									1						13			
Short-tailed albatross										2								
Black-footed albatross													1					
Atlantic yellow-nosed albatross													1		2			
Light-mantled albatross															4			
Waved albatross													1					
Northern giant petrel															3			
White-chinned petrel														1	5			
Grey petrel													1		4			

Appendix D: ACAP Threat-scoring criteria. Description of threat-scoring criteria.

Threats to each species at each breeding site are scored according to the Scope (proportion of population affected) and Severity (likely reduction of affected portion of the population within ten years), categorised as either Low (1-10%) or High (11-100%). This therefore excludes threats that are very unlikely to result in a population decline even if they cause a low level of breeding failure or occasional mortality of adults in a large population. The Scope and Severity were combined in a simple matrix to assess the overall threat magnitude, which reflects the lowest score for either factor (e.g. High Scope and Low Severity = Low overall threat). This assessment considered the anticipated impact over the next decade, assuming the continuation of current conditions and trends. To allow for threats such as alien species that caused a major historical decline but now have minimal impact on a much reduced local population (so would not qualify under the Scope criterion), a threat was also listed as Low magnitude if it substantially limited expansion in numbers or distribution at an occupied site even if the local population was stable or slightly increasing. Threats were only included if there was a current, documented impact that was expected to continue, i.e., a threat for which there is already effective management (e.g. intensive trapping effort directed at an alien predator) did not meet the criteria. Predation by native predators was not considered a threat unless there was anthropogenic perturbation in the system leading to increased pressure. Nor was the presence of a non-native species, disease or disease vector, or disturbance by tourists or researchers considered to be a threat unless there was evidence of a direct impact on the ACAP species.

Appendix E: Supplementary Table 4. Islands with breeding albatrosses and large petrels (*Macronectes* and *Procellaria* spp.) where introduced vertebrates are present, were eradicated in recent years, or an eradication is planned. N - species present, no eradication planned. “Year” – year of successful eradication. (“year”) – start year of planned eradication.

Island Group	Island	Cattle	Dog	Goat	Deer	Cat	European hare	House mouse	Stoat	Ferret	Small Indian mongoose	Rabbit	Sheep	Reindeer	Polynesian rat	Brown (Norwegian) rat	Black (ship) rat	Unspecified rats	Pig	cotton-tail rabbit	Brushtail possum
Amsterdam and St Paul	Amsterdam	2010				N										N					
Antipodes	Antipodes							(2015)													
Auckland	Auckland					N		N											N		
Crozet	Ile aux Cochons					N						N									
Crozet	Ile de la Possession																N				
Crozet	Ile de l'Est											N									
Falkland (Malvinas)	Barren												N								
Falkland (Malvinas)	Bleaker					2001										Y					
Falkland (Malvinas)	Burnt Islet	N																			
Falkland (Malvinas)	Carcass	N											N								
Falkland (Malvinas)	Dyke (Weddell)	N											N			N					
Falkland (Malvinas)	East Falkland	N				N	N	N				N	N								
Falkland (Malvinas)	George	N						N					N								
Falkland (Malvinas)	Governor															2008					
Falkland (Malvinas)	Keppel					2007										N					
Falkland (Malvinas)	Lively	N											N								

Island Group	Island	Cattle	Dog	Goat	Deer	Cat	European hare	House mouse	Stoat	Ferret	Small Indian mongoose	Rabbit	Sheep	Reindeer	Polynesian rat	Brown (Norwegian) rat	Black (ship) rat	Unspecified rats	Pig	cotton-tail rabbit	Brushtail possum
Falkland (Malvinas)	New					N		N									N			N	
Falkland (Malvinas)	Pebble	N				N						N	N			N					
Falkland (Malvinas)	Penn															N					
Falkland (Malvinas)	Saddle															(2011)					
Falkland (Malvinas)	Saunders	N				N	N						N			N					
Falkland (Malvinas)	Sea Lion	2004											2009								
Falkland (Malvinas)	Speedwell	N											N								
Falkland (Malvinas)	Steeple Jason							N													
Falkland (Malvinas)	Swan												N			N					
Falkland (Malvinas)	West (Cape Orford)															N					
Falkland (Malvinas)	West Falkland					N	N	N				N	N								
Falkland (Malvinas)	West Point							N					N			N					
Gough Island	Gough							N													
Hawaiian	Kaua'i		N			N															
Hawaiian	Kaula																N				
Hawaiian	Lehua														N						
Hawaiian	Midway Atoll							N													
Hawaiian	O'ahu		N			N		N			N						N				
Isla de La Plata	Isla de La Plata					2009															
Isla de los Estados	Isla de los Estados			N	N											N					
Isla de los Estados	Isla Observatorio											N				N	N				

Island Group	Island	Cattle	Dog	Goat	Deer	Cat	European hare	House mouse	Stoat	Ferret	Small Indian mongoose	Rabbit	Sheep	Reindeer	Polynesian rat	Brown (Norwegian) rat	Black (ship) rat	Unspecified rats	Pig	cotton-tail rabbit	Brushtail possum
Isla Guadalupe	Isla Guadalupe		2007	2010		N															
Izu Shoto	Torishima																N				
Kerguelen	Howe											N									
Kerguelen	Kerguelen (Grande Terre)					N						N		N			N				
Macquarie Island	Macquarie					2002		2014				2014					2014				
New Zealand	Great Barrier		N			N									N		N		N		
New Zealand	Little Barrier														2004						
New Zealand	South	N	N	N		N			N	N						N					N
Ogasawara (Bonin)	Anejima															N					
Ogasawara (Bonin)	Imotojima															N					
Ogasawara (Bonin)	Magojima																	N			
Ogasawara (Bonin)	Mukojima			2002													(2010)				
Ogasawara (Bonin)	Nakodojima																N				
Prince Edward	Marion							N													
South Georgia (Islas Georgias del Sur)	Harcourt															2011					
South Georgia (Islas Georgias del Sur)	South Georgia (Islas Georgias del Sur)							(2011)						2015		(2011)					
Tristan da Cunha	Inaccessible			N																	
Tristan da Cunha	Tristan da Cunha	N						N					N				N				

Appendix F: Supplementary Table 5. High priority fisheries for conservation management to safeguard globally-important populations of albatrosses and large petrels (*Macronectes* and *Procellaria* spp.). This table only includes fisheries that have been reported on by ACAP Parties or Range States. LL = longline. WCPFC = Western and Central Pacific Fisheries Commission, CCSBT = Commission for the Conservation of Southern Bluefin Tuna, ICCAT = International Commission for the Conservation of Atlantic Tuna, SEAFO = Southeast Atlantic Fisheries Organisation, SPRFMO = South Pacific Regional Fishery Management Organisation, IOTC = Indian Ocean Tuna Commission, IATTC = Inter-American Tropical Tuna Commission.

Species (island group)	Fishery
Antipodean albatross (Antipodes Islands)	WCPFC Pelagic LL
Antipodean albatross (Auckland Islands)	CCSBT Pelagic LL
Atlantic yellow-nosed albatross (Tristan da Cunha)	Brazil Pelagic LL
	Brazil Pelagic LL (Itaipava)
	ICCAT Pelagic LL
	Namibia Demersal LL
	Namibia Demersal trawl
Black-browed albatross (Antipodes Islands)	CCSBT Pelagic LL
	WCPFC Pelagic LL
Black-browed albatross (Campbell Island)	CCSBT Pelagic LL
	WCPFC Pelagic LL
Black-browed albatross (Iles Crozet)	CCSBT Pelagic LL
Black-browed albatross (South Georgia (Islas Georgias del Sur))	ICCAT Pelagic LL
	CCSBT Pelagic LL
	Namibia Demersal LL
	SEAFO Demersal trawl
Black petrel (Great and Little Barrier Islands)	CCSBT Pelagic LL
	WCPFC Pelagic LL
	Peru Pelagic LL
	Australia Pelagic trawl
	Peru Demersal LL
	SPRFMO Demersal trawl
Campbell albatross (Campbell Island)	CCSBT Pelagic LL
	WCPFC Pelagic LL
Grey-headed albatross (South Georgia (Islas Georgias del Sur))	CCSBT Pelagic LL
	ICCAT Pelagic LL
	IOTC Pelagic LL

Grey petrel (All sites)	CCSBT Pelagic LL
	ICCAT Pelagic LL
	IOTC Pelagic LL
	WCPFC Pelagic LL
	Peru Pelagic LL
	UK (OT) Pelagic LL
Indian yellow-nosed albatross (Amsterdam Island)	CCSBT Pelagic LL
	IOTC Pelagic LL
	Australia Demersal trawl
Indian yellow-nosed albatross (Crozet Island)	CCSBT Pelagic LL
	IOTC Pelagic LL
Indian yellow-nosed albatross (Prince Edward Island)	IOTC Pelagic LL
Laysan albatross (Laysan)	IATTC Pelagic LL
	WCPFC Pelagic LL
Northern giant petrel (Prince Edward Islands)	CCSBT Pelagic LL
	IOTC Pelagic LL
Northern royal albatross (Chatham Islands)	Brazil Pelagic LL
	Argentina Demersal trawl
	CCSBT Pelagic LL
	ICCAT Pelagic LL
	WCPFC Pelagic LL
Shy albatross (Tasmania)	Australia Trawl
	Australia Demersal LL
	IOTC Pelagic LL
	Namibia Demersal LL
	Namibia Pelagic LL
	Namibia Pelagic trawl
Sooty albatross (Iles Crozet)	CCSBT Pelagic LL
	IOTC Pelagic LL
Sooty albatross (Prince Edward Islands)	CCSBT Pelagic LL
	IOTC Pelagic LL
Southern giant petrel (Islas de los Estados & Observatorio)	Argentina Demersal trawl
Southern giant petrel (Prince Edward Islands)	CCSBT Pelagic LL
	IOTC Pelagic LL
Tristan albatross (Gough Island)	Brazil Pelagic LL
	Brazil Pelagic LL (Itaipava)
	CCSBT Pelagic LL
	ICCAT Pelagic LL
	IOTC Pelagic LL
	Angola Pelagic LL
	Brazil Demersal LL
	Namibia Demersal LL
Wandering albatross (Iles Kerguelen)	CCSBT Pelagic LL

	IOTC	Pelagic LL
Wandering albatross (South Georgia (Islas Georgias del Sur))	Brazil	Pelagic LL
	CCSBT	Pelagic LL
	ICCAT	Pelagic LL
	Brazil	Pelagic LL (Itaipava)
	Argentina	Demersal trawl
	Brazil	Demersal LL
Waved albatross (Islas Galapagos)	IATTC	Pelagic LL
White-chinned petrel (South Georgia (Islas Georgias del Sur))	Brazil	Pelagic LL
	Brazil	Pelagic LL (Itaipava)
	CCSBT	Pelagic LL
	ICCAT	Pelagic LL