GA. WANDERING AND ROYAL ALBATROSSES

Status of chapter	This chapter, new in 2025, provides an update of the previous information in the Seabird chapter of AEBAR 2021. The present update included the restructuring of relevant information into a general seabirds overview, with individual chapters for different seabird species groupings, including the current chapter on wandering and royal albatrosses.
Scope of chapter	This chapter provides information on Gibson's and Antipodean albatrosses that breed in New Zealand; descriptions of the nature of fishing interactions, the nature and extent of interactions with fisheries; the management context and approach, means of estimating fisheries impacts and population level risk; and main sources of uncertainty.
Area	New Zealand Exclusive Economic Zone (EEZ) and Territorial Sea (TS) (noting that many seabirds are migratory and spend prolonged periods outside New Zealand's EEZ. On the high seas these effects are considered by other organisations, such as Regional Fisheries Management Organisation; capture estimates from New Zealand waters are reported to these bodies.
Focal localities	Interactions with fisheries occur in many parts of the EEZ and TS, on the high seas, and in the EEZs of other nations.
Key issues	Improved understanding of estimating incidental captures and risk in poorly-observed and unobserved fisheries and out-of-zone; improved understanding of population size and structure of whole-island populations at the breeding sites; improved understanding of distributional overlap with fisheries of Gibson's albatross outside New Zealand's EEZ, and incidental captures of both subspecies in these fisheries. cryptic mortality rates and survival of birds released alive.
Emerging issues	Potential new fishery monitoring techniques. New fishery mitigation technology. Aerial drone surveys for whole-population surveys. Global observer programmes.
Fisheries New Zealand research (current)	DAT2023-04C PSC Suite - 2022/2023, and 2023/2024; PR02023-17B Satellite Time for Southern Royal albatross; RIS2023-03 Collaborative update to Southern Hemisphere Risk Assessment;
New Zealand government research (current)	DOC Conservation Services Programme (CSP) projects: INT2024-01 Observing commercial fisheries, INT2022-02 Identification of seabirds captured in New Zealand fisheries, INT2023-02 Species identification of camera-detected protected species captures in New Zealand fisheries, MIT2024-01 Protected species liaison project, MIT2024-02 Enhancing seabird bycatch mitigation across the set and soak periods in surface longline fisheries, MIT2024-03 Assessment of weighted hooks as a seabird bycatch mitigation option for surface longline fisheries; POP2022-10 Antipodes Island seabird research: Antipodean albatross and white chinned petrel; POP2023-04 Campbell Island seabird research
Related chapters/issues	National Plan of Action (2020) Reducing the incidental mortality of seabirds in fisheries (Fisheries New Zealand 2020). https://www.mpi.govt.nz/dmsdocument/40652-National-Plan-Of-Action-Seabirds-2020-Report. Risk assessment chapter (Chapter RA). General chapter on seabirds (Chapter GS).

GA.1 CONTEXT

Wandering and royal albatrosses are in the family *Diomedeidae*, often referred to as the "great albatrosses". This family encompasses seven species in two species complexes, the wandering and Amsterdam albatrosses and the royal albatrosses. Four species breed in New Zealand, Gibson's albatross (*Diomedea antipodensis gibsoni*), Antipodean albatross (*Diomedea antipodensis antipodensis*), southern royal albatross (*Diomedea epomophora*), and northern royal albatross

(*Diomedea sanfordi*). These species are endemic to New Zealand, whereas their congener wandering albatross (*Diomedea exulans*) frequents New Zealand waters but breeds elsewhere (Waugh 2013). The remaining two wandering and royal albatross species are not commonly found in New Zealand, they are the Amsterdam albatross (*Diomedea amsterdamensis*) and Tristan albatross (*Diomedea dabbenena*).

Much of the research on fisheries interactions in New Zealand has focused on two subspecies from the wandering and Amsterdam albatrosses complex, Gibson's albatross and the Antipodean albatross due to considerable population decline since 2006 (Richard 2021).

All wandering and royal albatrosses are "absolutely protected" in New Zealand waters (please see Chapter GS for detailed information on legislation and policies pertaining to petrels and other seabirds in New Zealand and internationally).

GA.2 BIOLOGY

The summary of information provided here is based on summaries provided elsewhere, most notably species data collated by the Agreement of the Conservation of Albatrosses and Petrels (ACAP https://acap.aq/), New Zealand Birds Online (https://www.nzbirdsonline.org.nz/), and population studies by Elliott and Walker (and co-authors, e.g., Walker et al. 2023).

This summary has a greater focus on the two Antipodean albatross (*Diomedea antipodensis* species as these have received a greater focus due to their current population status and recorded interactions with domestic New Zealand fisheries. Research for the southern royal albatross (*Diomedea epomophora*) and northern royal albatross (*Diomedea sanfordi*) is being updated as our understanding of domestic and international fisheries risk is improved.

GA.2.1 TAXONOMY

The taxonomy of the Antipodean albatross (*Diomedea antipodensis*) is currently unresolved, with early taxonomic changes of the genus including a split of this species into two subspecies, Antipodean albatross and Gibson's albatross. An alternative division distinguished these two subspecies as separate species. Because genetic analysis did not support this species status but ACAP does not use trinominal nomenclature, it provides relevant information separately for Antipodean albatross *Diomedea antipodensis antipodensis* and *Diomedea antipodensis gibsoni*, based on their separate breeding sites. Similarly, the genetic analysis of the wandering albatross species complex suggested that *Diomedea antipodensis antipodensis* and *Diomedea antipodensis gibsoni* form two Management Units (sensu Moritz 1994), based on significant genetic differences between them (Burgh & Croxall 2004) and differences in foraging locations (Rexer-Huber et al. 2019, Richards et al 2024a).

GA.2.2 DISTRIBUTION

Of the seven species in the family *Diomedeidae* four are endemic to New Zealand, southern royal albatross (*Diomedea epomophora*) on Campbell Island and the Auckland Islands, and northern royal albatross (*Diomedea sanfordi*) on the Chatham Islands, Enderby Island, and Otago Peninsula. For Antipodes albatross and Gibson's albatross, both subspecies have distinct breeding locations, with Antipodean albatross nesting primarily on Antipodes Island, but with a few breeding pairs nesting on Chatham and Campbell islands. In comparison, Gibson's albatross breeds at Auckland Islands, with about 95% of its population breeding at Adams Island. There is only limited overlap in the foraging distribution of these two populations.

Wandering albatross (*Diomedea exulans*) breed on South Georgia, Crozet, Kerguelen, Marion, Prince Edward, Heard and Macquarie Islands and frequent New Zealand waters to forage.

The remaining two wandering and royal albatross species do not breed in New Zealand and are not commonly found in New Zealand waters, they are the Amsterdam albatross (*Diomedea amsterdamensis*) which breeds on Amsterdam Island

in the southern Indian Ocean with only possible sightings in New Zealand, and Tristan albatross (*Diomedea dabbenena*) which breeds on Gough Island in the south Atlantic with no known sightings in New Zealand.

The foraging distribution of wandering and royal albatrosses covers much of the Southern Ocean and up into the Pacific, Indian and Atlantic oceans. Northern royal albatross, southern royal albatross and wandering albatross having circumpolar foraging distributions, whereas the other species in the family *Diomedeidae* have more restricted distributions often staying within the ocean basin where they breed.

GA.2.2.1 ANTIPODEAN ALBATROSS

Long-term population monitoring on Antipodes Island has included the tracking of Antipodean albatross individuals via satellite tags and global location sensing (GLS) loggers since 1996 (Walker et al. 2023). As of 2024 378 Antipodean albatross have been tracked as part of these studies (Richard et al. 2024a). These long-term tracking data, covering the period between 1997 and 2021, were used to assess temporal variability in the distribution of Antipodean albatross, including its spatial overlap with fisheries (Richard et al. 2024a). The assessment highlighted key spatial differences in the distribution of Antipodean albatross by breeding status, age, and sex. Information of these differences was incorporated to derive a distribution map of all life stages combined, which integrated all available tracking data with weights by life stage from a recently-updated population model. The overall density of interpolated tag records showed areas of high use around the main colony of Antipodes Island, between the colony and the eastern end of Chatham Rise, around Chatham Rise (but not above it), and in two distinct areas along the west coast of South America (Figure GA.1). There was also relatively high use of the Tasman Sea. Long term temporal changes in the distribution previously reported by Elliot and Walker (2017) were not statistically significant when track length was taken into account suggesting that the distribution has been stable over the study period (Richards et al. 2024a).

Across life stages, there were distinct differences in the spatial distribution of Antipodean albatross distribution hotspots (Figure GA.2). All life stages used the area immediately east of New Zealand intensively, with the highest use adjacent to the colony at Antipodes Island. Nevertheless, juveniles also used some areas in the Tasman Sea extensively, especially westward from New Zealand's Exclusive Economic Zone. Non-breeding adults had hotspots distributed across the South Pacific Ocean, including in the Tasman Sea and in an extensive area off the Chilean coast (at around latitude 44 degrees South) and around the Juan Fernández Islands. Breeders had the most restricted hotspot area, concentrated around Antipodes Island, and extending northward to the tip of New Zealand.

Considering density hotspots for all life stages over time, the two areas with the highest hotspot consistency were the areas eastward of New Zealand, including Antipodes Island, and the Chilean coast (Figure GA.3).

Distribution modelling supporting the New Zealand multi-species seabird risk assessment predicted the highest abundance of Antipodean albatross around its main breeding colony at Antipodes Island between January and March (Roberts et al. 2022; see Figures GA.4 and GA.5). This taxon was also predicted to occur around most of New Zealand's EEZ.

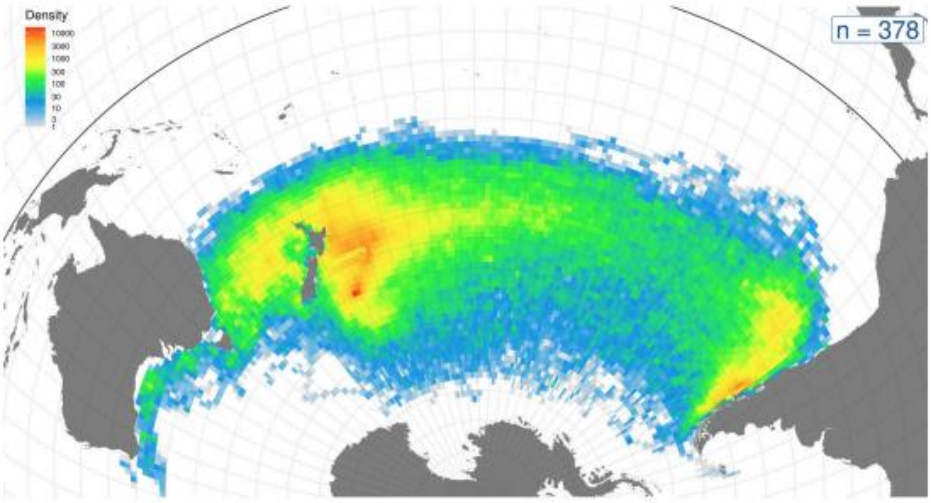


Figure GA.1: Density (in log-scale) of interpolated tag records for all years and tracked Antipodean albatross individuals combined, at 1-degree resolution (from Richard et al. 2024a). The number of tracks is shown in the top-right corner.

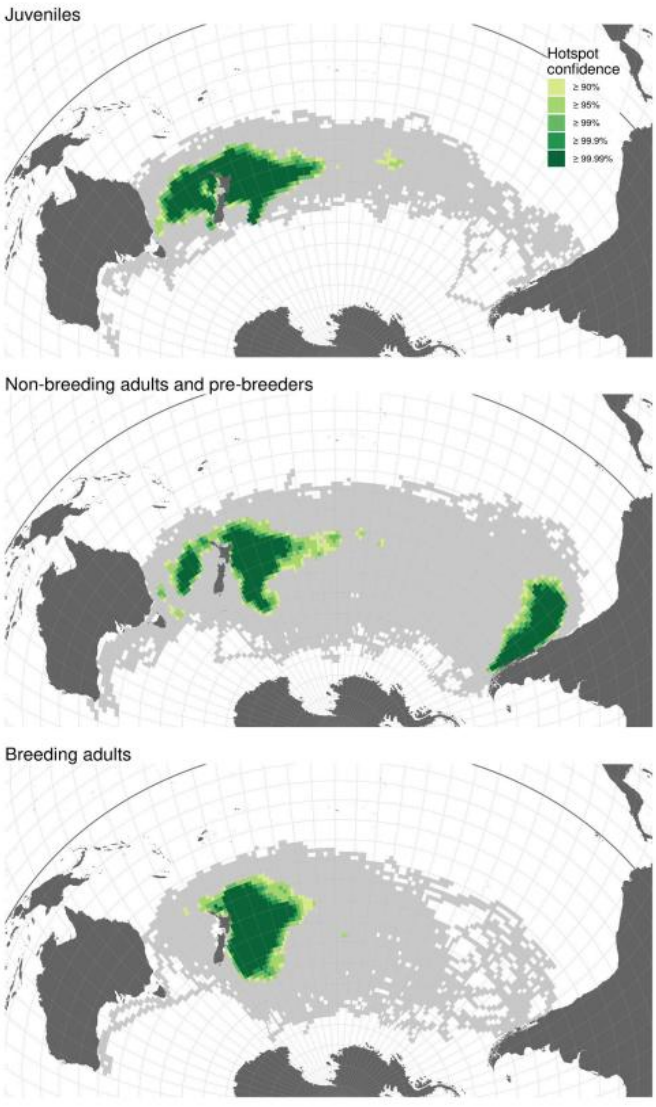


Figure GA.2: Distribution of Antipodean albatross hotspots for key life stages (from Richard et al. 2024a). Grey shading shows cells with at least one record, cells consisting of a hotspot are shown in shades of green as a function of the confidence level.

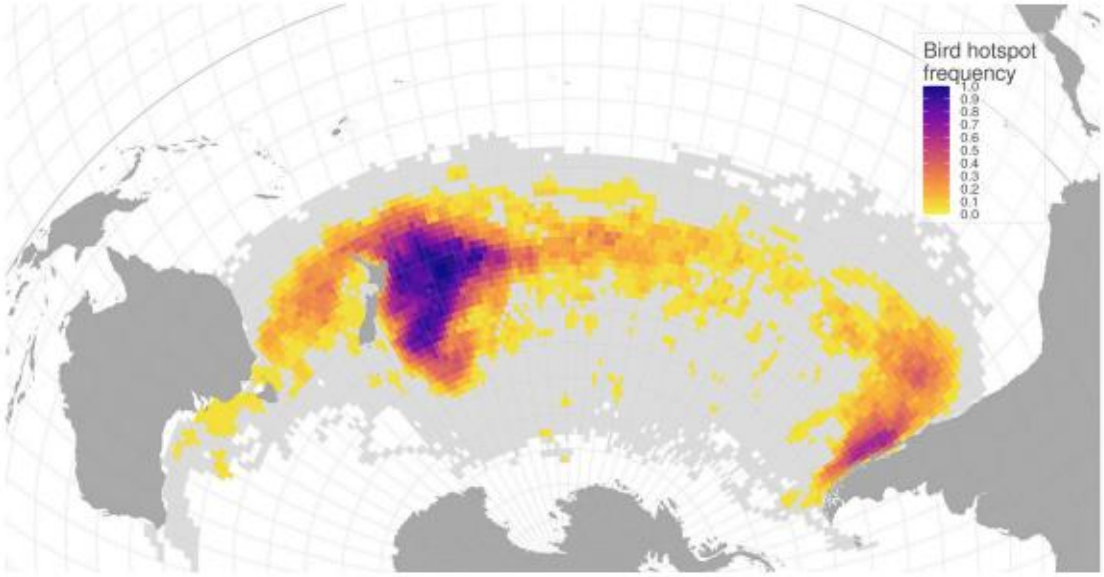


Figure GA.3: Temporal stability of Antipodean albatross distribution hotspots (from Richard et al. 2024). The colour shows the proportion of years when a cell was identified as a hotspot of bird density, at a 99% confidence level. The light grey envelope represents the total extent of the distribution.

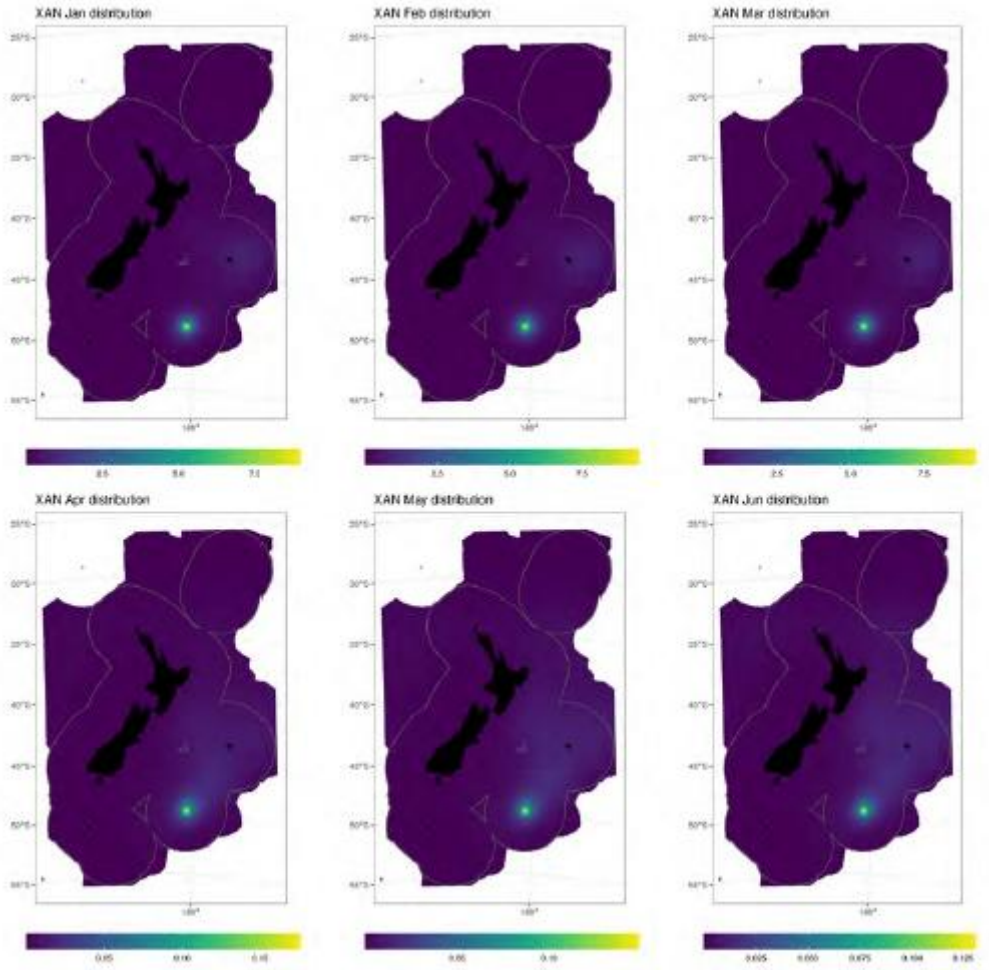


Figure GA.4: Predicted relative spatial density of Antipodean albatross (XAN) by month, for January to June (from Roberts et al. 2023). Please note different colour scale across months.

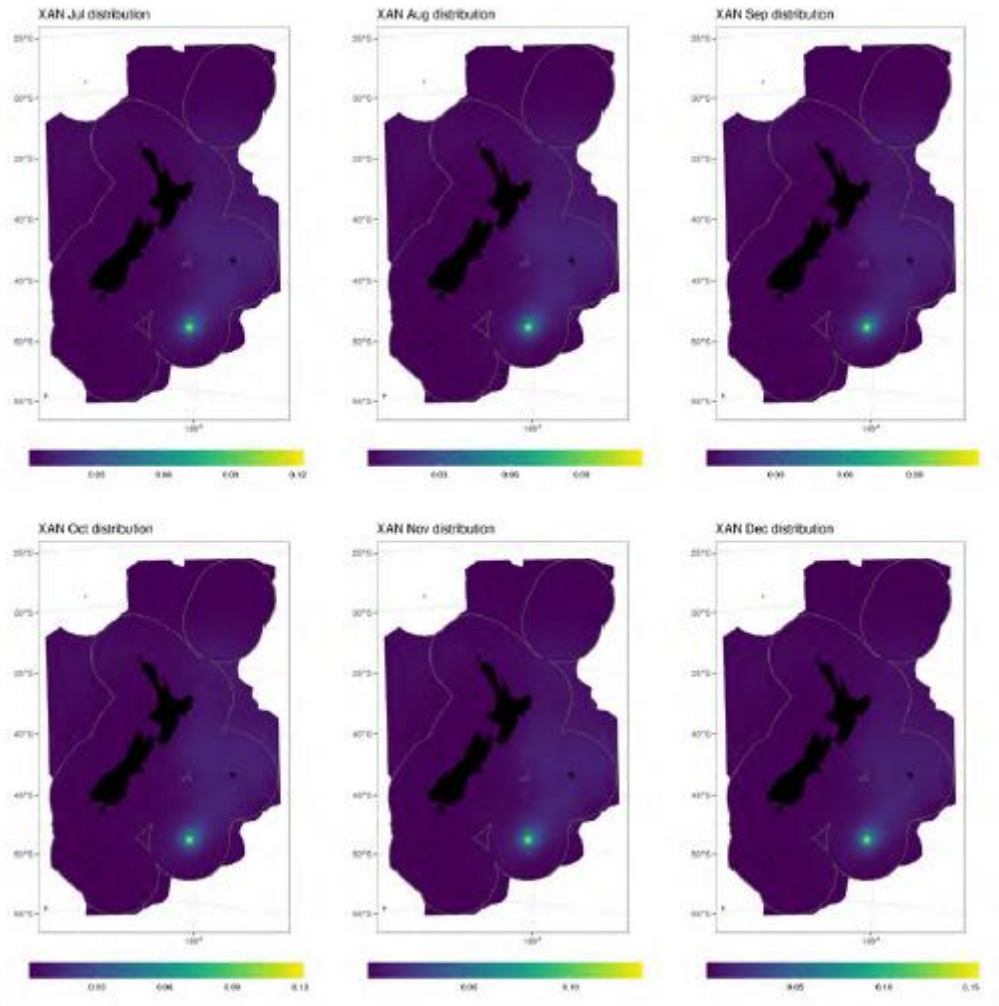


Figure GA.5: Predicted relative spatial density of Antipodean albatross (XAN) by month, for July to December (from Roberts et al. 2023). Please note different colour scale across months.

GA.2.2.2 GIBSON'S ALBATROSS

For Gibson's albatross, there has been long-term annual monitoring of the population at a 61-ha study area on Adams Island since 1991, with the collection of tracking data added in 1996 (Walker & Elliott 2006, Walker et al. 2017). These tracking data were from satellite telemetry tags (between 1996 to 2004 from 57 birds) and from GLS tags (from 2009 onwards from 77 birds). These tracking data were used to assess the foraging distribution of this species over time, including comparison between periods when the population was increasing or declining. This analysis showed that the foraging distribution of breeding birds exhibited relatively little change, but the ranges of both males and females potentially extended and moved north (Figure GA.6). For non-breeding birds, the distributional range increased markedly, particularly for females (Figure GA.7). At that time, both male and female Gibson's albatross were increasingly foraging in the Great Australian Bight. In comparison, recent tracking data from 2019 documented that breeding birds were predominantly foraging in the Tasman Sea, compared with failed breeders expanding their foraging range west into the Great Australian Bight (Rexer-Huber et al. 2020)(Figure GA.8).

In addition, the recent tagging of 22 juvenile Gibson's albatross before fledging in 2022 provided the first tracking data for this age group (Walker et al. 2023). Following fledging, juveniles foraged north-east of New Zealand, spending comparatively more time in this area than previously tracked adults.

For Gibson's albatross, distribution modelling for seabird species in New Zealand predicted that this taxon was most abundant around main breeding colonies at Auckland Islands, with a general distribution throughout New Zealand's EEZ (Roberts et al. 2023; see Figures GA.8 and GA.9).

Note that further analyses to look at the effect of track length on the distributions from each of the time periods has not been undertaken.

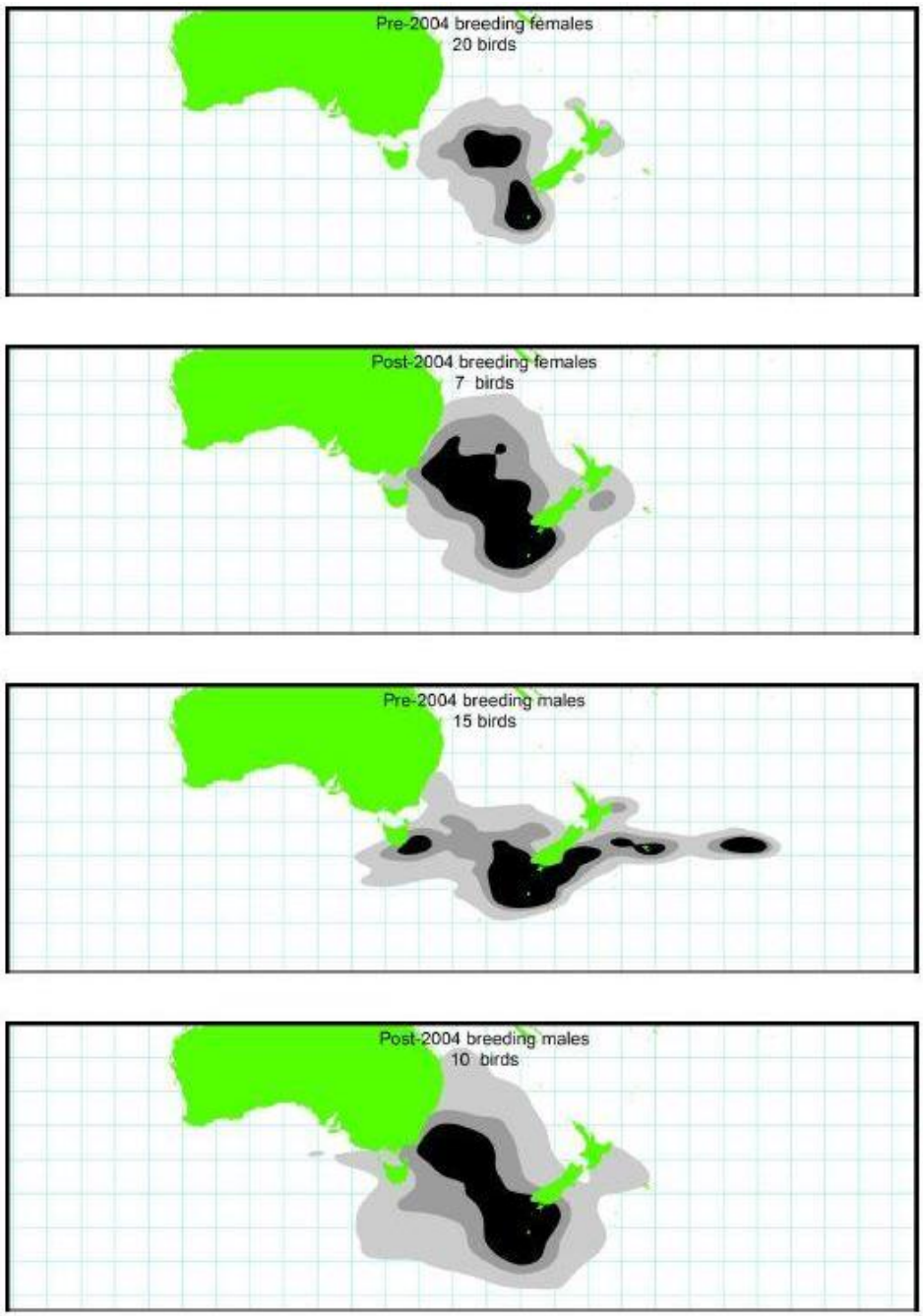


Figure GA.6: Kernel density plots of breeding Gibson's albatross tracked in 1996–2004 and in 2009–17 (from Walker et al. 2017). Black indicates the 50% contour, dark grey the 75% contour, and light grey the 95% contour.

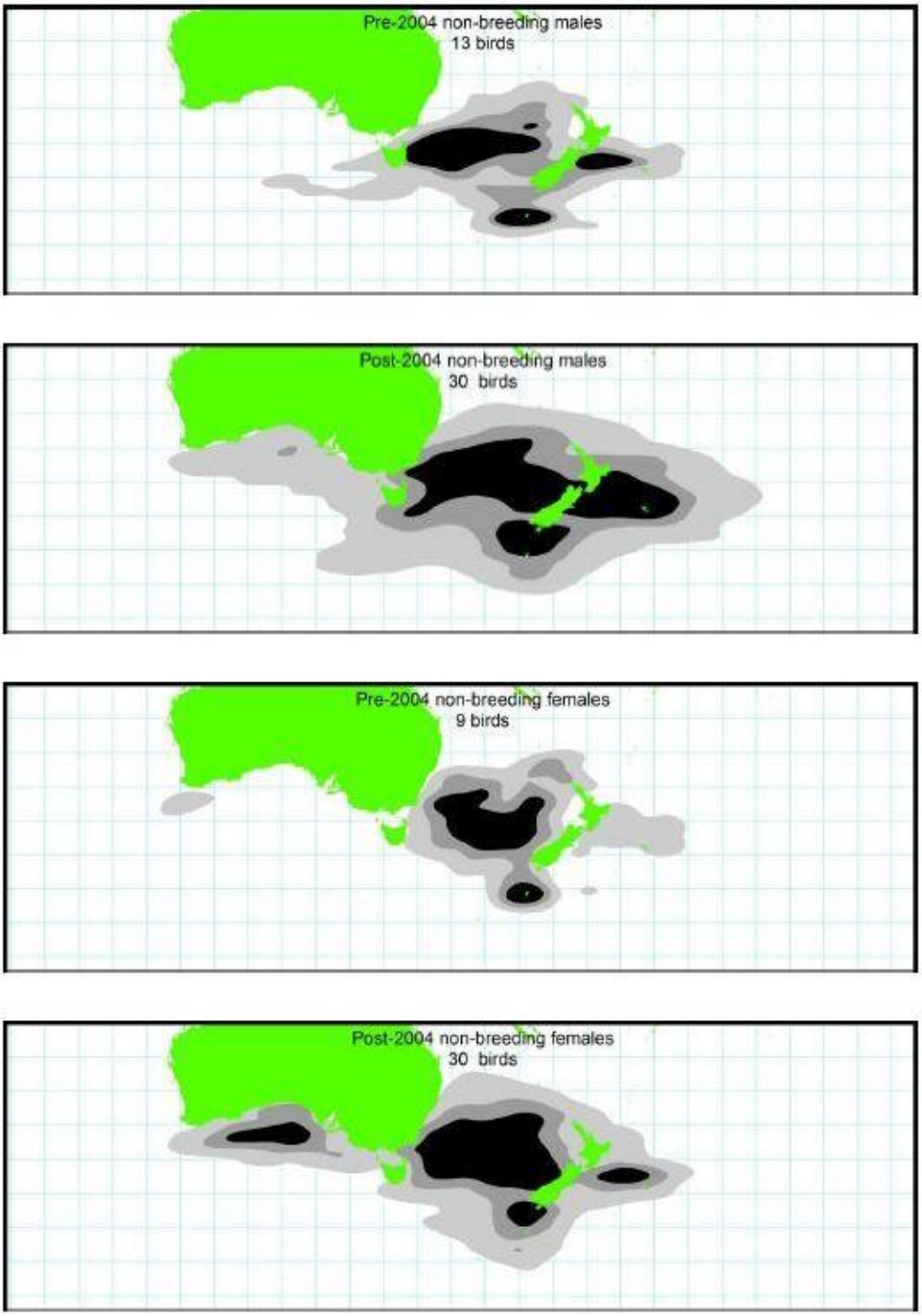


Figure GA.7: Kernel density plots of non-breeding Gibson's albatross tracked in 1996–2004 and in 2009–17 (from Walker et al. 2017). Black indicates the 50% contour, dark grey the 75% contour, and light grey the 95% contour.

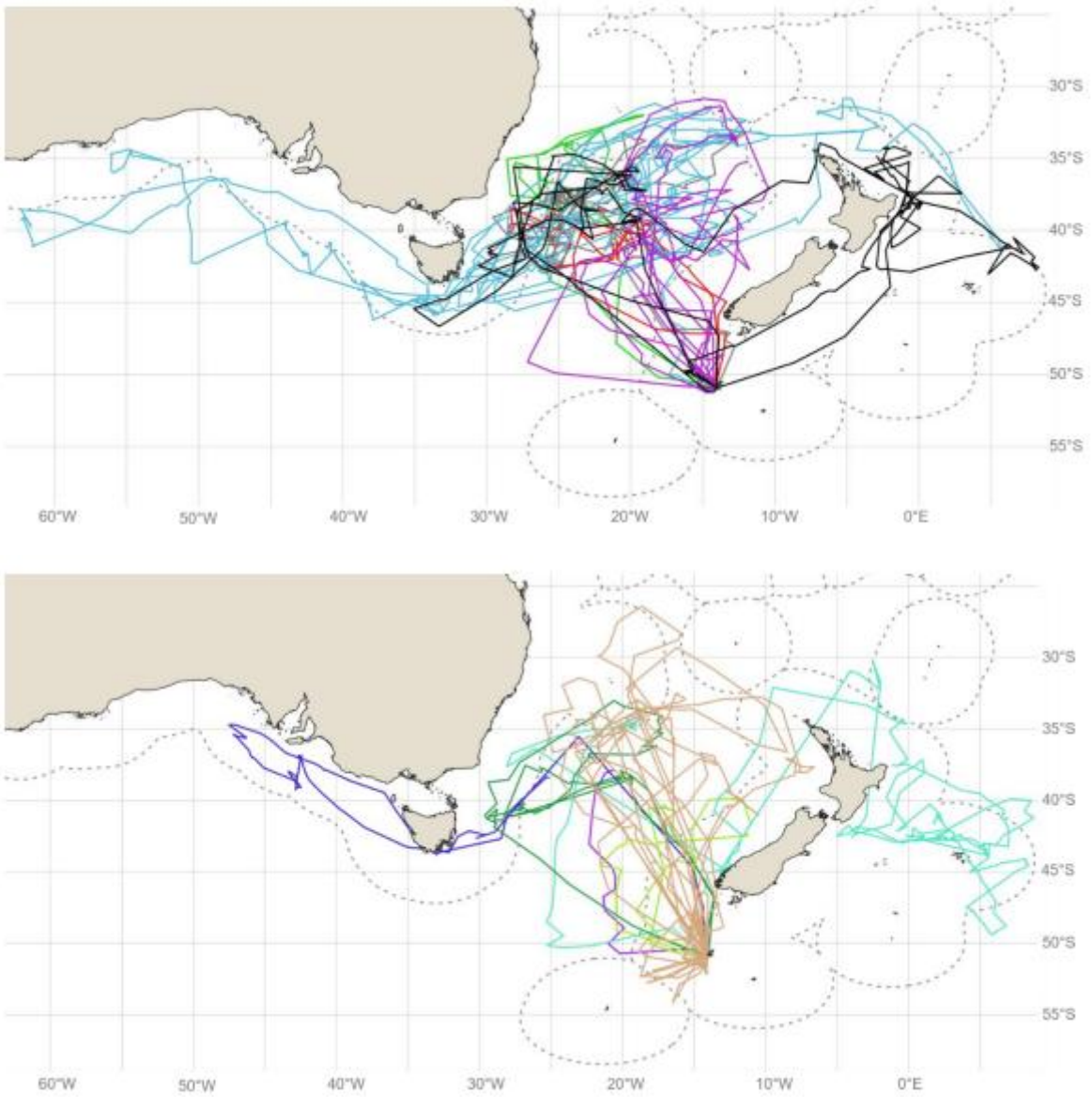


Figure GA.8: Foraging range of Gibson's albatross, tracked from February to September 2019 (from Rexer-Huber et al. 2020). Top: tracks from six breeding females; bottom: failed breeders, with tracks from two males (grey and black) and four females (coloured).

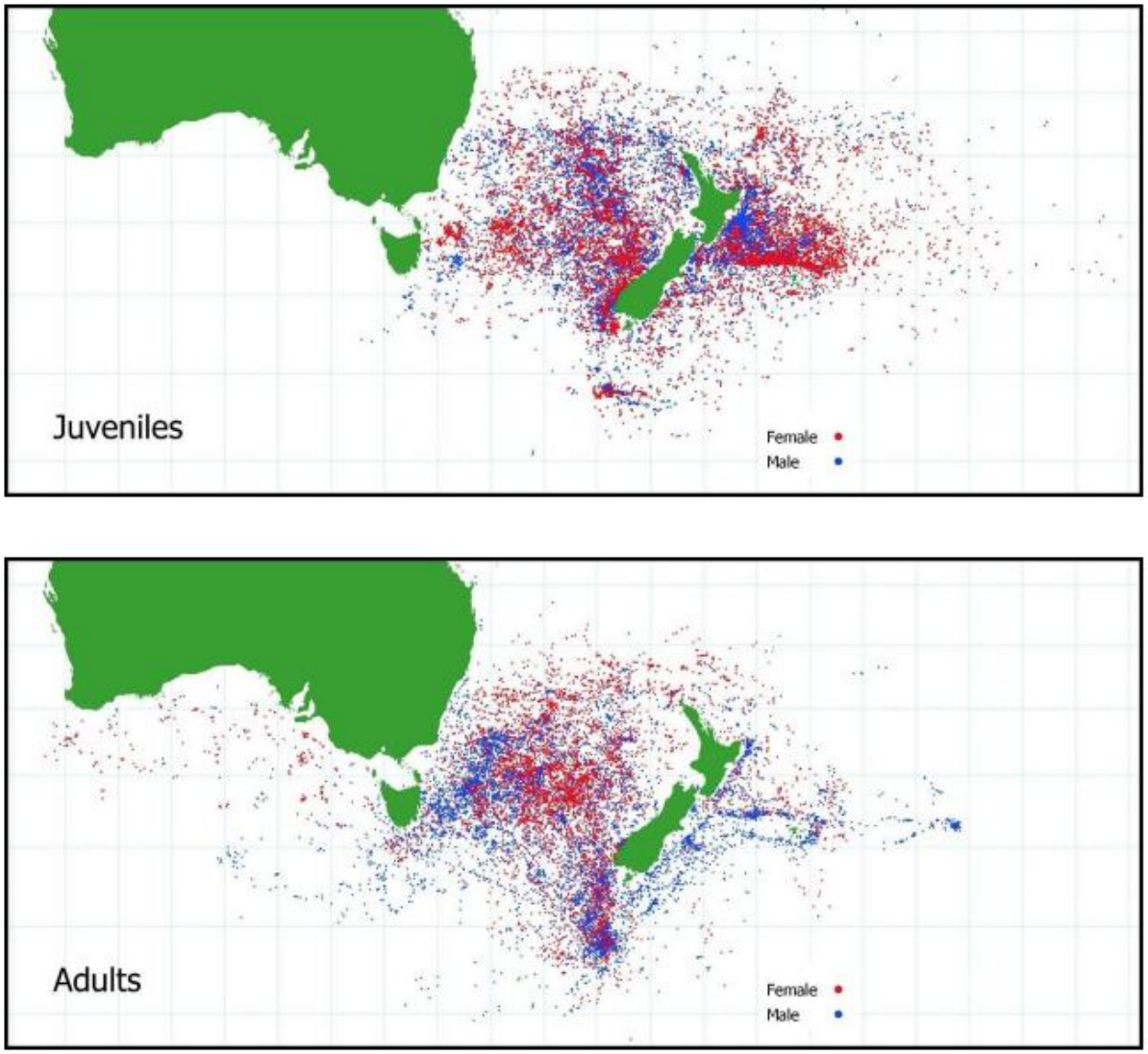


Figure GA.9: Satellite fixes from Gibson's albatross (from Walker et al. 2023). Top: 22 juveniles tracked between December 2022 and July 2023; bottom: 87 adults tracked since 1994.

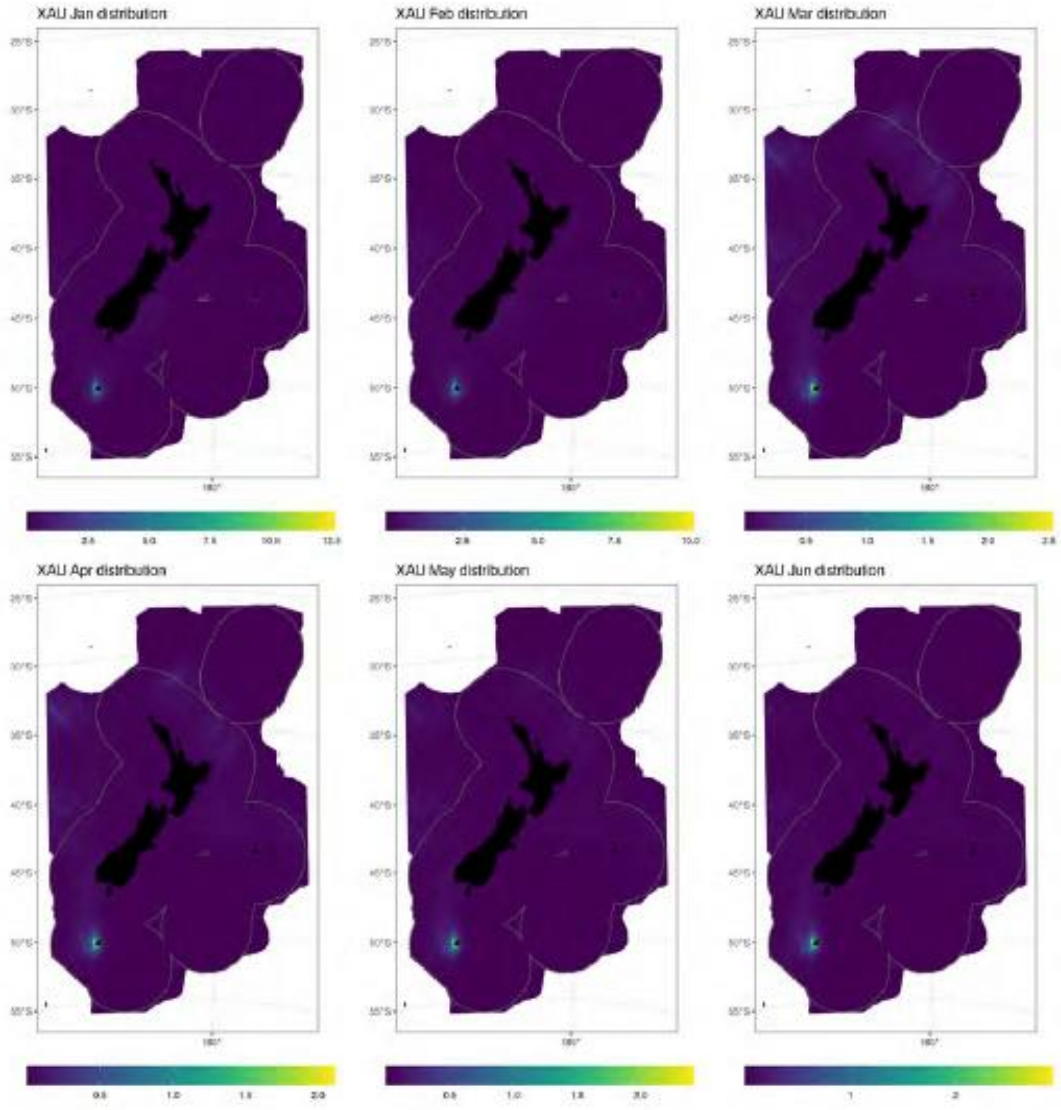


Figure GA.10: Predicted relative spatial density of Gibson's albatross (XAU) by month, for January to June (from Roberts et al. 2023). Please note different colour scale across months.

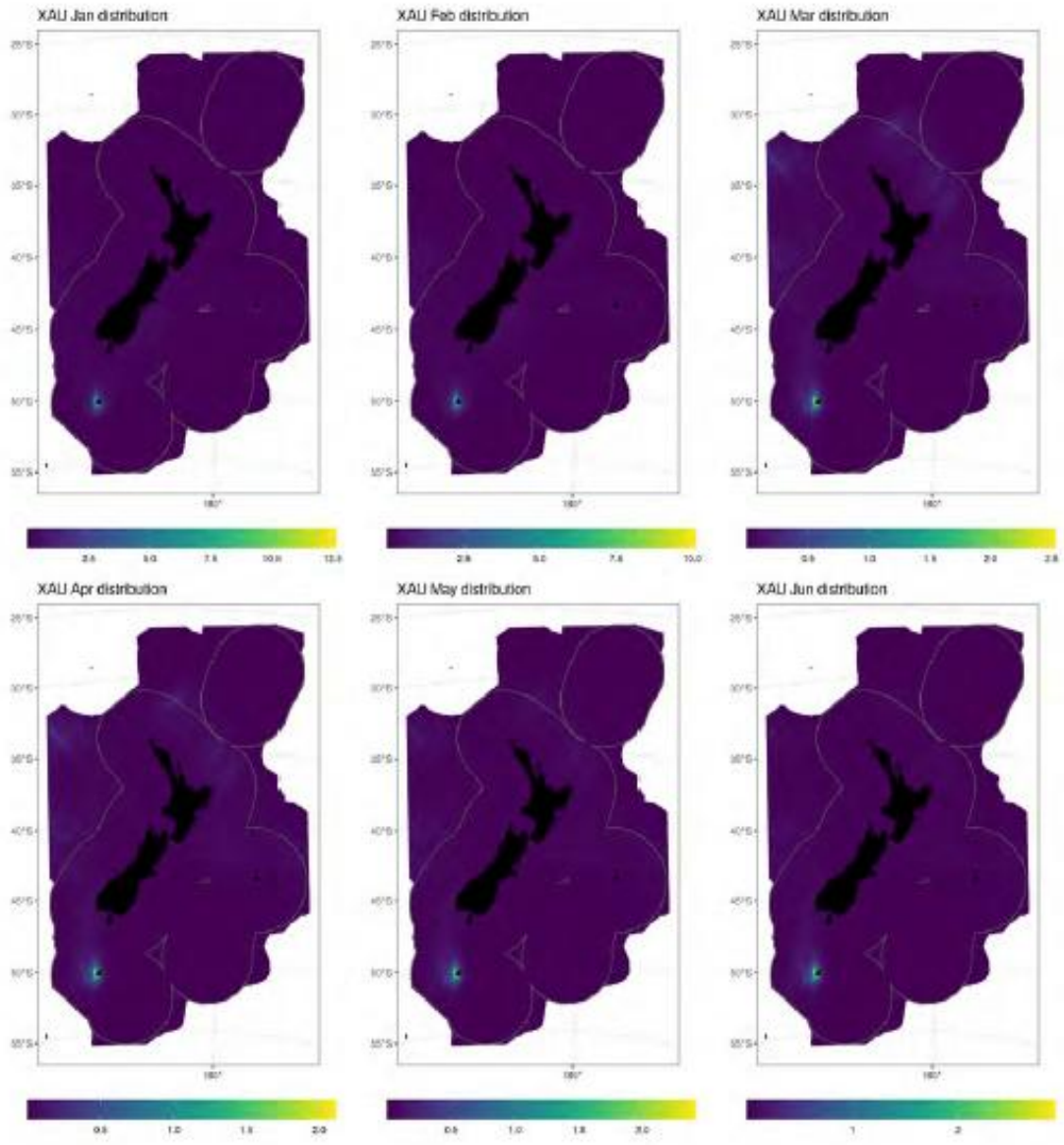


Figure GA.11: Predicted relative spatial density of Gibson's albatross (XAU) by month, for July to December (from Roberts et al. 2023). Please note different colour scale across months.

GA.2.2.3 NORTHERN ROYAL ALBATROSS

Although the population on Otago Peninsula has been thoroughly monitored (including some small scales tracking studies), the overall population trend of the species is uncertain due to sporadic assessment of the main breeding population on the Chatham Islands (Bose et al. 2023). It is estimated that up to 35 birds are killed annually in New Zealand domestic fisheries, as such it is important to better understand the distribution both around New Zealand and internationally (Edwards et al. 2023a). The tracking of 30 birds was undertaken in 2021 (16 males and 14 females), results showed that breeding birds primarily stayed within New Zealand waters with non-breeders heading over to South America going as far north as Uruguay (Bose et al. 2023).

GA.2.2.4 SOUTHERN ROYAL ALBATROSS

Data collected in between 2020 and 2023 (Mischler 2020, Mischler & Wickes 2023) showed a possible large decline in the southern royal albatross population indicating a need to improve understanding of the distribution of the species to better

understand overlap with fisheries. During the 2023/24 austral summer 34 satellite tags (15 on females and 19 on males) and 28 GLS tags (12 on females and 16 on males) were deployed on southern royal albatross (Mischler et al. 2024). Preliminary data show these birds moving north to the Chatham Rise, west to Tasmania, south towards Antarctica, and to the Patagonian Shelf east of Argentina (Figure GA.12). Prior to this only sporadic tagging had taken place for this species, including the deployment of seven satellite tags in 1999, and at sea tagging of three birds off the coast of Uruguay in 2016.

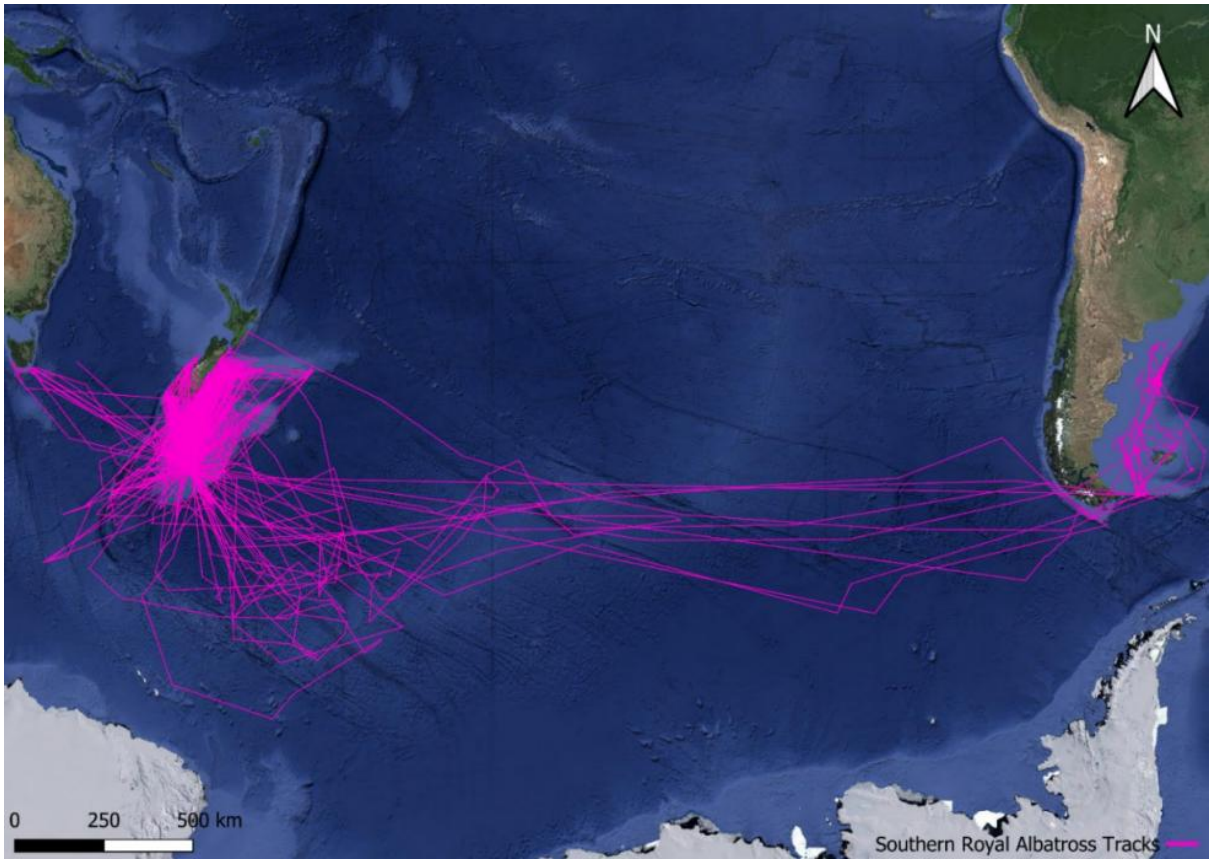


Figure GA.12: Satellite tracks from devices deployed on 35 Southern royal albatross in the CoI study area on Campbell Island (from Mischler et al. 2024). Tracks cover the period from deployment until 11 May 2024.

GA.2.3 FORAGING ECOLOGY

Wandering and royal albatross feeds by surface seizing, targeting cephalopods (squid) and fish. Samples of food items collected during chick-rearing included vertical migrant squid species and also bioluminescent forms, indicating nocturnal feeding. This species has also been observed to feed on fishery discards and baits.

GA.2.4 REPRODUCTIVE BIOLOGY

GA.2.4.1. ANTIPODEAN AND GIBSON'S ALBATROSS

Antipodean albatross (*Diomedea antipodensis*) breeds biennially, with shared incubation and chick care. This species has an extensive breeding cycle of a year to hatch and raise a single chick. The breeding season varies between the two subspecies, with a later season at Antipodes Island (Antipodean albatross - *Diomedea antipodensis antipodensii*) than at Auckland Islands (Gibson's albatross - *Diomedea antipodensis gibsoni*). At the Auckland Islands, eggs are laid in December and January, compared with January and February at Antipodes Island. Chicks hatch in March and April after an average incubation period of about 79 days. Age at first return to the colony is at least three years, and the age at first breeding is 9 years for birds Antipodean albatross and 11 years for Gibsons albatross (Edwards et al. 2023a).

GA.2.5 POPULATION BIOLOGY

GA.2.5.1. ANTIPODEAN ALBATROSS

The Antipodean albatross colony at Antipodes Island has been monitored by Department of Conservation annually since 1994, except in 2006 (see most recent survey reports by Walker & Elliott 2022, Parker et al. 2023). These survey data were used in an integrated population model developed by Richard (2021), which was subsequently updated to inform the multi-threat risk assessment of Antipodean albatross (Richard et al. 2024b). The updated model was based on data from the period between 1995 and 2021 from a study area on the island which formed part of the long-term population monitoring. Based on the modelling, the mean total population size of Antipodean albatross in the study area was estimated at 895 (95% c.i.: 821–961) individuals in 2021, including 363 (95% c.i.: 290– 440) females, and 532 (95% c.i.: 459– 612) males. Males were predominant in all classes, except among juveniles. As the population in the study area is estimated to represent 2.73% of the global population, scaling the population size in study area by dividing the estimates by 0.0273 derives global estimates; this scaling results in an estimated global population size of 32,800 birds.

When the population size was simulated for the next 50 years based on the demographic parameters estimated for the period 2008 to 2020, the trajectory showed a considerable decrease; the mean annual population growth rate was -5.8% (95% c.i.: -7.3% to -4.4%)(Richard et al. 2024b). In comparison, when using parameters from the period 1994 to 2005, the decline was smaller, with a mean of -0.9% (95% c.i.: -3.2% to 1%), and a 19% probability of a population increase.

Using the model to simulate the trajectory of all birds between 1994 and 2020, only considering

their initial state, the number of breeding birds within the study area corresponded closely to the number of nests recorded within the study area (Figure GA.12). Both the simulated numbers of males and females followed a similar trend over time, showing a marked decline. Similarly, the annual breeding probability of adults varied across years, but declined considerably over time; it was similar for adults that were previously unsuccessful breeders and other adults (Figure GA.13). Breeding success, defined as the probability that a nest produces a fledgling, also showed considerable variation, but followed a similar decline as breeding probability, with a potential increase recently, but remaining low overall. Annual survival declined for the four classes considered in the model —adult females, adult males, pre-breeders, and juveniles (Figure GA.14). The decline was most apparent for adult females, from a mean survival rate pre-2006 of 0.95 (95% c.i.: 0.9– 0.98) to a mean survival rate of 0.88 (95% c.i.: 0.79–0.96) after 2006. The finding documented that the adult female life expectancy, declined from a mean of 19.1 years to a mean of 8.3 years. In contrast, the smallest decline in survival rate was for adult males, from a mean of 0.95 (95% c.i.: 0.9– 0.98) to a mean of 0.93 (95% c.i.: 0.88– 0.97) after 2006. This decrease corresponded to a change in adult male life expectancy from a mean of 18.4 years to a mean of 13.6 years.

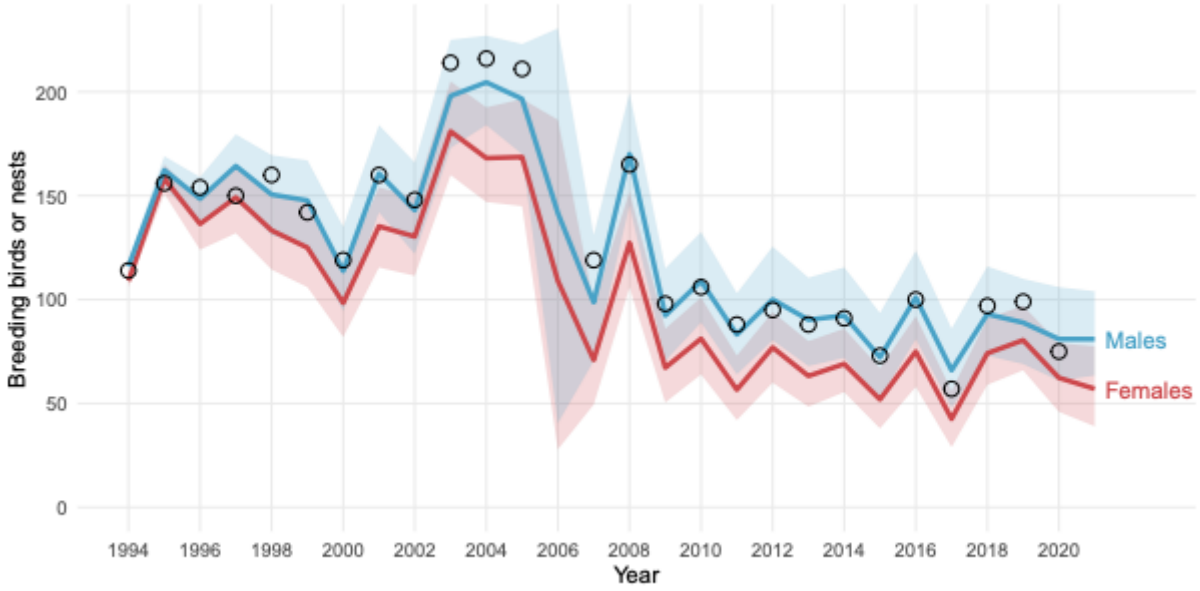


Figure GA.12: Simulation of the number of breeding male and female Antipodean albatross within the Antipodes Island study area between 1994 and 2021, represented by their mean (line) and 95% credible interval (shading)(from Richard et al. 2024b). Black circles show the counts of active nests within the same study area.

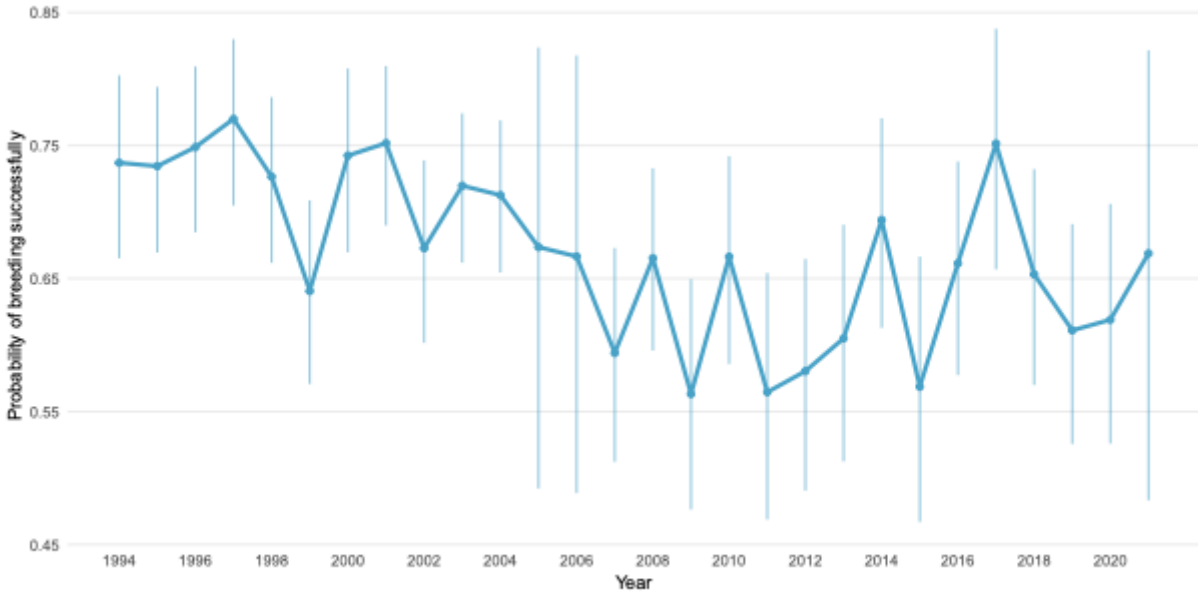


Figure GA.13: Annual breeding success of Antipodean albatross, the probability that a breeding attempt leads to a surviving fledgling, as estimated by the population model (from Richard et al. 2024b) The points and lines indicate the mean values, and the vertical bars the 95% credible interval.



Figure GA.14: Annual survival rate of Antipodean albatross estimated by the population model, by population class and year (Richard et al. 2024b). The points and lines indicate mean values, and vertical bars the 95% credible interval.

Population estimates for the Antipodean albatross subspecies for the recent New Zealand seabird risk assessment were a population size of 11,100 (95% confidence interval: 9,160–13,500) adults, 3,300 (95% CI: 2,970–3,670) annual breeding pairs, proportion of adults breeding of 0.599 (0.501–0.692), age at first reproduction of 9 (7.16–12.9) years, juvenile survival rate of 0.206 (0.0308–0.413), and current adult survival rate of 0.908 (0.863–0.943)(Peatman et al. 2023).

The population size of this species is listed by BirdLife International as 50,000 mature individuals for both subspecies, with a decreasing population trend (BirdLife International 2024).

GA.2.5.2. GIBSON'S ALBATROSS

Population monitoring of Gibson's albatross has been conducted annually at the main breeding area at Adams Island since 1991 (except in 2021; Walker et al. 2023). This monitoring is conducted by mark-recapture of birds in census areas and focuses on key demographic parameters, such as survival, productivity, recruitment, and population trends over time. Research efforts have also included tracking of individual birds to establish their distribution, and the exploration of methods to survey the entire population, such as the use of drones for aerial surveys. The most recent data are from the 2022/23 survey (Walker et al. 2023), but the lack of information from 2021 meant that some trends (relying on mark-recapture data) were not considered reliable, so that some of the time-series data were not extended from earlier surveys (Parker et al. 2022, Rexer-Huber et al. 2020).

Over the survey period, the population in the study area at Adams Island showed a marked decline, with a substantial drop (68%) in breeders in 2004–2006; this decline continued subsequently, but at a slower rate from 2012 onwards (Walker et al. 2023; see Figure GA.15). Recent data indicated some signs of population recovery, although not consistently across population parameters (Walker et al. 2023). There was an increase in annual survival rate for both males and females (Figure GA.16), and also in nesting success and in the number of chicks fledged, but the estimated number of breeding pairs remained low (Figure GA.17). In 2022/23, there were an estimated 4,434 nests across all of Adams Island. This estimate of the breeding population was about half of its estimate before the marked decline in 2004 (Figure GA.18). The most recent estimate of breeding success was 56% in 2019 (Rexer-Huber et al. 2020a).

Estimates for the total population (including pre-breeders) were provided in an analysis of three data sets for the 21-year period from 1991 to 2011 (Francis et al. 2015). This modelling indicated an annual decline of 5.7% in the adult population since 2005, caused by sudden and marked drops in adult survival (from 0.95 to 0.89), in the proportion breeding (from 0.53 to 0.37), and in the proportion of successful breeding attempts (from 0.60 to 0.25)(Figure GA.19). The breeding population at the time (2011) was estimated to be only 54% of the average of 5831 pairs estimated previously for the period 1991–97 (by Walker & Elliott 1999). Forward projections indicated that adult survival was the most significant population parameter of the three parameters with estimated declines (Figure GA.20).

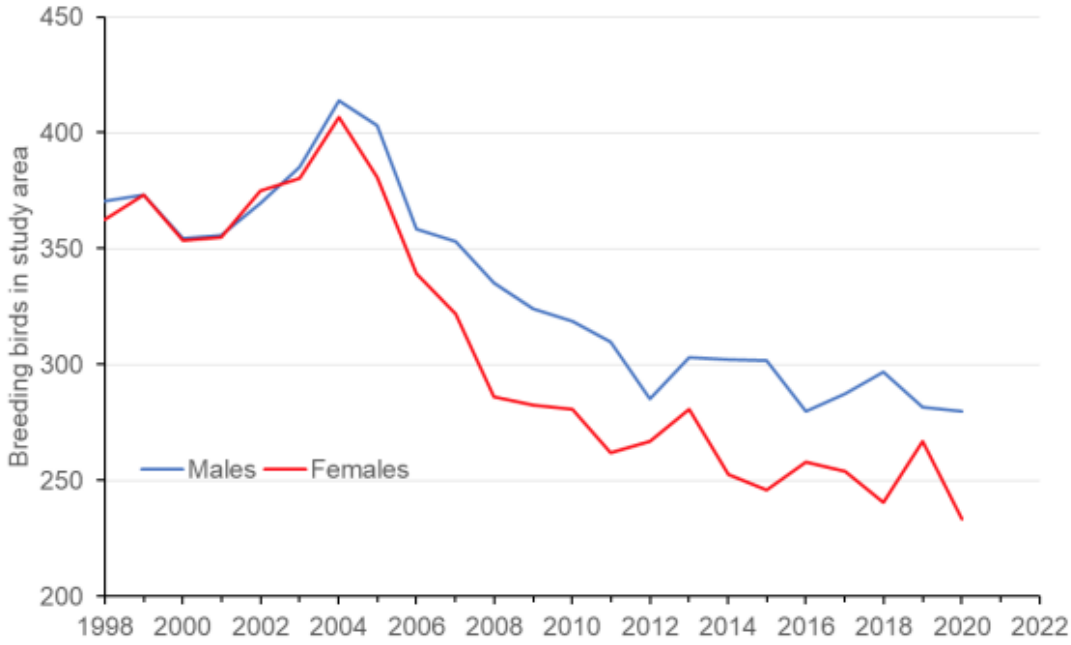


Figure GA.15: Number of breeding Gibson's albatross in the Adams Island study area between 1998 and 2023 estimated by mark-recapture (reproduced by Walker et al. 2023 from Rexer-Huber et al. 2020).

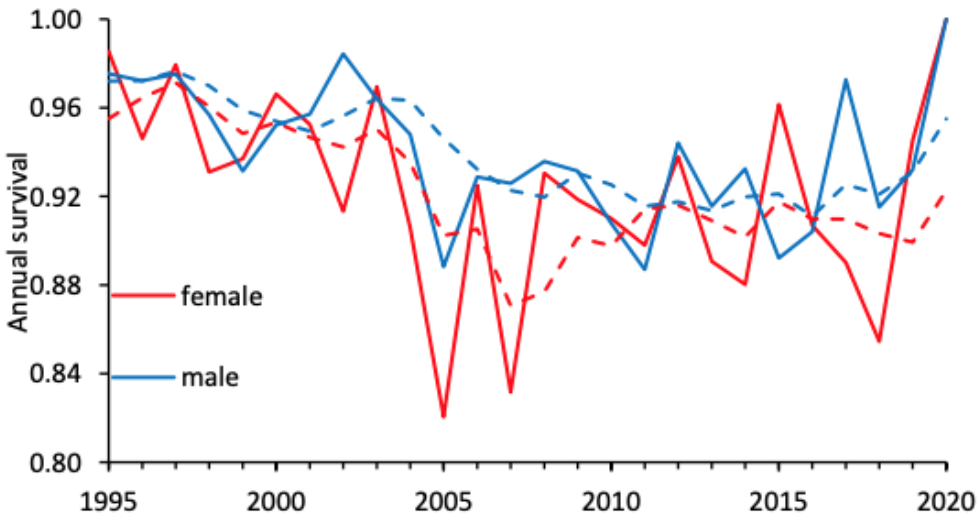


Figure GA.16: Annual survival of Gibson's albatross in the Adams Island study area since 1995, estimated by mark-recapture (reproduced by Walker & Elliott 2023 from Rexer-Huber et al. 2020). Also shown are four-year rolling averages (dashed lines).

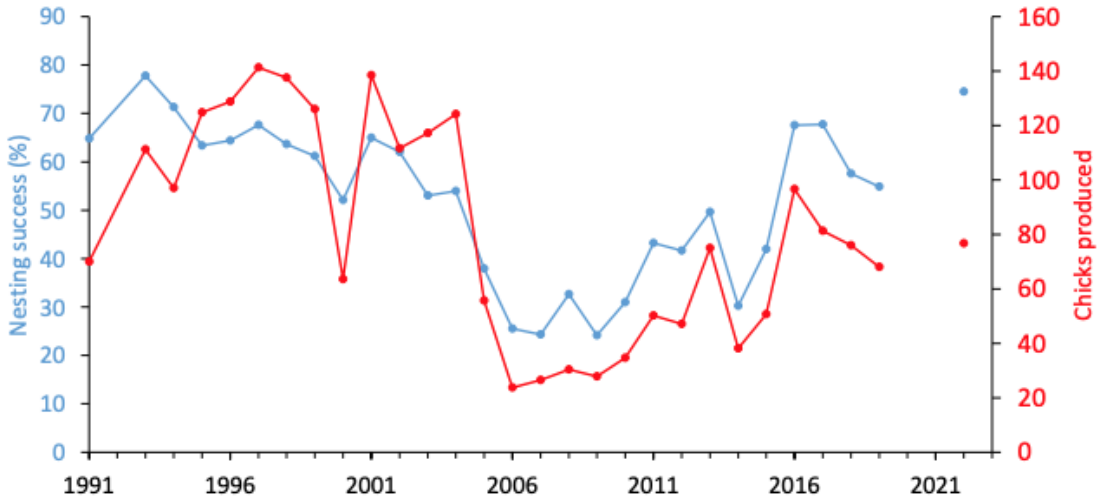


Figure GA.17: Nesting success and number of chicks fledged of Gibson's albatross at the study area on Adams Island since 1991 (from Walker et al. 2023).

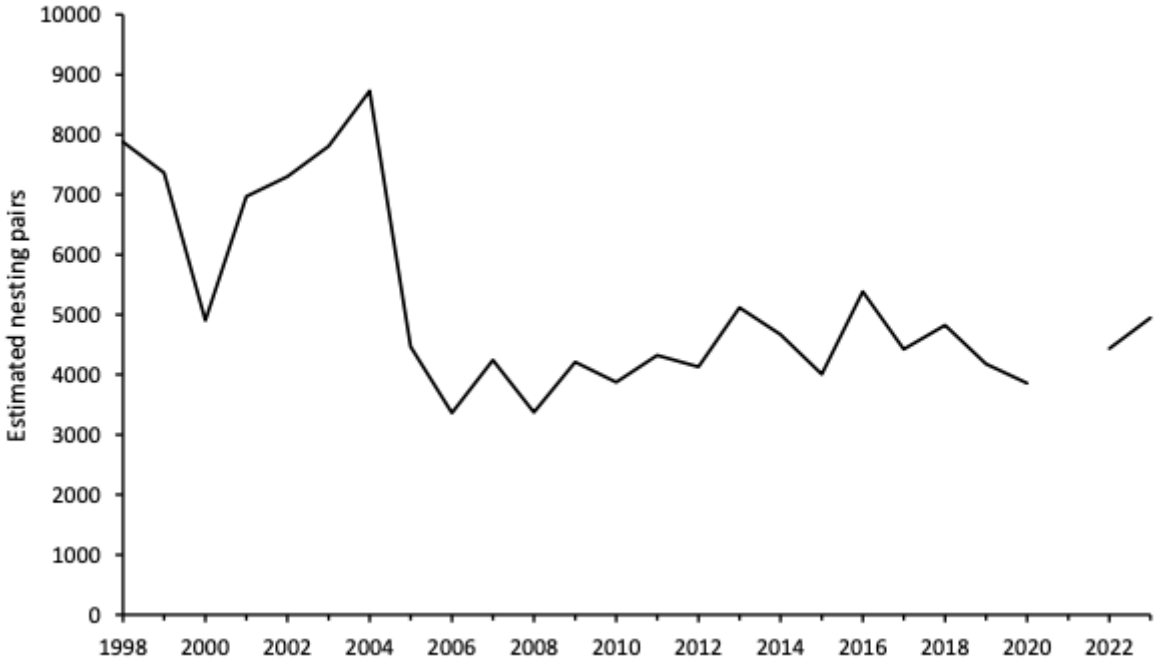


Figure GA.18: Total number of nests (or breeding pairs) of Gibson's albatross across Adams Island between 1997 and 2023 (from Walker et al. 2023). Estimated number of nesting pairs on the island was based on annual counts in the three census blocks, taking account of the number of failed nests and unlaid eggs at the time of counting.

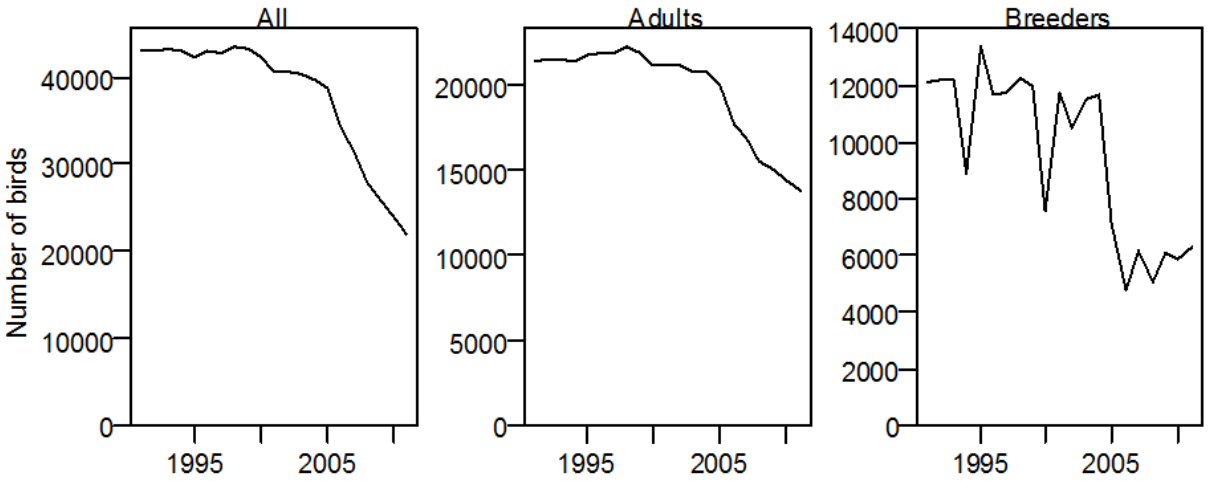


Figure GA.19: Estimated population trajectories for the whole Auckland Islands population of Gibson's albatross (from Francis et al. 2015). Trajectories were calculated by scaling up trajectories from a fully Bayesian model (GIB5) to match earlier estimates for the entire population by Walker & Elliott (1999).

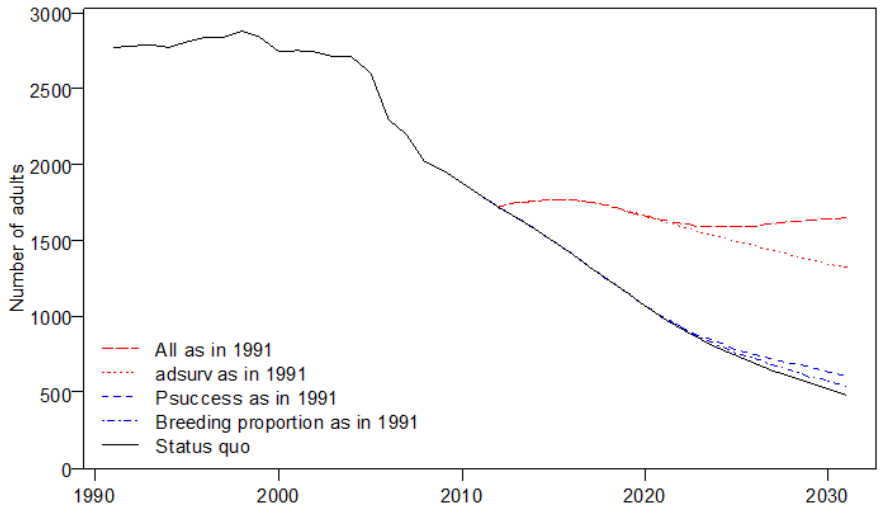


Figure GA.20: Estimated population trajectory for adult Gibson albatross (from Francis et al. 2015). Trajectories are from a fully Bayesian model (GIB5) with 20-year projections under five alternative scenarios about three demographic parameters: adult survival (adsurv); breeding success (Psuccess); and proportion of adults breeding. Scenarios differ according to whether each parameter remains at its status quo (as at 2011) level or recovers immediately to its 1991 level.

Population estimates for the Gibson's albatross subspecies derived for the recent New Zealand seabird risk assessment were a population size of 14,500 (95% confidence interval: 11,100–18,700) adults, 4,310 (95% CI: 3,500–5,220) annual breeding pairs, proportion of adults breeding of 0.599 (0.497–0.693), age at first reproduction of 11 (10.1–11.9) years, juvenile survival rate of 0.188 (0.0282–0.396), and current adult survival rate of 0.918 (0.872–0.951)(Peatman et al. 2023).

GA.2.6 CONSERVATION BIOLOGY AND THREAT CLASSIFICATION

Under the New Zealand Threat Classification System, both subspecies of Antipodean albatross are ranked Nationally Critical; the international threat ranking for this species is Globally Threatened - Endangered (Robertson et al. 2021, BirdLife International 2024).

GA.3 GLOBAL UNDERSTANDING OF FISHERIES INTERACTIONS

At a global scale, petrels (together with albatrosses) have been recognised as being particularly vulnerable to fisheries bycatch, with conservation concerns in the 1980s leading to the multi-lateral ACAP that covers 29 albatross and petrel

species, including Antipodean albatross (as a species; Phillips et al. 2016, Phillips & Wood 2021). The vulnerability of these seabird groups is linked to their life histories, such as late age at first breeding (five to over ten years), low reproductive rate (i.e., single-egg clutch, with some species only breeding every two years), and their frequent overlap with a range of fisheries across different jurisdictions.

Incidental captures in other jurisdictions are difficult to assess, because observer data are scarce, particularly at the species level. Observer records from 2012 to 2018 used in a risk assessment of surface-longline fisheries to albatrosses and petrels in the Southern Hemisphere included 269 captures of "great albatrosses"; most (243) of these observed captures were in the Japanese high seas, with 25 observed captures in New Zealand surface longline, and one capture in the South African domestic surface-longline fishery (Abraham et al. 2019).

Bycatch of Antipodean albatross in longline fisheries has been highlighted as one the main threats to this species by the ACAP, which considered that the expansion of the southern bluefin tuna fishery around New Zealand and Australia is likely to have had considerable impact on both subspecies. Bycatch of this species has also been recorded in pelagic longline fisheries targeting swordfish in Chilean waters, where the species grouping "wandering albatross" was the second most-frequently caught taxon in 2005–2006, as recorded in autopsy reports. The distribution of this species also overlaps with considerable fishing effort in the Australian Eastern Tuna and Billfish fishery, and with other longline fleets targeting albacore tuna in the central Pacific Ocean.

Analyses of tracking data and spatial fishing information (from Global Fishing Watch) highlighted the bycatch threat posed by pelagic longline fisheries in the Pacific Ocean, including in New Zealand waters (Bose & Debski 2020, 2021). Impacts from other fisheries were considered to be minor, owing to the lack of overlap (demersal longlining, jigging), or few observed incidental captures (trawl fisheries in New Zealand waters). Recent distribution modelling of Antipodean albatross highlighted the overlap between this subspecies and surface-longline fleets (Richard et al. 2024). This temporal assessment revealed variability in the location of overlap hotspots through time, but there were distinct areas that were consistently classified as overlap hotspots in the time period from 1997 to 2019. These areas included the Tasman Sea, an area eastward and northward of New Zealand's North Island, and off the coast of Chile.

The distribution of this species overlaps with six Regional Fisheries Management Organisations, primarily with the Western and Central Pacific Fisheries Commission (WCPFC) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The other RFMOs are the Indian Ocean Tuna Commission (IOTC), the Inter-American Tropical Tuna Commission (IATTC), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), and the South Pacific Regional Fisheries Management Organisation (SPRFMO).

GA.4 STATE OF KNOWLEDGE IN NEW ZEALAND

Incidental captures of Antipodean albatross are recorded in observer data from New Zealand fisheries, with identifications at the subspecies level; some captures may also be included in observer records under general groupings such as "albatrosses" and "wandering albatrosses". Across fisheries, there was a small number of observed captures that were identified to either subspecies (in addition to captures in the general species grouping wandering albatrosses) in trawl fisheries between 2002–03 and 2020–21 (see Chapter GS). In surface longline, observed captures identified to the subspecies level were 42 captures of Antipodean albatross and 43 captures of Gibson's albatross, with 4 additional captures of birds in the wandering albatrosses grouping over this period. Observed captures occurred mostly in southern blue tuna, bigeye tuna, and broadbill swordfish targets. In bottom longline, there were four observed captures of birds in the "wandering albatrosses" grouping between 2002–03 and 2020–21.

GA.4.1. QUANTIFYING FISHERIES INTERACTIONS

Bycatch estimates for Antipodean albatross in New Zealand waters were derived as part of multi-species and individual risk assessments that included both subspecies (Edwards et al 2017, Richard & Abraham 2020, Edwards et al. 2023a). In

the updated multi-species risk assessment for seabirds in New Zealand waters, both subspecies were identified amongst the top species at risk from commercial fisheries (Edwards et al. 2023). The Antipodean albatross subspecies was also the focus of an earlier individual risk assessment for New Zealand surface-longline fisheries (Edwards et al. 2017).

GA.4.1.1. ANTIPODEAN ALBATROSS

Most recently, a multi-threat risk assessment for the Antipodean albatross subspecies included commercial fisheries and other threats, such as the impact of climate and plastic pollution (Richard et al. 2024). Part of this assessment included an updated population model, with a focus on the risks of multiple threats to this subspecies, including spatial information.

The threat of fisheries was assessed by estimating the annual number of captures in New Zealand's domestic trawl, bottom- and surface-longline fisheries. The estimation included capture records of the subspecies and also captures identified to the generic wandering albatross grouping (which constituted the majority of recorded captures in trawl fisheries). The analysis highlighted a peak in estimated captures in surface longline between 2001 and 2005, followed by a marked decrease in estimated captures, and a slow continuous decline after 2006 (Figure GA.21). Since then, there have been around 22 estimated captures per year across commercial fisheries. The estimated captures were located off the eastern and northern coast of North Island, an area predominantly used by females (Figure GA.22). This finding was supported by necropsy data of Antipodean albatross caught in surface longline: since 1998, of the 28 observed captures for which the sex was identified, 17 (61%) were females. The timing and the sex bias in the captures in New Zealand surface-longline fisheries corresponded to the pattern of decline in demographic parameters, with the peak in captures occurring just before the demographic decline (Richard et al. 2024b).

GA.4.1.2. GIBSON'S ALBATROSS

There was a similar pattern in estimated captures of Gibson's albatross in New Zealand commercial fisheries, but estimates overall were lower than for its conspecific (Figures GA.21 and GA.22). Both males and females of Gibson's wandering albatross (*D. antipodensis gibsoni*) also forage in the Tasman Sea and with a similar decline in population size, survival rate, and breeding success recorded in 2005 and 2006, like their conspecific (Walker et al. 2023).

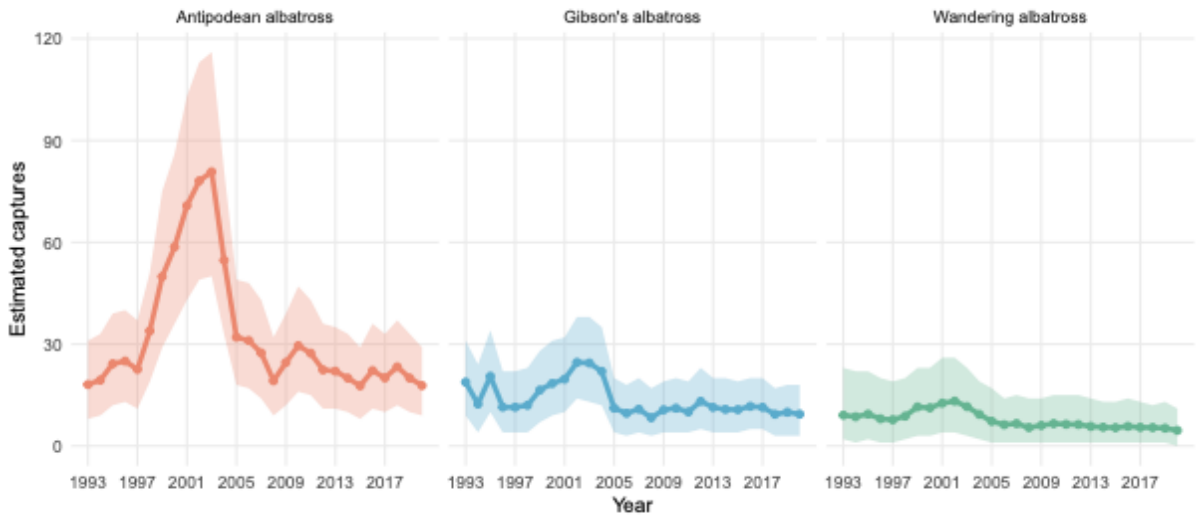


Figure GA.21: Total estimated captures of wandering albatross taxa in New Zealand commercial surface-longline, bottom-longline, and trawl fisheries by year (from Richard et al. 2024b). The line shows the mean, shading the 95% credible interval.

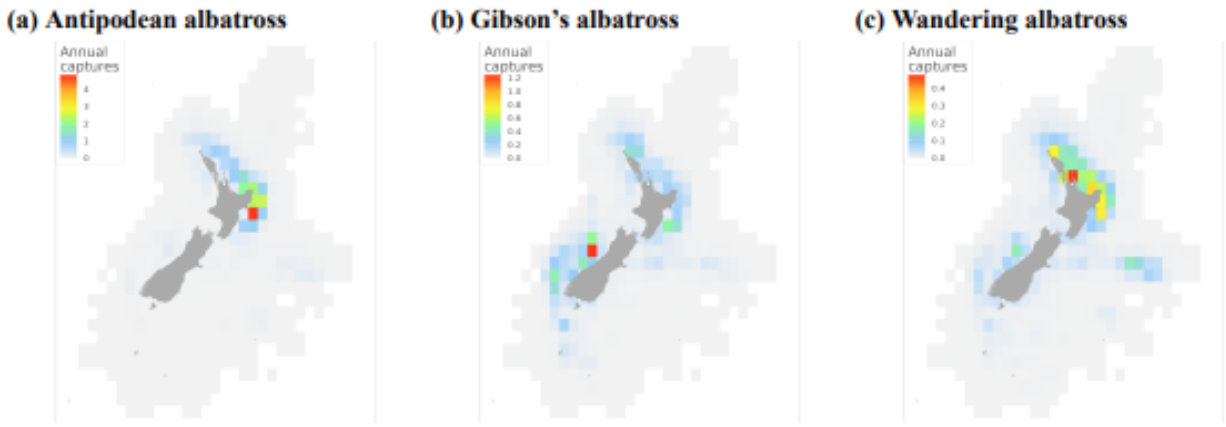


Figure GA.22: Mean estimated number of annual captures of wandering albatross taxa in New Zealand surface-longline (SLL), bottom-longline (BLL), and trawl fisheries, between 1993 and 2020 (from Richard et al. 2024b). (Note the different colour scales among taxa.).

GA.4.2 MODELLING POPULATION-LEVEL IMPACTS OF FISHERIES INTERACTIONS

The population-level impacts of fisheries interactions have been assessed in separate risk assessments for Antipodean albatross and Gibson's albatross. For the former subspecies, the most recent and comprehensive analysis was in the multi-threat risk assessment conducted in 2023 (Richard et al. 2024b). For Gibson's albatross, a 2015 study attempted to determine the risk of fisheries, including estimation of incidental captures across fisheries from a number of data sources (Francis et al. 2015).

GA.4.3 SEABIRD RISK ASSESSMENTS

GA.4.3.1. RISK ASSESSMENT FOR NEW ZEALAND

GA.4.3.1.1. ANTIPODEAN ALBATROSS

Predictive modelling that assessed the temporal variability in the distribution of Antipodean albatross, also included its spatial overlap with fisheries (Richard et al. 2024a). This analysis was based on a comparison of the distribution map of this subspecies with surface-longline fishing effort in the Southern Hemisphere to assess variability in particular areas of overlap with fisheries ("overlap hotspots"). Although there was variability in the location of overlap hotspots through time, there were distinct areas that were consistently classified as overlap hotspots in the time period from 1997 to 2019. These areas included the Tasman Sea, an area eastward and northward of New Zealand's North Island, and off the coast of Chile (Figure GA.23).

The multi-threat risk assessment for Antipodean albatross considered a number of different threats to this taxon, in addition to fisheries bycatch (Richard et al 2024). This study confirmed previous findings that the population decline of Antipodean albatross was a result of a decrease in survival rate, mostly of adult females, and in the breeding probability and breeding success.

Nevertheless, the analysis of different threats did not reveal a clear cause of the demographic decline of Antipodean albatross observed over the study period. Changes in oceanographic and climate parameters since 1995, and the overlap with plastic pollution in the Pacific Ocean did not explain the patterns in demographic parameters. The main potential change in threat levels identified was in fishing effort, especially in the Tasman Sea, leading to the suggestion that this change may explain the greater decline for females.

This suggestion was explored in an interactive simulation tool that was developed as part of the risk assessment project[1]. The simulation tool was based on the population model and used in an expert workshop that allowed participants to test different management scenarios in view of the potential impacts of different threats. In this exploration, the fisheries operating in the Tasman Sea were found to be the most likely cause of the observed population decline. Varying the impact of different international fisheries individually, the fleet flagged to China was the only fleet that could potentially explain both the change after 2006 and the female-biased impact. When the impact factor of this fleet was set to lead to around 1450 hypothetical deaths annually across the entire distributional range of the species, the simulation showed a stabilisation of the population, and an even survival rate between both sexes, at around 97% (see screenshot in Figure GA.24).

The recent multispecies risk assessment for New Zealand seabirds estimated Antipodean albatross to be in the medium risk category (Edwards et al. 2023; see Figure GA.25).

GA.4.3.1.2. GIBSON'S ALBATROSS

The development of population estimates based on 21 years of data in combination with fishery data was used by Francis et al. (2015) to assess the risks of fisheries to Gibson's albatross. Nevertheless, the assessment was hindered by the lack of information about incidental captures, particularly in waters other than New Zealand and Australia. Owing to this limitation, it was difficult to assess the impact of fishing on the sustainability of the Gibson's albatross population. For this reason, the authors put forward three conclusions pertaining to fishery impacts based on the availability of data; they considered that most fishing mortality of Gibson's albatross is in surface-longline fisheries, that this mortality has decreased over the study period, and that and there is no indication that the sudden and substantial declines in adult survival, the proportion breeding, and breeding success were caused primarily by fishing.

In the multispecies risk assessment for New Zealand seabirds, Gibson's albatross was ranked in the medium risk category (Edwards et al. 2023; see Figure GA.25).

[1] Available online at https: //antipodean-albatross-simulations.dragonfly.nz/

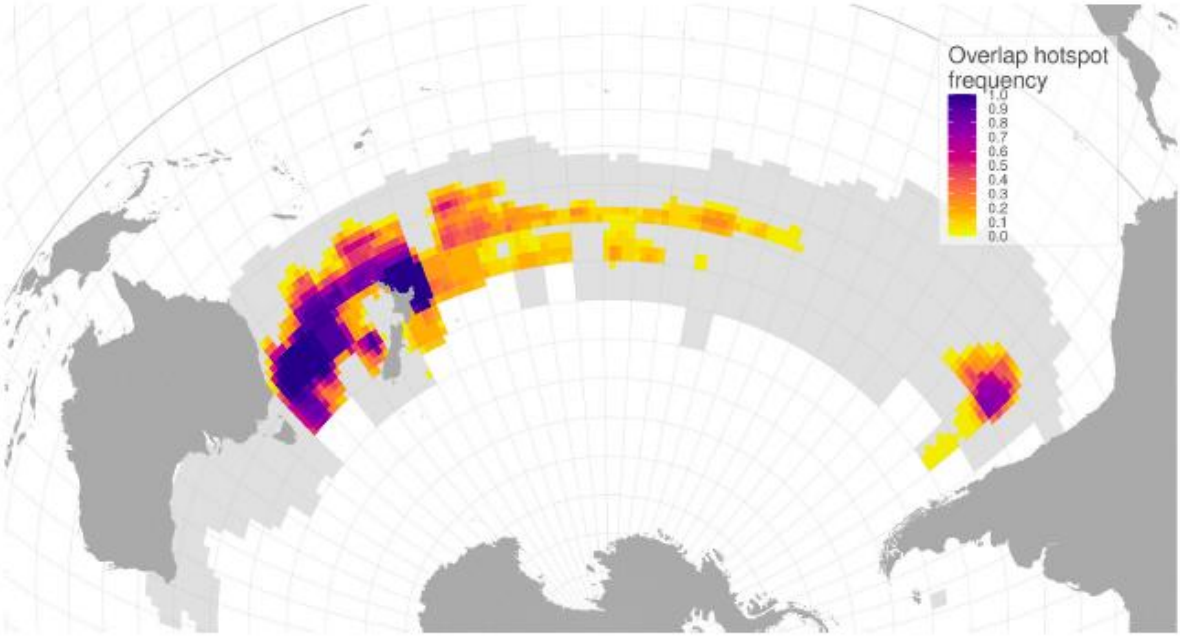
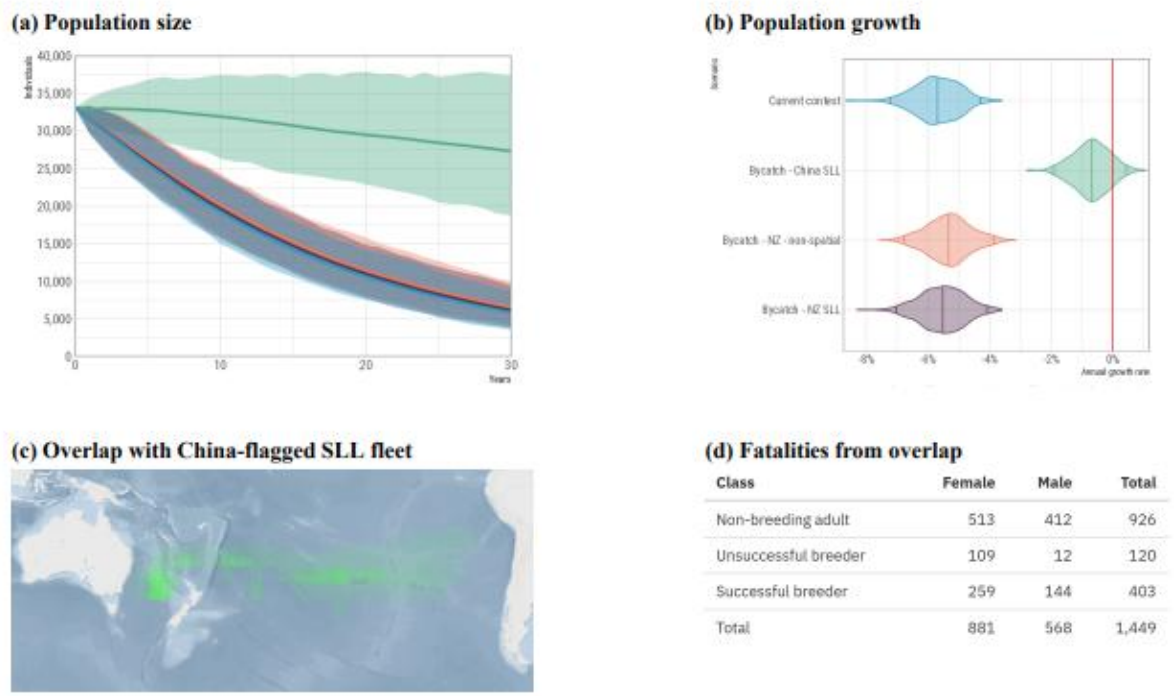


Figure GA.23: Temporal stability of overlap hotspots between Antipodean albatross and surface-longline fishing effort (from Richard et al. 2024a). The colour shows the proportion of years when each cell was identified as a hotspot of overlap, at a 99% confiden ce level. The light grey envelope represents the total extent of overlap.



Class	Female	Male	Total
Non-breeding adult	513	412	926
Unsuccessful breeder	109	12	120
Successful breeder	259	144	403
Total	881	568	1,449

Figure GA.24: Screenshots of the simulation tool exploring the demographic impact of Antipodean albatross bycatch within New Zealand's Exclusive Economic Zone, and a hypothetical impact of the China-flagged surface-longline (SLL) fleet (from Richard et al. 2024b).

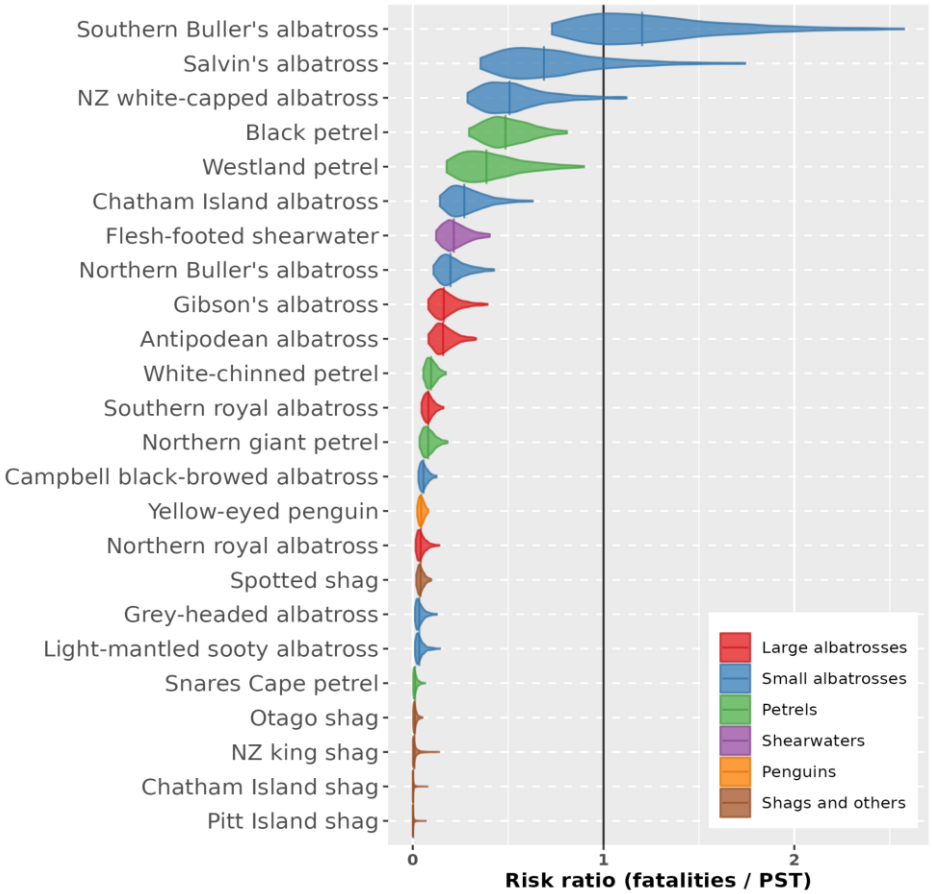


Figure GA.25: Risk ratio for different seabird taxa, generated from data from the 2023 New Zealand seabird risk assessment (Edwards et al. 2023a). The risk ratio is displayed on a logarithmic scale, with the threshold of the number of fishery-related deaths (fatalities) equalling the Population Sustainability Threshold (PST) represented by the black vertical line, and the distribution of the risk ratios within their 95% credible interval indicated by the coloured shapes, including the median risk ratio (vertical line). Seabird taxa are listed in decreasing order of the median risk ratio. Taxa with a risk ratio of almost zero were not included (95% upper limit less than 0.05).

GA.4.3.2. MULTISPECIES RISK ASSESSMENT FOR THE SOUTHERN HEMISPHERE

GA.4.3.2.1 LONGLINE AND TRAWL FISHERIES

The recent seabird risk assessment for the Southern Hemisphere considered albatrosses and petrels listed under the ACAP in trawl, surface-longline and bottom-longline fisheries (Edwards et al. 2023b). Because observer data were only available from New Zealand, the findings of this analysis were considered preliminary. They included an estimated high risk ranking for both subspecies, with a higher risk ratio for Gibson's albatross than for Antipodean albatross. A subsequent series of assessments through the Commission for the Conservation of Southern Bluefin Tuna based on this assessment framework is due for release in 2026.

GA.4.3.2.2 SURFACE-LONGLINE FISHERIES

A seabird risk assessment for surface-longline fisheries in the Southern Hemisphere focused on the risk posed to seabirds by surface-longline fisheries, based on observer data and fishing effort data across this region (Abraham et al 2019). Both subspecies of Antipodean albatross were included in this assessment, with Gibson's albatross ranking as the fourth highest at-risk taxon in the Southern Hemisphere (Figure GA.26). Its estimated risk ratio was 1.74 (95% credible interval: 1.05–2.89), indicating that fishery captures exceeded the sustainability of the population. The Antipodean albatross subspecies was considered to be at comparatively low risk.

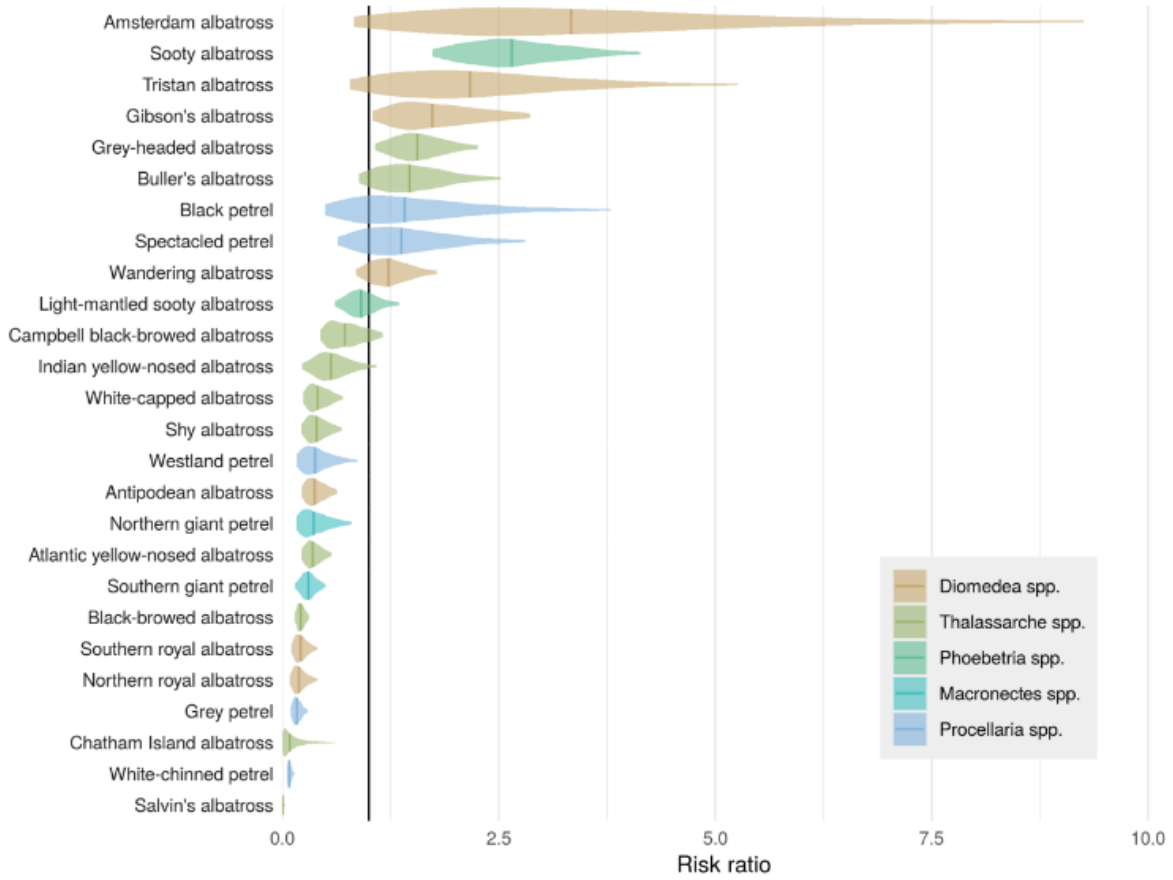


Figure GA.26: Risk ratio for different seabird taxa included in the Southern Hemisphere seabird risk assessment (from Abraham et al. 2019). The risk ratio is the ratio of the estimated annual captures (EAC) in Southern Hemisphere surface-longline fisheries to the Population Sustainability Threshold (PST). No cryptic mortality was included and the potential survival of captured seabirds that were released alive was not considered. Black line indicates a risk ratio of 1. For each species, the distribution of the risk ratio within the 95% credible interval is indicated by the coloured shapes, with the vertical line including the median risk ratio.

GA.4.4 SEABIRD CAPTURES IN NON-COMMERCIAL FISHERIES

Reports of incidental seabird captures in non-commercial fisheries are limited, owing to the general scarcity of data relating to the ad hoc and dispersed nature of these fisheries (but see Abraham et al. 2010, Abraham 2021). This aspect also means that capture records may not necessarily allow the distinction between commercial and non-commercial fisheries, and may lack species identifications. A New Zealand assessment of bycatch in non-commercial fisheries included 15 captures of albatrosses, but these records were not identified to species level (Abraham et al. 2010). Similarly, records from the bird banding recovery database (BIOWEB, administered by Department of Conservation) contained one fishing-related band recovery from Antipodean albatross in a net capture, without providing information of the fishery involved.

Capture records from a recent analysis of recreational bycatch data included 15 captures of seabirds identified as "albatross" in boat ramp surveys of recreational fishers; there were also 32 captures of "large albatrosses" in responses in the National Panel Survey of recreational fishers (Abraham 2020).

The online interactive application by Department of Conservation that collates public and self-reported records of protected species bycatch contains one interaction record of "wandering albatross" (https://docnewzealand.shinyapps.io/protectedspeciescatch/; accessed 20 March 2024). This capture was reported as a boat strike, and the species identification was unverified.

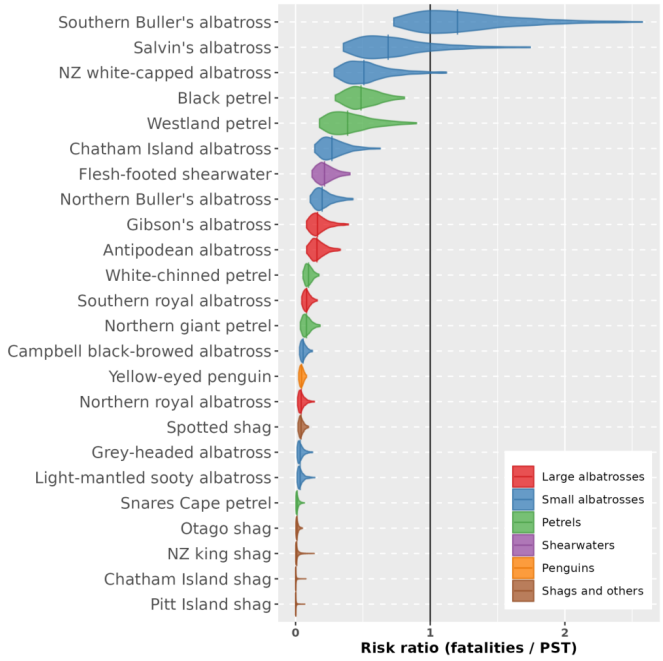
GA.4.5 MANAGING FISHERIES INTERACTIONS

See general seabird chapter.

GA.4.6 SOURCES OF UNCERTAINTY

See general seabird chapter.

GA.5 INDICATORS AND TRENDS

Population size	50,000 mature individuals (species level; BirdLife International 2024)
Population trend	Declining for both subspecies.
Threat status	New Zealand: Nationally Critical (for both subspecies; Robertson et al. 2021). IUCN Globally Threatened - Endangered (BirdLife International (2024).
Number of interactions	There were no observed captures of Antipodean albatross recorded at the species or subspecies level in the 2020–21 fishing year (observed captures from PSC v7). Between 2002–03 and 2020–21, most observed captures of these subspecies were in surface-longline fisheries, with 42 and 43 observed captures for Antipodean albatross and Gibson's albatross, respectively.
Trends in interactions	Estimated captures of Antipodean albatross showed a peak between 2001 and 2005, followed by a marked decrease in estimated captures, and a slow continuous decline after 2006. There was a similar pattern for Gibson's albatross, albeit with lower capture estimates overall. Both subspecies were ranked in the medium risk category in the recent multi-species risk assessments (Edwards et al. 2023a). 

GA.6 REFERENCES

Abraham, E.R.; Berkenbusch, K.N.; Richard, Y. (2010). The capture of seabirds and marine mammals in New Zealand non-commercial fisheries. *New Zealand Aquatic Environment and Biodiversity Report No. 64*. 52 p.

Abraham, E.; Richard, Y.; Walker, N.; Gibson, W.; Daisuke, O.; Tsuji, S.; ... Waugh, S. (2019). Assessment of the risk of surface longline fisheries in the Southern Hemisphere to albatrosses and petrels, for 2016. Prepared for the 13th meeting of the Ecologically Related Species Working Group (ERSWG13) of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

Abraham, E. (2021). Capture of protected species in New Zealand recreational marine fisheries. Report prepared for Department of Conservation. 39 p.

Bose, S.; Debski, I. (2020). Antipodean albatross spatial distribution and fisheries overlap 2019. Prepared by the Department of Conservation. 23 p.

Bose, S.; Debski, I. (2021). Antipodean albatross spatial distribution and fisheries overlap 2020. Prepared by the Department of Conservation, 36 p.

Burg, T.M.; Croxall, J.P. (2004). Global population structure and taxonomy of the wandering albatross species complex. *Molecular Ecology 13(8)*, pp.2345-2355.

BirdLife International (2024). IUCN Red List for birds. Downloaded from https://datazone.birdlife.org on 30/01/2024.

Edwards, C.T.T.; Peatman, T.; Goad D.; Webber, D.N. (2023a). Update to the risk assessment for New Zealand seabirds. *New Zealand Aquatic Environment and Biodiversity Report No. 314*. 66 p.

Edwards, C.T.T.; Peatman, T.; Roberts, J.O.; Devine, J.A.; Hoyle, S.D. (2023b). Updated fisheries risk assessment framework for seabirds in the Southern Hemisphere. *New Zealand Aquatic Environment and Biodiversity Report No. 321*. 103 p.

Edwards, C.T.T.; Roberts, J.O.; Walker, K.; Elliott, G. (2017). Quantitative modelling of Antipodean wandering albatross. *New Zealand Aquatic Environment and Biodiversity Report No. 180*. 67 p.

Elliot, G.; Walker, K. (2017). Antipodean wandering albatross census and population study 2017. Report prepared for the Department of Conservation. Conservation Services Programme.

Francis, R.I.C.C.; Elliott, G.; Walker, K. (2015). Fisheries risks to the population viability of Gibson's wandering albatross *Diomedea gibsoni. New Zealand Aquatic Environment and Biodiversity Report No. 152*. 48 p.

Mischler, C. (2020). Campbell Island/Motu Ihupuku seabird research: Operation Endurance March 2020. Final report to Marine Species and Threats, Department of Conservation. Department of Conservation, Twizel. 26 p.

Mischler, C.; Wickes, C. (2023). Campbell Island/Motu Ihupuku seabird research: Operation Endurance February 2023. Final report to Marine Species and Threats, Department of Conservation. Department of Conservation, Twizel. 13 p

Moritz, C. (1994). Defining "evolutionarily significant units" for conservation. *Trends in Ecology and Evolution 9*: 373–375.

Parker, G.C.; Elliott, G.; Walker, K.; Rexer-Huber, K. (2022). Gibson's albatross and white-capped albatross in the Auckland Islands 2021–22. Final report. Parker Conservation, Dunedin. 26 p.

Parker, G.C.; Rexer-Huber, K.; Walker, K.; Elliott, G. (2023). Antipodean wandering albatross population study 2023. POP2022-10 final report to the Department of Conservation. Parker Conservation, Dunedin. 21 p.

Peatman, T.; Edwards, C.T.T.; Goad, D.; Webber, D.N. (2023). Review of biological inputs for the New Zealand Seabird Risk Assessment. *New Zealand Aquatic Environment and Biodiversity Report No. 312*. 193 p.

Rexer-Huber, K.; Elliott, G.; Thompson, D.; Walker, K.; Parker, G.C. (2019). Seabird populations, demography and tracking: Gibson's albatross, white-capped albatross and white-chinned petrels in the Auckland Islands 2018–19. Final report to the Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin. 19 p.

Rexer-Huber, K.; Elliott, G.; Walker, K.; Thompson, D.; Parker, G.C. (2020). Seabird population research: Gibson's albatross and white-capped albatross in the Auckland Islands 2019–20. Final report to the Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin. 30 p.

Richard, Y. (2021). Integrated population model of Antipodean albatross for simulating management scenarios. BCBC2020-09 final report prepared by Dragonfly Data Science for the Conservation Services Programme, Department of Conservation. 31 p.

Richard, Y.; Abraham, E.R. (2020). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006–07 to 2016–17. *New Zealand Aquatic Environment and Biodiversity Report No. 237*. 61 p.

Richard, Y.; Berkenbusch, K.; Crawford, E.; Tornquist, M.; Walker, K.; Elliott, G.; Tremblay-Boyer, L. (2024b). Antipodean albatross multi-threat risk assessment. *New Zealand Aquatic Environment and Biodiversity Report No. 332*. 62 p.

Richard, Y.; Tremblay-Boyer, L.; Berkenbusch, K.; Wilkinson, N.; Walker, K.; Elliott, G. (2024a). Assessing inter-annual variability in Antipodean albatross distribution. *New Zealand Aquatic Environment and Biodiversity Report No. 331*. 24 p.

Roberts, J.O.; Webber, D.N.; Goad, D.W.; Arnould, J.P.Y.; Bell, E.A.; Crowe, P.; Deppe, L.; Elliott, G.P.; Landers T.J.; Freeman, A.N.D.; Mattern, T.; Moore, P.J.; Nicholls, D.G.; Parker, G.P.; Rexer-Huber, K.; Taylor, G.A.; Thompson, D.R.; Walker, K.J.; Waugh, S.M.; Young, M.J. (2022). Spatial distribution modelling of at-risk seabirds in New Zealand commercial fisheries. *New Zealand Aquatic Environment and Biodiversity Report No. 298*. 167 p.

Robertson, H.A.; Baird, K.A.; Elliott, G.P.; Hitchmough, R.A.; McArthur, N.J.; Makan, T.D.; Miskelly, C.M.; O'Donnell, C.F.J.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A.; Michel, P. (2021). Conservation status of birds in Aotearoa New Zealand, 2021. New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43 p.

Taylor, G.A. (2000). Action plan for seabird conservation in New Zealand. Part A, threatened seabirds. Threatened Species Occasional Publication No. 16. Department of Conservation, Wellington. 234 p.

Walker, K.; Elliott, G.; Parker, G.; Rexer-Huber, K. (2023). Gibson's wandering albatross: population study and assessment of potential for drone-based whole-island census. Report prepared for the Department of Conservation. Conservation Services Programme POP2022-08.

Waugh, S.M. (2013). [updated 2022]. Wandering albatross Toroa. In Miskelly, C.M. (ed.) New Zealand Birds Online. www.nzbirdsonline.org.nz.