POP2023-04 Campbell Island Seabird Research Project

Photo: P. Moore

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Summary

This trip was the second year of a two-year follow-up project from the work done on Campbell Island in March 2020 and February 2023 to primarily determine population trends for southern royal albatross (*Diomedea epomophora*). Nests were counted in two study (Col and Moubray) and three index areas (Faye, Paris, Honey) to compare to historical counts. Additional aims were to resight marked birds, band up to 200 pairs in the Col study area, deploy PTT-GPS transmitters, GPS loggers, and GLS loggers, and set up remote cameras on nests to monitor breeding success. Other species work included conducting photo point counts for Campbell (*Thalassarche impavida*) and grey-headed albatross (*T. chrysostoma*), deploying remote cameras on grey-headed albatross nests, and deploying PTT-GPS transmitters on Campbell albatross. Accessible nest sites were searched for light-mantled sooty albatross (*Phoebetria palpebrata*) and remote cameras set up at nests. Opportunistic searches while traveling or within southern royal albatross study and index areas were done for Antipodean albatross (*Diomedea antipodensis antipodensis*), and any unbanded birds were marked. Opportunistic searches and counts were also done for northern giant petrels (*Macronectes halli*) and white-chinned petrels (*Procellaria aequinoctialis*), and PTT-GPS transmitters were deployed on northern giant petrel juveniles.

Nest counts for southern royal albatross showed an overall decline of 31.0% since the 1990s and a 25.2% decline since the 2000s. The Paris index area had the highest percent change of -46.9% since the 1990s, and Col study area had the lowest at -19.6%. A total of 15 PTT-GPS transmitters were deployed on non-breeding adult southern royal albatross in the Col study area and tracks showed that birds moved north, mainly up the east coast of the South Island and east to the Chatham Rise, and east to southern South America, particularly over the Patagonian Shelf east of Argentina. Thirteen GPS loggers were deployed on breeding adults and removed again by the end of the trip, and 16 previously deployed GLS loggers were retrieved. For demographics, 81 nests had both birds of the pair marked within the Col study area which is in addition to the 113 pairs completed in 2023/24 (total of 194 pairs). Twenty-two cameras were serviced from 2023/24 to monitor breeding success, and an additional 12 were deployed. Based on the Campbell and grey-headed albatross photo point counts, the percent change between 2019/20 and 2024/25 showed a decline in the total number of Campbell albatross (sitting and loafing birds) of 11.0% and a decline of 2.4% in the total number grey-headed albatross. For breeding success monitoring of grey-headed albatross, five cameras were serviced covering 24 nests. Ten PTT-GPS transmitters deployed on Campbell albatross showed that most birds headed south towards Antarctica. For light-mantled sooty albatross, a total of 11 cameras were serviced covering 15 nests to continue monitoring of breeding success. Ten Antipodean albatross were found on the Moubray Peninsula, of which three were previously banded on Campbell Island in 2023/24. Ten PTT-GPS transmitters were deployed on northern giant petrel juveniles, showing movements towards South America.

Introduction

Campbell Island/Motu Ihupuku lies in the South Pacific Ocean approximately 700 km south of New Zealand, and is the most southern of the NZ sub-Antarctic groups (Moore & Moffat 1990). It covers over 11,000 ha, and has a long history of sealing, whaling, and farming since its discovery in 1810 (Moore et al. 2012). The island was farmed from 1895 to 1931 (Moore & Moffat 1990), with sheep (*Ovis aries*) removed from the island by 1992 and cattle (*Bos taurus*) in 1984. Norway rats (*Rattus norvegicus*) were eradicated by 2001, and feral cats (*Felis catus*) disappeared in the mid-1980s (Moore et al. 2012).

The Southern royal albatross (*Diomedea epomophora*) is endemic to New Zealand, naturally uncommon, slow to mature (6-12 years), breed biennially, and are long-lived (Moore et al. 2012). Campbell Island is home to over 99% of the southern royal breeding population, with the most recent census (2004-08) estimating 8,300 to 8,700 breeding pairs (Moore et al. 2012). The introduction of mammals, such as cats and rats, the consequential degradation of the island from farming, such as burning of vegetation, grazing, and depletion of nesting habitat, and direct depredation of birds by humans greatly reduced royal albatross numbers (Moore et al. 2012). Between the 1940s and 1990s, breeding, banding, and population studies were set up at Col and Moubray study areas, with regular and thorough studies from 1987 to 1998 providing a clear baseline of data (Moore et al. 2012). Three additional blocks (Faye, Paris, and Honey) were set up in the late 1990s as index count sites to supplement study area counts (Moore et al. 2012).

Over 35,000 royal albatrosses were banded on Campbell Island mostly by meteorological staff between 1941 and 1998, peaking in the 1960s and 1970s (Moore 2003, Moore et al. 2012). Banding became restricted to the Col and Moubray study areas after 1987, and eventually birds in the study areas had their bands replaced with more reliable bands (made with a thicker grade of stainless steel) or with transponders (*Trovan ID100*, passive integrated transponders (PIT)) due to a large number of leg injuries (Moore et al. 2012). This work was completed between 2004/05 and 2008/09, and a total of 2,882 banded birds were found (Moore et al. 2012). By the end of the 2008/09 season, approximately 674 birds retained an appropriate band (Moore et al. 2012). A total of 405 birds had a PIT inserted, of which 314 (43 females, 271 males) had a confirmed reading on a subsequent visit (Moore et al. 2012).

Data collected in March 2020 (Mischler 2020) and February 2023 (Mischler & Wickes 2023) were indicative of a possible drastic decline in the southern royal albatross population. A two-year project was started in 2023/24 (Mischler et al. 2024) to build on these data, and the 2024/25 trip outlined in this report builds on the data collected in 2023/24. Due to the long duration of this trip (December 2024 to February 2025), several other objectives were added, including counts and monitoring of Campbell (*Thalassarche impavida*) and grey-headed (*T. chrysostoma*) albatross, surveys of light-mantled sooty albatross (*Phoebetria palpebrate*), surveys for Antipodean albatross (*Diomedea antipodensis antipodensis*) as well as incidental records of northern giant petrels (*Macronectes halli*) and white-chinned petrels (*Procellaria aequinoctialis*).

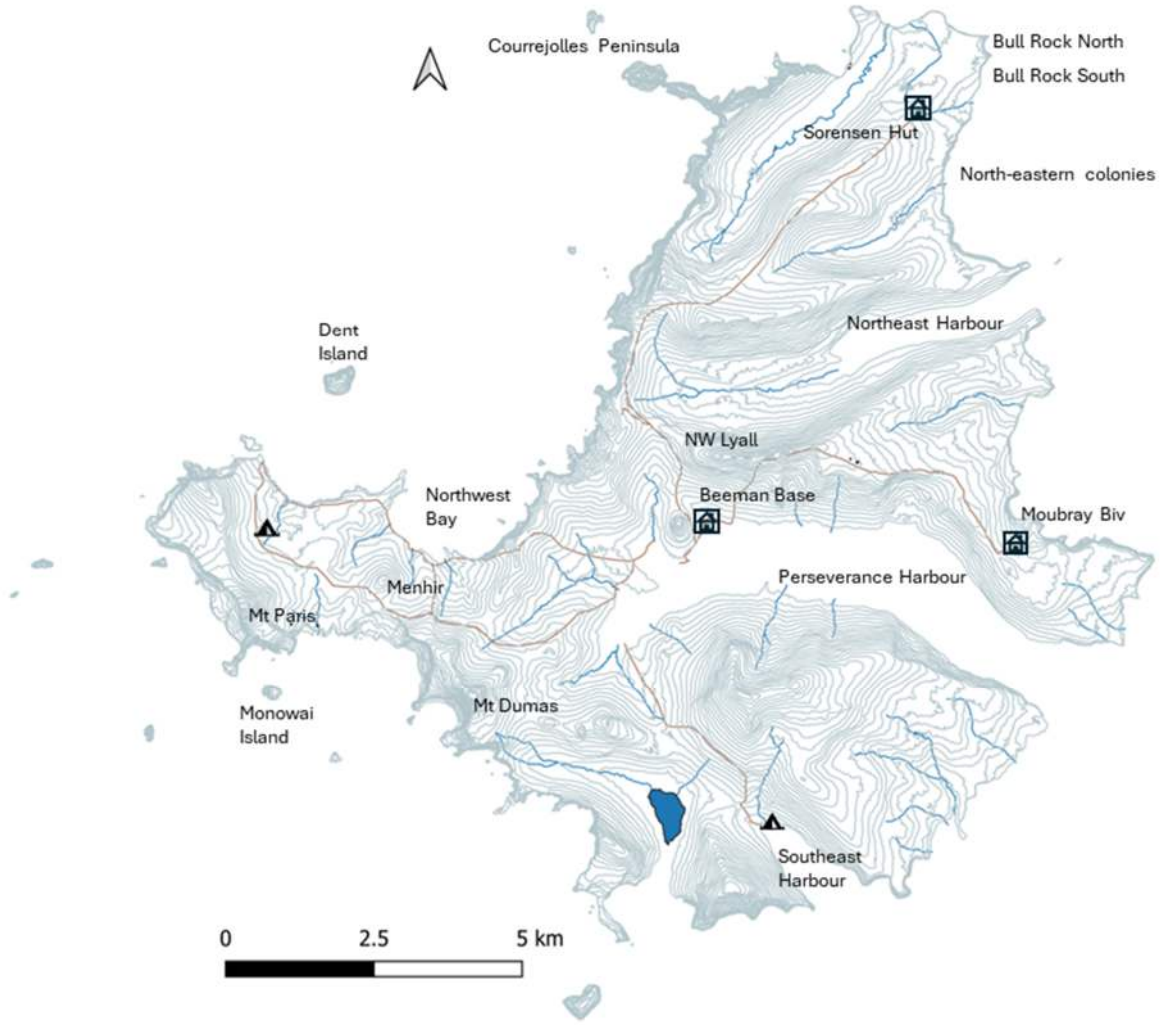

Fig. 1. Map of Campbell Island showing key locations referred to for seabird work conducted in 2024/25. Hut (house symbol) and campsite (tent symbol) locations used by the team are also indicated.

Campbell and grey-headed albatross breed in mixed colonies in the north of the island from Courrejolles Peninsula to Bull Rock and adjacent north-eastern colonies (Fig. 1). The Campbell population historically appeared to fluctuate whereas the grey-headed population showed an overall decline followed by a small increase (Moore 2004, Rexer-Huber et al. 2020, Frost 2019).

Light-mantled sooty albatross data are also lacking most likely because of their inaccessible nesting location on steep coasts and cliffs. The only previous surveys on this species on Campbell Island were conducted in 1995-1997, using a mixture of vantage points for coastal areas and ground searches for accessible areas (Moore 1996, unpubl. data). Breeding success was also monitored.

The Antipodean albatross population on Antipodes Island is well studied and known to be dramatically declining, but data on Antipodean albatross on Campbell Island are scarce. Antipodean albatross were first observed breeding on Campbell in 1944 (Bailey & Sorensen 1962). Some breeding pairs were monitored, and over 200 individuals were banded between the 1940s and late 1990s, mostly on Moubray Peninsula (Fig 1; Bailey & Sorensen 1962, NZNBBS 2024). Marchant & Higgins (1990) noted one pair between 1975-77 (exact location not given), and Elliott & Walker (2013) note “a few pairs”. The most comprehensive data is in field notes

taken by A. Tennyson during his trip in January 1993 where he summarized that 21 adults were noted in the Moubray hut book between 1986/87 to January 1993, all known to be within the Moubray area. On the 1993 trip itself, nine adults (six of which were on eggs) were noted in the same area. There was a note about an adult bird in January 1978 which was on the saddle between Paris and Menhir, and this was also noted in 1984/85 (G. Taylor, pers. comm.) There are also notes about three records which state "Dumas", and it was confirmed that there was a pair on the northeast slope of Mt Dumas in the mid-1980s which was monitored for 10-15 years (G. Taylor, pers. comm.). Besides Moubray and the above-mentioned areas, Antipodean albatross were never seen anywhere else on the island (Fig. 1).

Northern giant petrels have been largely unstudied at Campbell Island. Historically, the only whole-island census was conducted in 1996 (Wiltshire & Scofield 2000), and this was repeated by Rexer-Huber et al. (2020) which showed relatively stable numbers. Burrowing petrels also remain largely unstudied on Campbell Island, and this has been limited to grey (*Procellaria cinerea*) and white-chinned petrel surveys in 2014 and 2015 (Rexer-Huber et al. 2016). Sound recorders were deployed across the island in November 2019 to determine and detect any changes in distribution, and this showed that white-chinned petrels were recolonizing the island including in areas that were some distance away from the offshore source locations of Monowai and Dent islands (Fig. 1; Rexer-Huber et al. 2020).

The main objectives for the 2024/25 expedition were:

1. Southern royal albatross
    a. Population counts:
        i. Count and map nests in study (Col and Moubray) and index areas (Faye, Paris, Honey) to determine trends.
    b. Demographics:
        i. Collection of resight data on known birds in the traditional study blocks and surrounding areas to inform demographic parameter estimates.
        ii. Continue marking of unbanded adults (aim of 200 pairs over a two-year period) within Col study area and surrounding areas to continue building the mark-resight dataset.
    c. At-sea tracking:
        i. Attach 15 PTT (platform transmitter terminal) transmitters to non-breeding/gamming adults in the Col study area using back-feather mounts to gain short-term high-resolution insights into distribution and fisheries risks.
        ii. Attach 13 GPS loggers to breeding adults in the Col study area using back-feather mounts to gain very high resolution (3-5 min fix intervals) insights into distribution, fishery, and offshore wind farm risk and retrieve these at the end of the trip.
        iii. Recover (and download and redeploy if the tag has only been out for one year) previously deployed GLS loggers from breeding adults to gain long-term low-resolution insights into distribution and fisheries risks.
    d. Breeding success:
        i. Service, and where necessary, replace the existing 22 remote cameras in the traditional study site (10 associated with the boardwalk, 12 independent of the boardwalk) and download photos collected over the

last year to continue the breeding biology, phenology, success, and visitor impact study.

e. Diet sample collection:
    i. Collect 6-8 new (recently moulted) back contour feathers from ~15 adult males and ~15 females.

2. Grey-headed and Campbell albatross
    a. Population counts:
        i. Use traditional photo points to update existing population estimates.
    b. At-sea tracking:
        i. Attach 10 PTT-GPS transmitters to breeding Campbell adults using back-feather mounts to gain shorter-term high-resolution insights into distribution and fisheries risks.
    c. Breeding success:
        i. Service, and where necessary, replace the 5 remote cameras to study breeding biology, phenology, and success of grey-headed albatross.
    d. Demographics:
        i. Collection of resight data on known birds in the traditional study blocks to inform demographic parameter estimates.
        ii. Replace worn bands where necessary.
        iii. Band the 10 birds fitted with PTT satellite transmitters.

3. Light-mantled sooty albatross
    a. Population mapping:
        i. Count and map nests, particularly of accessible inland sites to identify suitable study sites and prepare for an update of the population estimates.
    b. Breeding success:
        i. Service, and where necessary, replace the 11 remote cameras to continue to study breeding biology, phenology, and success.

4. Antipodean albatross
    a. Population estimate:
        i. Count and map nests whenever encountered in either southern royal albatross study areas or elsewhere on the island to update the population estimate on Campbell.
    b. Biometrics:
        i. Collection of morphometric and plumage measurements in conjunction with the work on Adams and Antipodes Islands.
    c. Demographics:
        i. Band (stainless steel and darvic bands) any encountered individuals to facilitate individual recognition and add to the demographic dataset.

5. Northern giant petrel
    a. At-sea tracking:
        i. Attach 10 PTT-GPS transmitters to juveniles using back-feather mounts to gain shorter-term high-resolution insights into distribution and fisheries risks.
    b. Population mapping:
        i. Opportunistically count and map nests using ground searches to update population estimates from several potential study areas.

6. White-chinned petrel
    a. Population mapping:
        i. Opportunistically count and map any newly detected burrows to document recolonisation of this species.

Methods

Trip duration and timing

The trip to Campbell was 10.5 weeks total, with 9 weeks on the island, five days travel to the island from Bluff and five days travel return. Departure from Bluff was on 29 November 2024 on the *Evohe*, arrival on Campbell Island was on 4 December 2024, departure from Campbell was on 5 February 2025, and arrival back into Bluff was on 10 February 2025. The team initially consisted of four people. Unfortunately, due to an injury, one staff member was taken off the island on 11 December 2024, and the remainder of the work was carried out by a team of three. A two-person sealion/hoiho team was on the island simultaneously. The team conducted work from Beeman Base, Moubray Biv, Sorensen Hut, and campsite locations at Southeast Harbour and Cattle Bay Stream (Fig. 1).

Southern royal albatross (Objective 1a-e)

For the population objective, methods followed those used in the 2004/05-2008/09 population survey outlined by Moore et al. (2012) and replicated for the Col study area in 2020 by Mischler (2020). To maintain consistency, site marker and sector boundary coordinates for the two study areas (Col and Moubray) and three index areas (Faye, Paris, Honey; Fig. 2) were obtained from Moore et al. (2012) and loaded onto four GPS units. Maps and sector boundary descriptions available from the appendix in Moore et al. (2012) were printed and carried in the field for additional clarity. Nest surveying was done by three people walking in parallel sweeps while searching for nests within the study and index areas using boundaries shown on GPS units and maps. The GPS tracking feature was used to maintain relatively straight sweeps and to keep a record of tracks walked (Appendix Fig. A1). Depending on the terrain, weather conditions, and vegetation type (i.e. the ease of locating nests), the distance between observers varied between 10 m and 50 m (Fig. 3). Active nests with a bird and an egg were marked on the GPS. Nest contents were checked, sex of the bird was determined (using size and plumage colour; in Col only and for banded birds at Moubray), and both legs were examined for bands (all areas) and tracking devices (GLS; in Col only). Except for nervous birds, a line was sprayed across the centre of the chest of the bird using stock marker to indicate that the nest had been counted. Vegetation beside the nest was also sprayed. At the end of each survey day, accuracy checks

were completed where each person walked perpendicular to their survey line and checked each nest within 15 m on either side of their line for a bird sprayed with stock marker. If birds had switched nest attendance during the day, the nest was checked for the spray mark to ensure no nests were missed. If nests had been missed, the accuracy check allowed for adjustments in numbers to be made. All mapping was done on qGIS.

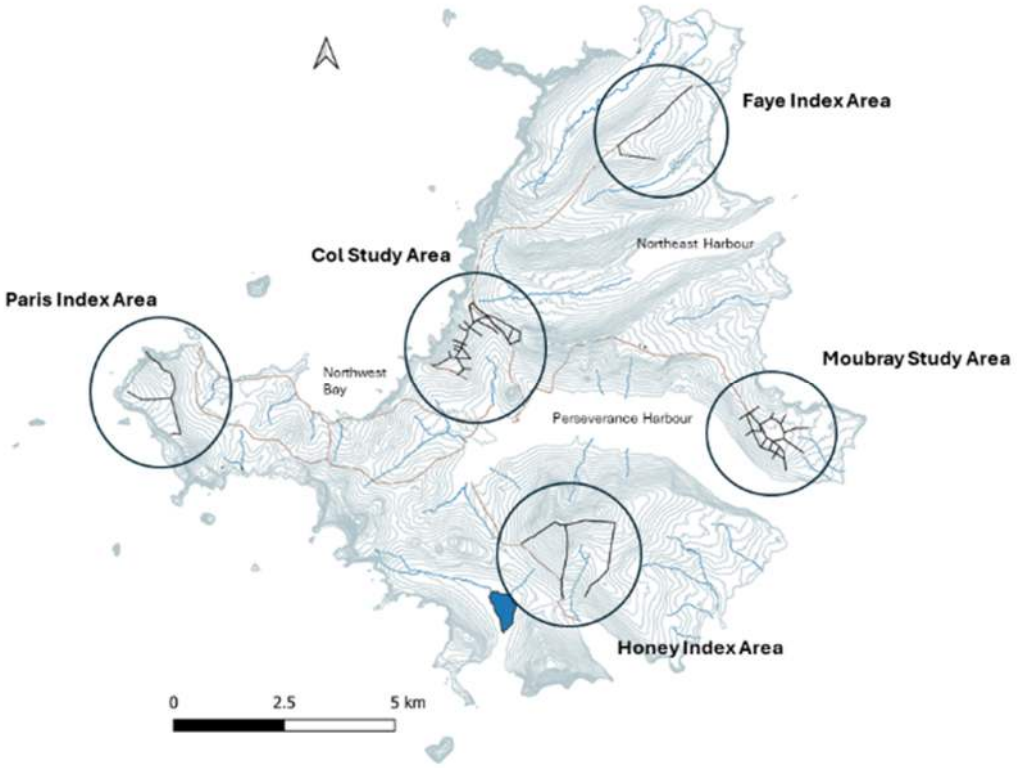

Fig. 2. Map of Campbell Island outlining the two study areas (Col and Moubray) and three index areas (Faye, Paris, Honey) used for southern royal albatross nest counts.

For the first part of the demographics objective (resight previously marked birds), birds were checked for bands while conducting the population surveys in all study and index areas. Bands were checked for gaps and adjusted if necessary. At Col, if no band was present on male birds, the back of the neck and the area towards the mantle were thoroughly scanned with a Trovan ISO Multireader for PIT tags. Birds were not removed from the nest as checks for bands and PIT tags could be done without holding the bird. Loafing birds were resighted if they had alpha-numeric colour bands or captured if they had metal bands or GLSs. For Moubray, only one visit per nest was possible.

Fig. 3. The southern royal albatross survey team sweeping across mixed tussock and scrub in the Honey survey block, Campbell Island (Photo: P. Moore).

To meet the second part of the objective (marking of unbanded adults for a total of 200 pairs in Col), nests in the Col study area were visited several times to mark both birds of a pair. Nesting birds were generally not handled for banding, since most birds could be carefully banded while they sat on the nest. This technique requires sufficient training and experience to band the bird quickly and efficiently with the least disturbance to the bird, since the degree of difficulty varies depending on the nest site, type of bowl and behaviour of the bird. Operators worked in pairs, with the second person shielding the bander from the bird's bill with a clipboard if necessary. Since birds were more relaxed and sat more tightly on the real egg, dummy plastic eggs were only used for birds that became fidgety during banding or during initial training of an inexperienced bander. Exceptionally nervous birds were usually avoided on the first or second visit to allow them to get used to being approached by humans. Except in areas close to the tourist boardwalk, birds that had been marked were sprayed with stock marker across the chest to indicate that those individuals had already been checked.

Most birds received a primary mark (metal band) and a secondary mark (alpha-numeric colour band). All female birds were banded on the right tarsus with an R-sized band and all males were banded with an RC-clip band. Both sexes were additionally banded with an alpha-numeric darvic colour band (orange for females, blue for males; Fig. 4) on the left tarsus. Primary and secondary marks were added to some birds that had previously been marked with transmitters, transponders or GLS (see at-sea tracking below).

Fig. 4. An alpha-numeric darvic colour band on a female southern royal albatross. These in combination with numbered stainless steel leg bands were used to establish 200 marked breeding pairs in the Col study area on Campbell Island (Photo: P. Moore).

The at-sea tracking objective was divided into PTT-GPS transmitters and GPS loggers and GLS loggers.

Fifteen PTT-GPS transmitters (Druid GPS/PTT YAWL ARGOS C2 Max S 550) were deployed in the Col study area on non-breeding/gamming birds. Prior to deployment the tags were turned on and off with the Ecotopia App, left in the sun to charge the internal battery and turned on again before use. A loafing or gamming bird was surrounded by three observers and the bird was captured by one person grabbing the bill with one hand, then reaching over the bird to grab the legs with the other hand. If necessary, a second person helped tuck the wings into the crook of the handler's arm and body. The handler walked to a pre-chosen tagging site nearby and sat on a tussock or mound so that they sat with the bird cradled and restrained in their lap. A second person affixed the tag, applied bands, collected feathers and took photographs to assist with aging.

A baseplate was attached onto the bird's back with Tesa tape (Fig. 5) using 3-4 "feather clumps" where a few feathers immediately over the spine were lifted away from other feathers so that Tesa tape could be placed underneath the clump and wrapped over the baseplate. Progression was made down the spine, with clumps gathered up and tape put underneath it, overlapping with previous tape straps, for the length of the baseplate. The tag was then clipped into the baseplate and secured with adhesive and two cable ties. Feathers were trimmed in front and to the side of the tag to limit the degree to which the solar panel was shaded.

Fig. 5. A Druid PTT-GPS transmitter mounted on the back of a southern royal albatross at the Col study area, Campbell Island. A baseplate was taped to the back feathers and the transmitter was attached to the baseplate with glue and cable ties (Photo: P. Moore).

GPS loggers (i-gotU GPS loggers with custom resin potting) were deployed on 13 breeding adults in the Col study area (Fig. 6). Before capture, a nearby tagging location on a tussocky mound was chosen and the equipment prepared. The egg was removed from the nest and placed into a thermal hat which was then put into a kit bag and hidden from sight from skuas. Care was taken to keep the egg in the same orientation as it was in the nest. The bird was then captured at the nest and handled in the same way as described above for nonbreeders. The devices were attached directly to clumps of back feathers by wrapping lengths of Tesa tape around the tag and feather clumps. Bands were applied if necessary and a line was sprayed across the centre of the chest of the bird using stock marker (blue for males and orange for females). Additionally, GLS loggers (measuring saltwater immersion to help differentiate behaviour at sea) were attached to the bird's metal bands using two cable ties. Once marking was finished, a check for skuas in the vicinity was made, the egg was placed back in the nest and the bird was carefully placed 2-3 m from the nest and allowed to return to the nest on its own. Since the GPS loggers are designed for very high resolution and short-term deployment, and the data are only accessible if the devices are retrieved again, the tags were removed from the birds after one foraging trip. This necessitated visits to the nests every few days – because birds' chests were sprayed they could be observed from a distance. Once a bird had returned to the nest an observer carefully removed the GPS and GLS loggers by peeling or snipping the tape or cable ties while the bird sat on the nest.

Fig. 6. An i-gotU GPS logger shortly after attaching to the back of a southern royal albatross at the Col study area, Campbell Island. Strips of Tesa tape are wrapped around tufts of feathers and the logger (Photo: P. Moore).

GLS loggers were previously deployed on birds in the Col study area using plastic wraparound bands, with 2-4 holes drilled and cable tie(s) inserted through and around the GLS tags. When found on breeding birds, the devices were removed by unravelling or cutting the plastic band (depending on whether glue had been used) while the bird was sitting at the nest, or by capturing nonbreeding birds. The tags were downloaded, if possible, and returned to New Zealand for processing. None were redeployed. The GLS logger data provide low-resolution estimates of the movements of birds at sea but have the advantage of being able to function for a year or more.

For the breeding success objective, 22 cameras (Swift Enduro Outdoor Cameras Australia with 32 GB SD cards) previously deployed in the Col study area during the 2023/24 season were collected and the SD cards downloaded (Mischler et al. 2024). Ten of these cameras were part of a visitor impact assessment and were redeployed at nests near the boardwalk to determine the effects that visitors have on bird behaviour and nest success. Twenty-four cameras, including 12 new cameras, were (re)deployed in other parts of the Col study area (Fig. 7). One camera was removed after the nest failed. Each camera viewed one nest, all of which contained an egg, for a total of 34 nests. Distance from the nests varied (up to 10 m) depending on terrain and vegetation but was placed far enough away from the nest to capture the anticipated movement of the chick once it becomes mobile (Fig. 8). The cameras were positioned so as to avoid facing directly into the sunlight, and programmed to take one photograph every two hours between 0600 and 2100 hours. New batteries and SD cards were installed and the door seals and holes (for plugs or microphone) were coated with Gorilla Roof and Gutter silicone sealant to prevent water damage. Cameras were attached with wire to a wooden stake (Fig. 8) with a side stake added for stability. Analyses of the photographs retrieved this season will be carried out and reported on elsewhere.

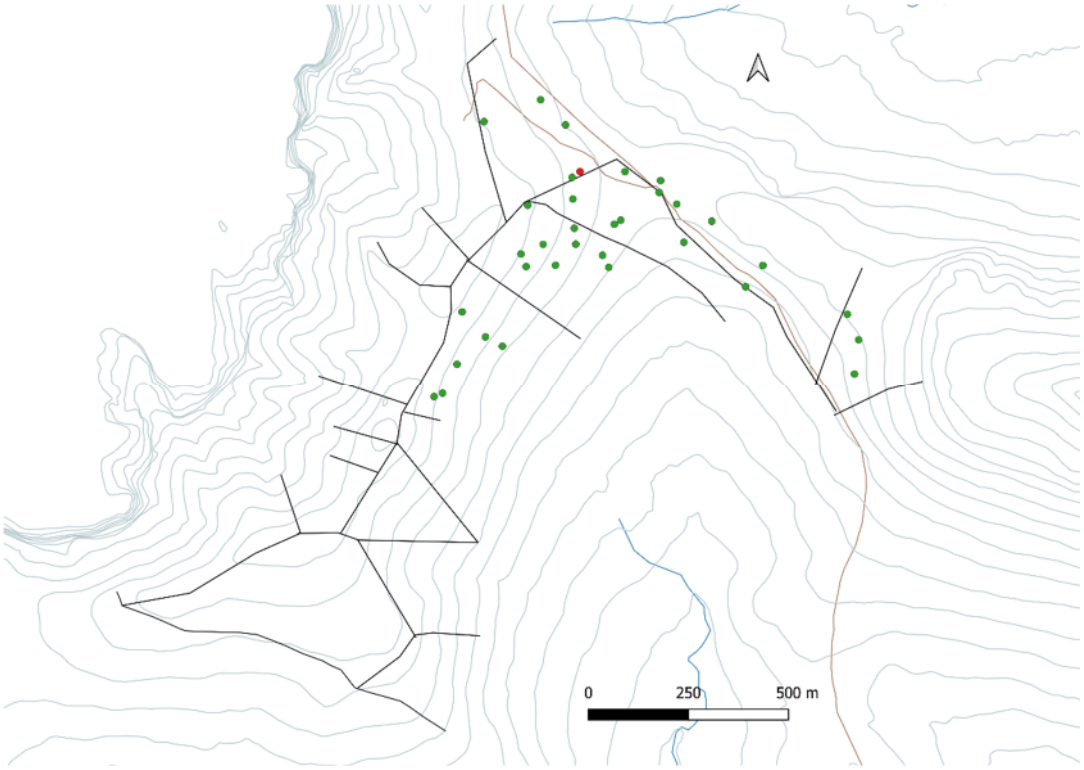

Fig. 7. Map showing nest locations of southern royal albatross in the Col study area where a camera was deployed to monitor breeding success (green). Red indicates where a camera was initially set up but the nest failed and camera was removed.

For the diet sample collection, 6-8 new (recently grown) breast feathers were collected from 14 adult males and 13 females that were captured for attaching devices. This was done by snipping off the feathers near the base. The feathers were stored in paper envelopes and sent away for stable isotope analyses. Results will be reported on elsewhere.

Fig. 8. Image showing remote camera deployment on a southern royal albatross nest at Col study area on Campbell Island, December 2023. The cameras were used to monitor breeding success (Photo: T. Thompson).

Grey-headed and Campbell albatross (Objective 2a-d)

To meet the first objective, counts from images taken at photo points established in 1987 (Moore & Moffat 1990) were completed (Fig. 9). Rexer-Huber et al. (2020) had revisited these points in 2019 after pooling information from several reports, and this was repeated on the current trip. Photographs were taken with a Canon EOS Rebel T5 with a Canon 75-300mm and 18-55mm zoom lens. MP12 photos were taken on 13 December, MP10-11 on 14 December, MP2-9 on 15 December, and MP1 and C1-2 on 19 December 2024. This included an overview photo at each location and several close-up images to allow for species identification (Campbell or grey-headed albatross) and for the most accurate count of birds that appeared to be incubating an egg or brooding a chick (Fig. 10). Nesting areas at each photo point were divided into sections which followed those outlined by Moore & Blezard (1999) and updated by Frost (2019) to allow for count comparisons. Stitching of images was not necessary as boundaries could be drawn and distinguished in adjacent individual photographs to avoid double-counting or gaps in sections. Birds were counted using DotDotGoose (v 1.7.0; Erts 2024), and classified as Campbell albatross, grey-headed albatross, or undefined (if it was not possible to distinguish the species). Within the species classification, they were classified by activity into sitting, loafing, or undefined. To determine if a bird was sitting, it had to be on a nest (of any size) and have the correct posture (sitting tightly, feet and legs not visible, the wing tips and tail sloping down). Differentiating between sitting and loafing was not always possible depending on the photograph quality (if colonies are a long distance away from the photo point) and angle (if rocks, vegetation, or birds are blocking parts of the bird) of the photograph and these birds were therefore classified as undefined.

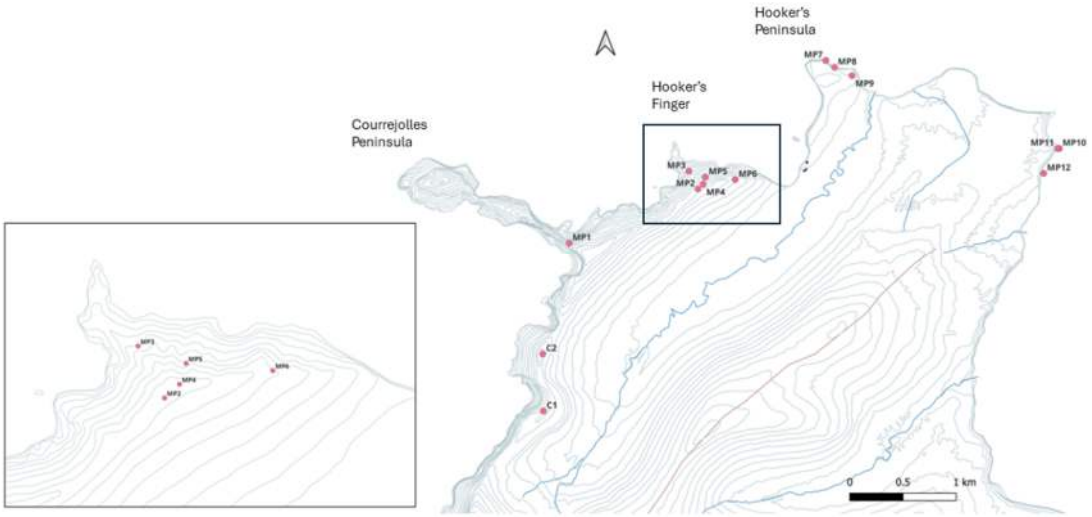

Fig. 9. Map showing photo point locations for Campbell and grey-headed albatross counts on Campbell Island.

To combine undefined species into either Campbell or grey-headed albatross, proportions from the known species classification for specific count sections were used. For example, if 89% of birds sitting in a section were identified to be Campbell albatross, 11% were grey-headed albatross, and 284 birds were unidentified species but known to be sitting, then 253 birds were added on to Campbell sitting and 31 birds to grey-headed. The same process was done for undefined activity. These extrapolations followed those used by Frost (2019) for consistency and count comparisons.

Fig. 10. View of Bull Rock North albatross colony from photo point MP11, Campbell Island. Zoomed in photographs were used to later count Campbell and grey-headed albatross (Photo: P. Moore).

Since peak egg laying for Campbell and grey-headed albatross is assumed to be around 10 October, counting in December results in a lower number of nests as some nests will have failed. To account for these losses, Moore (2004) developed regression equations (-0.1468x + 141.39 for those colonies dominated by Campbell and -0.3144x + 189.55 for those dominated by grey-headed albatross, where x is equal to the day of year on which photographs were taken). These formulae were used to determine the final estimate of apparently nesting Campbell and grey-headed albatross.

In order to assess the proportion of nests still active with an egg or a chick, a ground survey was conducted on 13 December (transects 1-3) and 14 December (transect 4) in the Bull Rock South colonies (see Fig. 3 in Rexer-Huber et al. (2020) for an overview of transect locations). Species were divided into Campbell and grey-headed albatross, and activity was categorized as sitting (bird sitting on an egg or chick), empty (bird sitting on a nest but with no egg or chick), and loafing (loose birds walking around in the colony or standing on an empty nest bowl). This ground survey was not used as a 'correction factor because it only applies to one colony and does not necessarily represent what is happening at other colonies, and because of the uncertainty around what a bird on an empty nest means (i.e. it may or may not have had an egg).

Fig. 11. Campbell albatross with a Druid PTT-GPS transmitter which has a baseplate that was attached to feathers of the back using Tesa tape, Bull Rock South, Campbell Island (Photo: P. Moore).

For the at-sea tracking objective, ten PTT-GPS transmitters (8 Druid GPS/PTT YAWL ARGOS C2 Max S 550 and 2 Telonics PTT TAV-2630) were deployed on breeding Campbell albatross, all of which were guarding (sitting on) a chick (Fig. 11). Before catching a breeding bird, a nearby tagging location on a tussocky mound at the colony margin was chosen and the equipment prepared. The chick was removed from under its parent, placed in a thermal hat and put loosely in a kit bag and placed out of sight from skuas. The adult was then captured by grabbing the bill with one hand, securing the feet and tucking the bird into the crook of the other arm. Feathers were plucked from the chest of each bird to determine sex. Four birds were previously banded and the other six had new bands applied.

Fig. 12. Images showing a) remote camera set up at grey-headed albatross nests at Bull Rock South on Campbell Island, and b) nest coverage of grey-headed albatross by one remote camera. Cameras were used to monitor breeding success (Photos: B. Philp).

For the breeding success objective, the five cameras (Swift Enduro Outdoor Cameras Australia with 32 GB SD cards) which were deployed on grey-headed albatross nests at Bull Rock South (Fig. 12a, 13) in 2023/24 were serviced (new batteries, SD cards and re-sealed with silicone sealant – see royal albatross camera methods for a full description). Two out of the five cameras were moved a short distance to improve the angle and view. A total of 24 active nests were covered by the cameras, 16 of which contained an egg and eight with a chick. Distance from the nests varied depending on where the best location for the camera was to capture the largest number of nests. A photograph was taken from behind the camera to later mark the nest locations within the camera view and annotate its contents (Fig. 12b). Cameras were programmed to take one photograph every two hours between 0600 and 2100 hours. Analyses of the photographs retrieved this season will be carried out and reported on elsewhere.

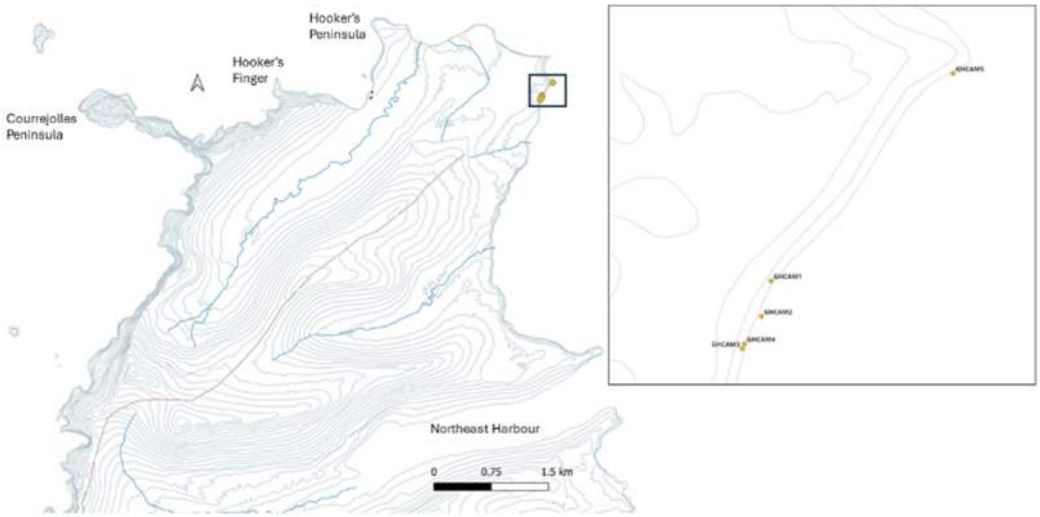

Fig. 13. Map showing locations of remote camera deployments on grey-headed albatross nests at Bull Rock South on Campbell Island. Camera is used to capture breeding success data.

For the demographics objective, all birds (both Campbell and grey-headed) which were seen during the ground survey transects at Bull Rock South were checked for bands. If incubating or nonbreeding birds had a band, the number was read while the bird was sitting or standing. In order to reduce disturbance in the colony, no birds were captured to read bands.

Light-mantled sooty albatross (Objective 3a-b)

To meet the first objective of finding accessible light-mantled sooty albatross nests, areas surveyed during 2023/24 (Mischler et al. 2024) were used as a starting point and some additional areas that had been surveyed by Moore (1996) were also visited. Breeding monitoring areas, including Beeman Hill, north-west Lyall ridge and Azimuth (Moore 1996) and east Lyall Ridge (Mischler et al. 2024), were visited to locate nests by searching steep vegetated areas and rocky outcrops (Fig. 14). Flying, calling (gamming) and landing birds were also used as indicators of the presence of nests. Scanning with binoculars from viewpoints was also used, although this is less effective in non-coastal areas as birds are hidden by vegetation and topography. Searches were conducted when time and weather permitted.

Fig. 14. Team member carrying stakes for mounting cameras to monitor light-mantled sooty albatross nests on Beeman Hill, Campbell Island (Photo: H. Thompson).

For breeding success, a total of 11 cameras (Swift Enduro Outdoor Cameras Australia with 32 GB SD cards) deployed in 2023/24 were serviced and re-deployed (Fig. 15). A total of 15 nests were covered by the cameras, seven of which contained an egg, five contained a chick, and three were not checked due to inaccessibility. Distance from the nests varied depending on where the best location for the camera was to capture the largest number of nests. Cameras were programmed and sealed the same way as described for the southern royal albatross. Cameras were attached with wire to a plastic waratah (n = 1) or a short single or double wooden stake. Analyses of the photographs retrieved this season will be carried out and reported on elsewhere.

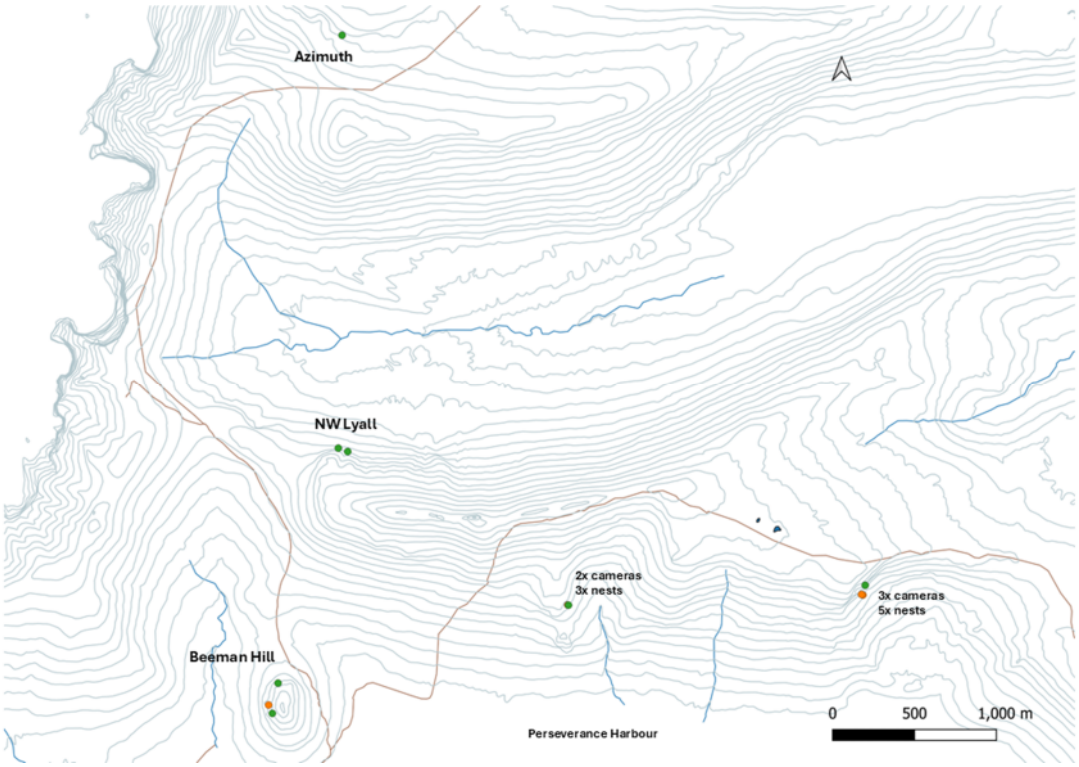

Fig. 15. Map showing light-mantled sooty albatross nest locations (green) where a remote camera was deployed to monitor breeding success on Campbell Island in 2024/25. Orange indicates one camera covering multiple nests.

Antipodean albatross (Objective 4a-c)

The three objectives for the Antipodean albatross were all dependent upon locating birds in previously known nesting areas. Historical records for the number and locations of Antipodean albatross are very scarce and difficult to find due to data being collected haphazardly during the Meteorological Station era (1940s-1995) and in subsequent years. In 2024/25, an opportunistic search was conducted while traveling along the Lyall-Moubray ridge and while counting southern royal albatross nests in the Moubray study area. This ridge system is where most Antipodean albatross have been found in recent decades (P. Moore, unpubl. data) and where some chicks from the 2023/24 season were found. All bird locations were marked with a GPS point. Birds were captured in the same manner as described for non-breeding southern royal albatross. Measurements included culmen length and culmen tip bill depth (Appendix Fig. A2). Several photographs was taken of dorsal and head plumage of each bird to help determine sex and GPI (Gibson Plumage Index; Appendix Fig. A3). For demographics, each bird was checked for bands. If they were previously banded, the band was checked to ensure it remained in suitable condition, and tightened or replaced if it was not. If the bird was unbanded, it was banded with a metal (R size) band on the right tarsus and a green alpha-numeric darvic band on the left tarsus.

Northern giant petrel (Objective 5a-b)

For the at-sea tracking, ten PTT-GPS transmitters (five Druid GPS/PTT YAWL ARGOS C2 Max S 550 and five Telonics PTT TAV-2630) were deployed on juveniles to gain shorter-term high-resolution insights into distribution and fisheries risks (Fig. 16). Previously recorded nesting areas (Tucker, Garden and Venus Coves) were searched in late January to find chicks that were close to fledging (i.e., had fully developed flight feathers and minimal down). The young birds

were caught at or near their nests amongst tall tussocks and shrubs near the coast. The catching, handling and transmitter attachment techniques were identical to that described for non-breeding southern royal albatross. Feathers were plucked from the breast to determine sex of the juvenile birds.

Fig. 16. Northern giant petrel chick with a PTT-GPS transmitter attached to its back feathers with Tesa tape (Photo: K. Hamilton).

The population objective involved opportunistic counting and mapping of nests while traveling across the island. The GPS locations of previously located nesting areas were provided to the team (K. Rexer-Huber, pers. comm.; Rexer-Huber et al. 2020) to determine if those sites remain active.

White-chinned petrel (Objective 6a)

This objective was the lowest priority, and involved opportunistically counting and mapping of any burrows found while traveling across the island for other species work. White-chinned petrel burrows generally have a very muddy and large entrance and are therefore distinguishable from other species. The GPS locations of previously located burrows were provided to the team (K. Rexer-Huber, pers. comm.; Rexer-Huber et al. 2020) to determine if those areas have undergone an increase in the number of burrows, and to determine whether any new burrows found on the island were indeed newly discovered.

Results

Southern royal albatross (Objective 1a-e)

Counts of nests for all study and index areas were conducted. All parts of Col were visited at least 2-3 times, and eastern and central parts were visited several more times to maximise the number of breeding partners encountered. Moubray and the three index count areas were visited only once. Numbers from surveys conducted between 1987/88 to 2024/25 are shown in Table 1. Nest numbers in Col and Moubray study areas in 2024/25 remain higher than they were in 1987/88, but are the lowest counts since 1991/92 (Figs. 17, 18). Counts at Faye, Paris, and Honey index areas in 2024/25 were all the lowest compared to the rest of the survey years.

When examining the percent change between the decades (Table 2), there has been a decline across all years since the 1990s. Col initially remained stable between the 1990s to the 2000s but has declined at 19.6% since. Moubray apparently peaked in numbers in the late 1990s but decreased 25.9% since the 2000s. Paris has undergone the greatest declines across all surveys compared to the other areas, with the percent change doubling between 1990s-2000s and 2000s-2020s, and an overall decline of 46.9%. Faye has the second worst declines particularly between 2000s to 2020s. Honey had a relatively large decline in 1990s-2000s. Across all survey years, Paris has declined the most at 46.9%, followed by Faye (35.1%), Honey (25.1%), Moubray (28.6%), and Col (19.6%). The average across all areas between 2000s and 2020s is a 25.2% decline, and the average was higher when comparing between 1990s to 2020s at 31.0%. Due to expected annual variation in counts caused by nesting success in the previous season (i.e. failed breeders will breed in consecutive years), counts in over several seasons are essential for clarifying the current trend.

Table 1. Southern royal albatross nest counts completed at respective study (Col and Moubray) and index areas (Faye, Paris, Honey) in various seasons. Nest count data were collated from Moore & Moffat 1990, Moore et al. 1997, P. Moore unpubl. data 1997/98-1998/99, Moore et al. 2012).

	Study or Index area				
Season	Col	Moubray	Faye	Paris	Honey
1987/88	128	344	-	-	-
1991/92	158	376	-	-	-
1992/93	187	400	-	-	-
1993/94	170	435	-	-	-
1994/95	189	489	-	-	-
1995/96	201	508	-	-	-
1996/97	188	508	598	394	433
1997/98	200	551	657	439	400
1998/99	203	564	639	489	428
2004/05	207	506	598	-	-
2005/06	185	462	537	-	-
2006/07	182	494	572	332	336
2007/08	196	492	563	334	402
2008/09	214	569	609	435	377
2019/20	141*	-	-	-	-
2023/24	148	381	413	237	301
2024/25	168	367	407	231	329

*adjusted nest count to Dec/Jan as actual count done in March

For the first part of the demographic objective (resight of previously marked birds), 18 previously marked birds were found at Col, all but one of which were breeding. These included 12 females (previously marked with R-bands) and six males (four previously marked with transponders and two with RA-bands; Appendix Table A1). The majority of previously banded males at Col had their bands removed and replaced with PIT tags during the 2000s (Moore et al. 2012). Scanning males for PIT tags can be problematic because the more nervous birds did not tolerate having their neck and back "ironed" with the reader. Some were consequently avoided or given a quick perfunctory scan, hence some transponders were probably missed. Successful scanning required close contact with the inner part of the circular reader and that was less often achieved if the bird was in its natural sitting position as opposed to stretching the neck forward. The oldest known-age female at Col was a 33-year-old that had been banded as a chick in

August 1992. Two other females were probably at least 37 years old if they were found breeding at around eight years of age. The youngest known-age female was a breeder that was banded as a chick in August 1995. The oldest known-age male was a 37-year-old breeder that was banded as a chick in August 1988 and has been breeding with the same partner since 1995/96. Two other males were breeding with the same partner they had during the 2000s. The youngest known-age males were two 28-year-old birds that were banded as a chick in September 1997, which was the last time that chicks were banded on Campbell Island. There were also seven previously banded females found at Moubray. The oldest female was a 40-year-old that was banded as a chick in June 1985, and the youngest female was banded as a chick in October 1997. Note that most bands were removed from males at Moubray during the 2000s (Moore et al. 2012).

Table 2. Percent change calculated between survey periods of southern royal albatross nest counts in study and index areas on Campbell Island. Average was calculated using counts from seasons where all study and index areas were surveyed (Table 1).

	% change		
Area	1990s to 2000s	2000s to 2020s	1990s to 2020s
Col	0.2	-19.7	-19.6
Moubray	-3.7	-25.9	-28.6
Faye	-8.8	-28.8	-35.1
Paris	-16.7	-36.2	-46.9
Honey	-11.6	-15.2	-25.1
Average	**-8.9**	**-25.2**	**-31.0**

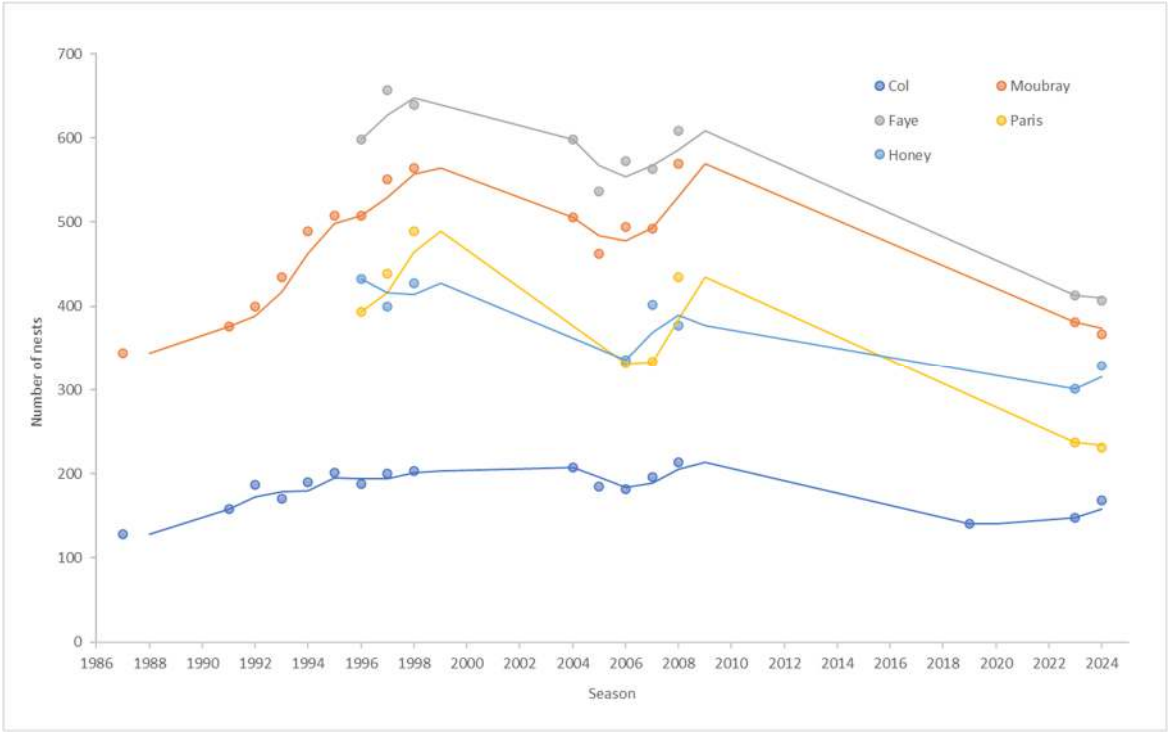

Fig. 17. Graph showing nest count data of southern royal albatross over survey seasons in study or index areas on Campbell Island. Lines are indicative of moving averages with a period of two.

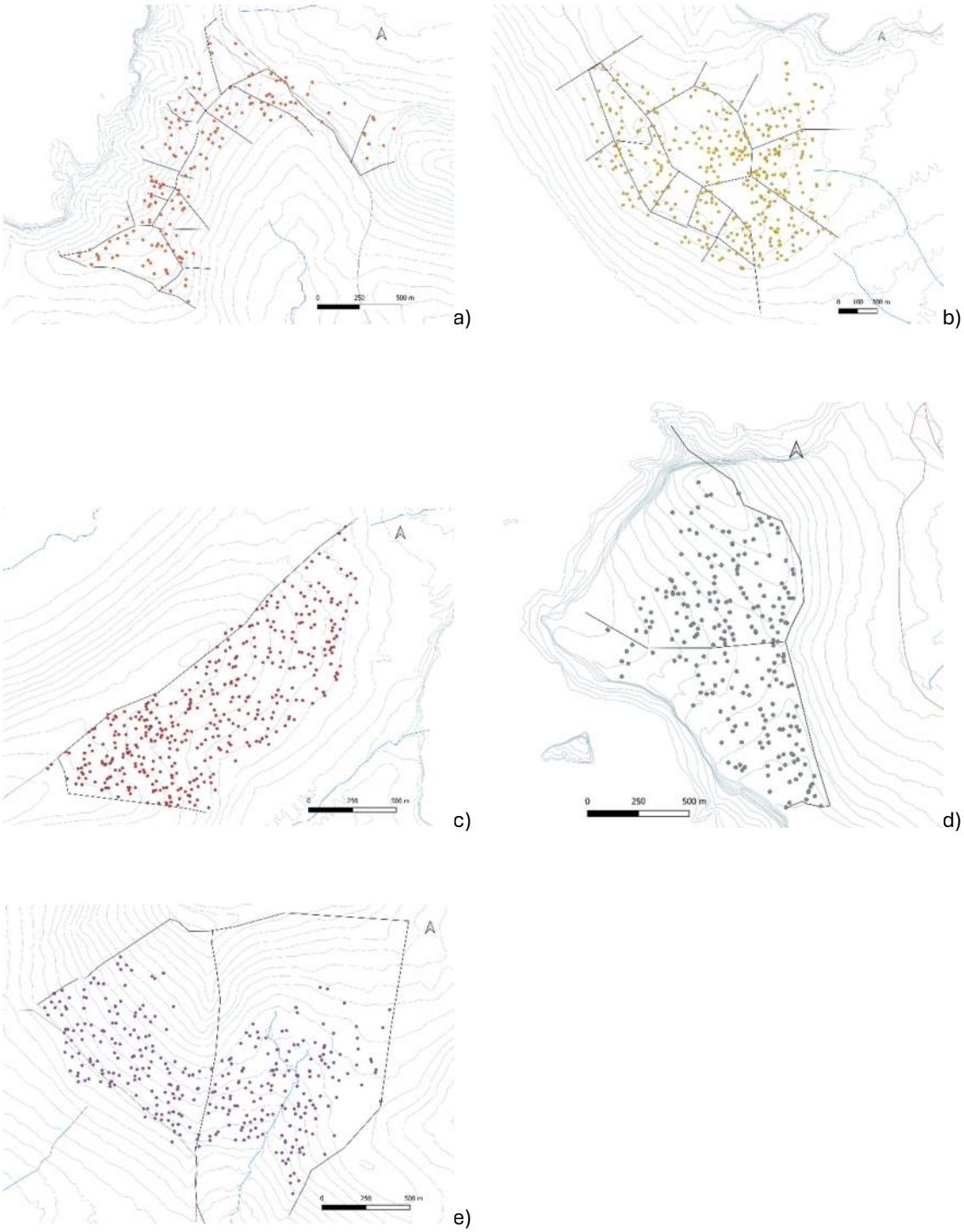

Fig. 18. Nest locations of southern royal albatross in 2024/25 in the study areas of a) Col and b) Moubray, and in the index areas of c) Faye, d) Paris, and e) Honey on Campbell Island.

For the second part of the demographic objective (marking of unbanded adults for a total of 200 pairs in Col over two seasons), a total of 113 nests in Col had both partners marked in 2023/24 and an additional 81 nests with both partners marked were added in 2024/25 for a total of 194 breeding pairs over the two seasons. Of the 168 nests at Col in 2024/25, 98 were fully marked pairs, 15 nests only had one bird marked, and 55 nests had unbanded pairs (Fig. 19; Table 3 and A2). Thirty pairs comprised birds that had bred in 2023/24 but had failed and returned in consecutive years. Not all of the failed breeders could be banded in 2023/24, so some of these

pairs were completed (i.e. a partner was banded) in 2024/25. All banding information has been entered into the FALCON, the New Zealand bird banding database.

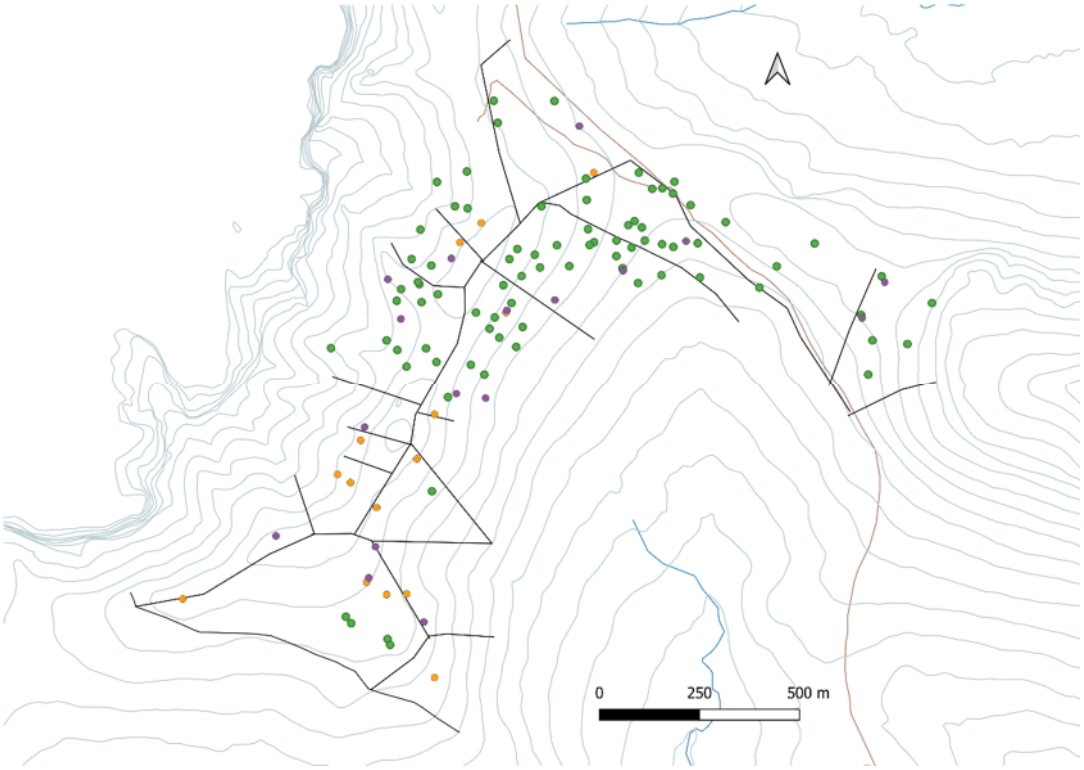

Fig. 19. Map showing nest locations of southern royal albatross in the Col study area where both partners were banded (green; *n* = 81), where both partners were banded in 2023/24 and were breeding again (purple; *n* = 17), and where only one partner was banded (orange; *n* = 15) on Campbell Island in 2024/25.

Table 3. Breeding pair summary for southern royal albatross in the Col study area, Campbell Island showing number of birds and pairs banded during the 2023/24 and 2024/25 seasons.

Pair Status	2023/24	2024/25	Total	2024/25 Notes
Completed pair (both birds identified)	113	81	194	Includes some pairs where only one bird had been identified in 2023/24 but the partner was banded in 2024/25 (i.e. the pair was completed)
Completed pair that bred in consecutive years		17	17	All failed breeders from 2023/24
One bird of a pair banded or resighted	30	15	45	Includes some failed breeders from 2023/24
Both birds unbanded or unidentified	7	55	62	
Total failed pairs from 2023/24		30		Failed pairs from 2023/24 where one or both partners were identified
Total nests	150	168		

For the at-sea tracking objective, eight PTT-GPS transmitters were deployed on non-breeding females and seven were deployed on non-breeding males in the Col study area. As an overview,

tracks show birds moving north, mainly up the east side of the South Island and east to the Chatham Rise, and east to southern South America, particularly over the Patagonian Shelf east of Argentina (Fig. 20). The results of this will provide short-term high-resolution insight into distribution and fisheries risks assessments and will be summarized elsewhere. An additional 13 GPS loggers were deployed on southern royal albatross for approximately one month (with one unit left on a male for nearly two months) in the Col study area. Six of these loggers were deployed on breeding females and seven on breeding males (Fig. 21). Twelve sets of loggers were retrieved before the end of the trip and the thirteenth was later collected by the hoiho team. These devices provide very high resolution insights into distribution, fishery, and offshore wind farm risk and will be summarized elsewhere. Sixteen previously deployed GLS loggers were retrieved from birds, including 11 breeding females, three breeding males, and a nonbreeding pair that had failed the previous season. Data from the loggers will provide long-term low-resolution insight into distribution and fisheries risks assessment and will be summarized elsewhere.

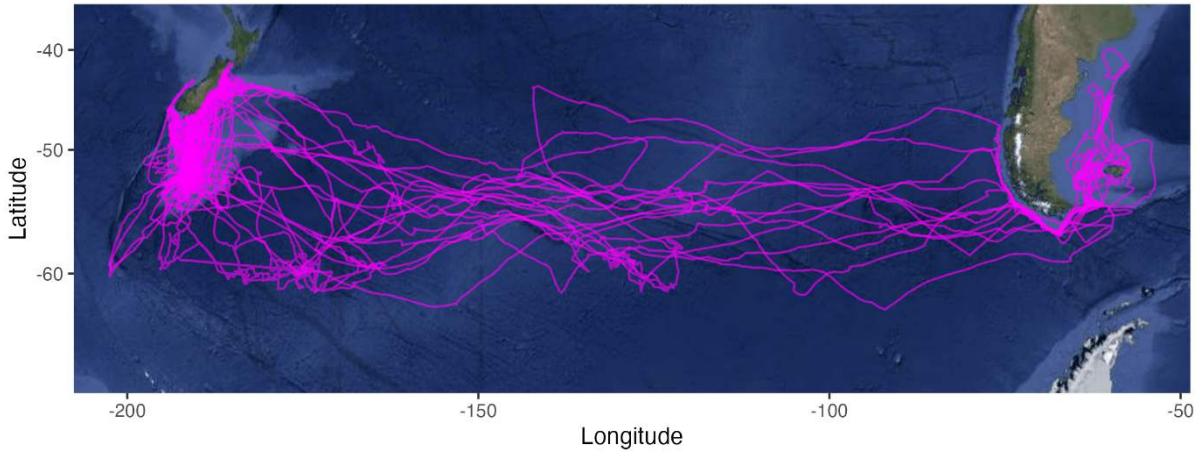

Fig. 20. Satellite tracks from devices deployed on 15 nonbreeding southern royal albatross in the Col study area on Campbell Island. Tracks cover the period from deployment until mid-June 2025.

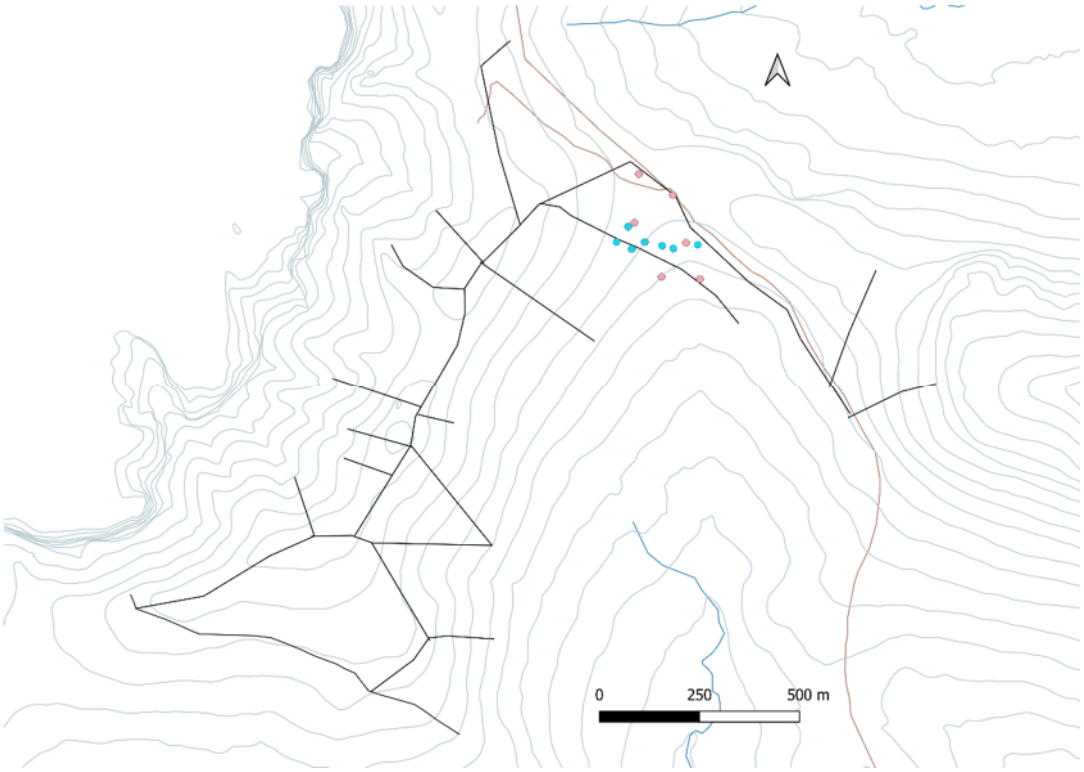

Fig. 21. Map showing nest locations of southern royal albatross at the Col study area where the male (blue) and female (pink) partner was fitted with a GPS logger on Campbell Island in 2024/25.

Grey-headed albatross (Objective 2a-d)

Overall counts for both Campbell and grey-headed albatross from photo points were lower than during the 2019/20 survey (Frost 2019) but higher compared to the 2023/24 survey (raw counts shown in Appendix Table A3). Table 4 has been adjusted by removing counts done from aerial photographs in 2019/20 to allow for direct comparisons. It is very notable that the number of loafing birds was much higher in 2023/24 than 2019/20 for Campbell albatross and even higher in 2024/25. For grey-headed albatross, there was an increase in the number of loafing birds compared to 2023/24. The change in number of sitting birds for both species varied between areas when compared to 2023/24 but was lower for all areas compared to 2019/20 except for Courrejolles Isthmus. The combined total of sitting and loafing Campbell albatross is 17,586 in 2023/24 compared to 20,953 in 2019/20 (16.1% decline) and 18,648 in 2024/25 (11% decline since 2019/20 and a 6% increase from 2023/24). For grey-headed albatross, there were 4,673 in 2023/24 compared to 6,453 in 2019/20 (27.6% decline) and 6,297 in 2024/25 (2.4% decline since 2019/20 and 34.8% increase from 2023/24).

Table 4. Number of sitting and loafing Campbell and grey-headed albatross individuals from photo point counts done in 2019/20 (24 Nov 2019), 2023/24 (6 and 14 Dec 2023), and 2024/25 (13-15 and 19 Dec 2024). Data from 2019/20 adapted from Frost (2019) and P. Frost raw data to exclude all aerial photograph counts as well as Courrejolles Isthmus excluded an area called JDK, Bull Rock North excluded areas 1c, 16-18, Bull Rock South excluded area 10. 'Sitting' birds were assumed to be breeding birds on an egg or chick, and 'loafing' birds were non-breeding birds.

	Campbell					
	Sitting			Loafing		
Area	2019/20	2023/24	2024/25	2019/20	2023/24	2024/25
Courrejolles Peninsula	7305	4180	1214	1438	4088	5568
Courrejolles Isthmus	133	149	139	45	110	112
Hooker's Finger	1127	785	816	154	738	830
Hooker's Peninsula	347	156	229	109	94	182
Bull Rock North	3190	2335	2145	794	856	1917
Bull Rock South	5277	2947	2261	1034	1148	3235
TOTAL	**17379**	**10552**	**6804**	**3574**	**7034**	**11844**

	Grey-headed					
	Sitting			Loafing		
Area	2019/20	2023/24	2024/25	2019/20	2023/24	2024/25
Courrejolles Peninsula	3089	1844	1080	739	1054	3087
Courrejolles Isthmus	128	135	143	89	67	82
Hooker's Finger	850	660	562	137	224	237
Hooker's Peninsula	303	146	302	192	117	127
Bull Rock North	512	305	378	78	24	108
Bull Rock South	290	76	123	46	21	68
TOTAL	**5172**	**3166**	**2588**	**1281**	**1507**	**3709**

When examining percent change (Table 5) between the survey years for each area, the average percent change of Campbell albatross between 2019/20 and 2023/24 was a decrease of 6.9%, an increase of 4.4% between 2019/20 and 2024/25, and an increase of 18.8% between 2023/24 and 2024/25. The average percent change of grey-headed albatross between 2019/20 and 2023/24 was a decrease of 34.0%, a decrease of 13.4% between 2019/20 and 2024/25, and an increase of 43.9% between 2023/24 and 2024/25.

Table 5. Percent change between 2019/20 and 2023/24, between 2019/20 and 2024/25, and between 2023/24 and 2024/25 surveys calculated from data in Table 4 for each respective area and species. 'Total' represents the overall total percent change.

	Campbell		
Area	2019/20 to 2023/24 Total birds	2019/20 to 2024/25 Total birds	2023/24 to 2024/25 Total birds
Courrejolles Peninsula	-5.4	-22.4	-18.0
Courrejolles Isthmus	45.5	41.0	-3.1
Hooker's Finger	18.9	28.5	8.1
Hooker's Peninsula	-45.2	-9.9	64.4
Bull Rock North	-19.9	2.0	27.3
Bull Rock South	-35.1	-12.9	34.2
Average of percent change	**-6.9**	**4.4**	**18.8**
TOTAL	**-16.1**	**-11.0**	**6.0**

	Grey-headed		
Area	2019/20 to 2023/24 Total birds	2019/20 to 2024/25 Total birds	2023/24 to 2024/25 Total birds
Courrejolles Peninsula	-24.3	8.9	43.8
Courrejolles Isthmus	-6.9	3.7	11.4
Hooker's Finger	-10.4	-19.0	-9.6
Hooker's Peninsula	-46.9	-13.3	73.4
Bull Rock North	-44.2	-17.6	47.7
Bull Rock South	-71.1	-43.2	96.9
Average of percent change	**-34.0**	**-13.4**	**43.9**
TOTAL	**-27.6**	**-2.4**	**34.8**

Using the regression formulae developed by Moore (2004) to adjust for nest failures prior to the photo point counts on 6 and 14 December 2023, the total number of nesting Campbell albatross was 11,853 and 3,672 for grey-headed albatross (Fig. 22). Using the same formulae to adjust for nest failure prior to the photo counts on 13-15 and 19 December 2024 for the 2024/25 counts, the total number of nesting Campbell albatross was 7,616 and 2,950 for grey-headed albatross. Comparisons between surveys need to be done with caution as different methods were used during different years. When compared to the 1940s, it is a 75.4% decline for Campbell albatross and a 93.1% decline for grey-headed albatross (Frost 2019; Fig. 22). Note that the number of Campbell albatross nests for 2024/25 in Fig. 22 was adjusted to 8,324 nests to hypothetically include counts from the Eastern Colonies (this was also done for the 2006-12 and 2023/24 surveys). The percentage that the Eastern Colonies comprised in those years where a total population count was done was used as a correction factor – i.e. the Eastern Colonies comprised approximately 9.17% of the total population in 1995-97 and 9.43% in 2019/20, for an average of 9.3%.

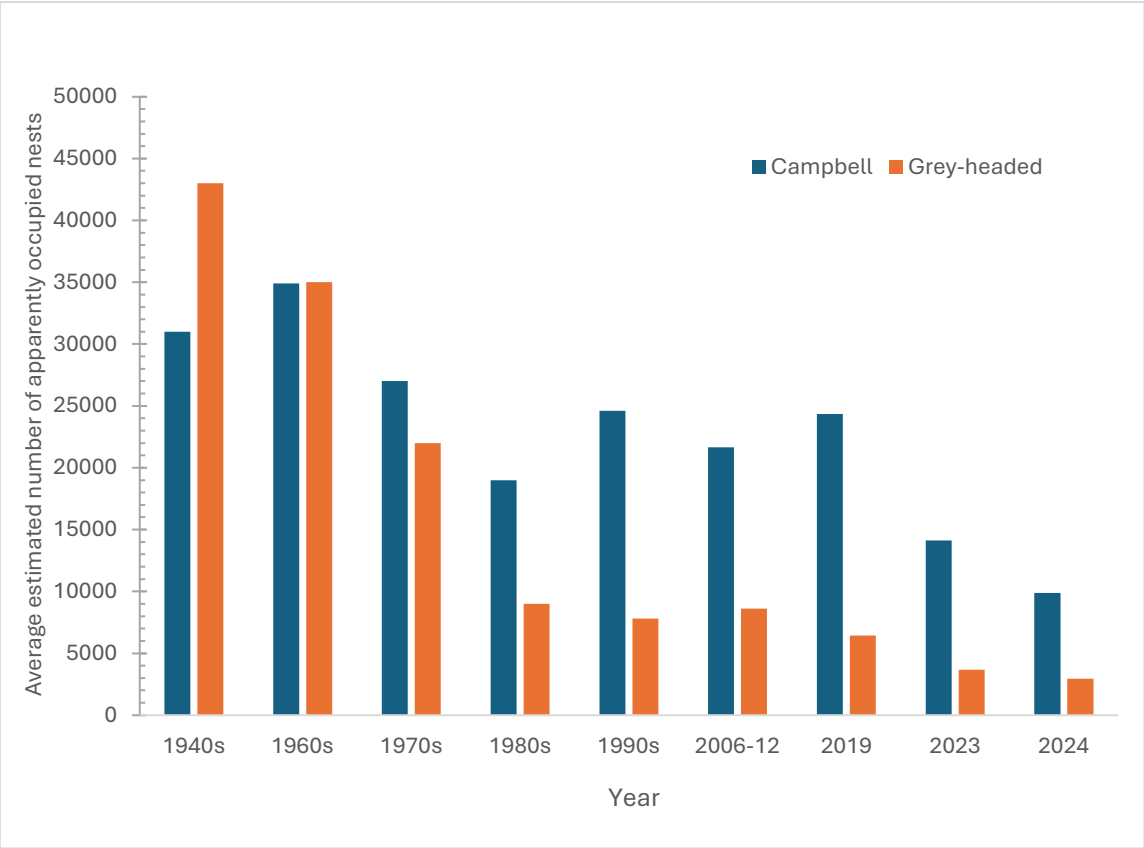

Fig. 22. Overall change in the number of Campbell and grey-headed albatross nests on Campbell Island as summarized by Frost (2019). Regression formulae have been used to adjust the total nest numbers to those expected in early October (as developed by Moore 2004). Campbell albatross numbers have been adjusted for 2006-12 and 2023 to hypothetically include Eastern Colonies. See Moore (2004), Sagar (2014), and Frost (2019) for further details. Caution is required when using this graph as different methods were used between years (i.e. aerial photographs in 2019/20).

Assessing the proportion of nests (still) active with an egg or a chick by ground surveys was conducted at Bull Rock South using transects outlined by Rexer-Huber et al. (2020). For Campbell albatross in 2024/25, total number of birds at Bull Rock South was 5,496 of which 41.1% were designated as sitting which is lower than when this is compared to the ground survey transects (Table 6) where the total % of sitting birds was 58.1%. For grey-headed albatross, the total number of birds at Bull Rock South in 2024/25 was 191 of which 64.4% were counted as sitting. This is comparable to the ground survey transect count where 58.2% of the total number of birds were sitting. As outlined in methods, this ground survey was not used as a 'correction factor because it only applies to one colony and does not necessarily represent what is happening at other colonies, and because of the uncertainty around what a bird on an empty nest means (i.e. it may or may not have had an egg).

Table 6. Number of birds counted while carrying out ground truthing transects (transects 1-3 on 13 Dec and transect 4 on 14 Dec 2024) as outlined by Rexer-Huber et al. (2020) at Bull Rock South. a) were Campbell albatross counts, and b) were grey-headed albatross counts. 'Sitting' were birds incubating an egg or guarding a chick, 'empty' were birds sitting on a nest but which did not have anything in the nest, 'loafing' were loose birds walking around in the colony or standing on nest bowls.

a)

Transect	Sitting	Empty	Loafing	Total birds on nest	Total birds	% empty of birds on nest	% loafing of all birds	% birds sitting of total birds
1	101	50	57	151	208	33.1	27.4	48.6
2	96	41	18	137	155	29.9	11.6	61.9
3	90	22	14	112	126	19.6	11.1	71.4
4	33	20	9	53	62	37.7	14.5	53.2
Total	**320**	**133**	**98**	**453**	**551**	**29.4**	**17.8**	**58.1**

b)

Transect	Sitting	Empty	Loafing	Total birds on nest	Total birds	% empty of birds on nest	% loafing of all birds	% birds sitting of total birds
1	56	37	16	93	109	39.8	14.7	51.4
2	5	2	3	7	10	28.6	30.0	50.0
3	3	1	0	4	4	25.0	0	75.0
4	50	14	9	64	73	21.9	12.3	68.5
Total	**114**	**54**	**28**	**168**	**196**	**32.1**	**14.3**	**58.2**

The results from the ten PTT-GPS transmitters which were deployed on breeding Campbell albatross will provide short-term high-resolution insight into distribution and fisheries risks assessment and will be summarized in a separate report. As an overview, most of the individuals foraged relatively close to Campbell Island and travelled south towards Antarctica (Fig. 23).

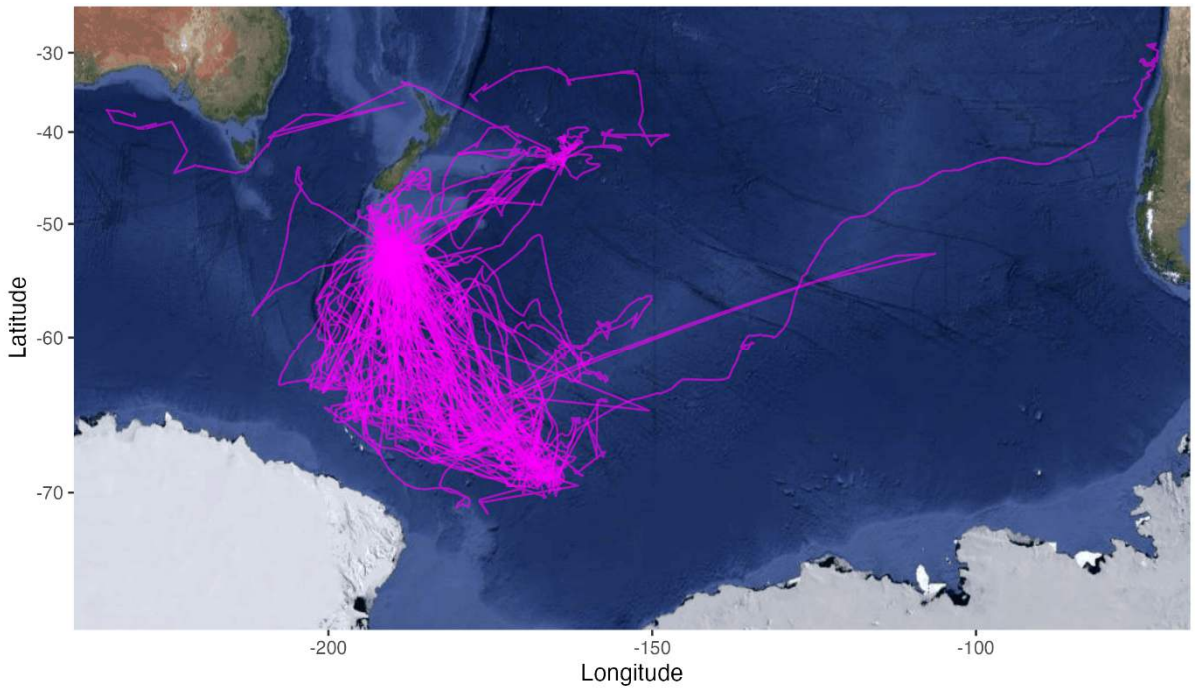

Fig 23. Satellite tracks from devices deployed on ten Campbell albatross on Campbell Island. Tracks cover the period from deployment until mid-June 2025.

For demographics, there were 24 banded birds resighted, 13 of which were Campbell albatross and 11 grey-headed albatross. Of the previously banded Campbell albatross, five were brooding chicks, one was sitting on a dead chick, and for seven the status was not recorded. Of the

previously banded grey-headed albatross, four were sitting on an egg, three were sitting on a chick, and four birds did not have the status recorded. Six breeding Campbell albatross (sitting on chicks) on which transmitters were deployed were newly banded this year. Detailed band information is shown in Appendix Table A2 and A4, and all banding information has been entered into the FALCON, the New Zealand bird banding database..

Light-mantled sooty albatross (Objective 3a-b)

The search areas and locations of light-mantled sooty albatross nests are summarized in Fig. 24. Nests were found at Beeman Hill, Northwest Lyall, East Lyall Ridge and Azimuth. A total of 19 active nests were located of which 15 had cameras placed at them for monitoring. Of the four nests which were not used for cameras, the contents were not checked for three, and one nest had a chick. There were also at least two nests found by the hoiho team on the western bank of Monument Harbour, and several nests on the northern bank of Perseverance Harbour just above sea level, past De la Vire Point (M. Young, pers. comm.).

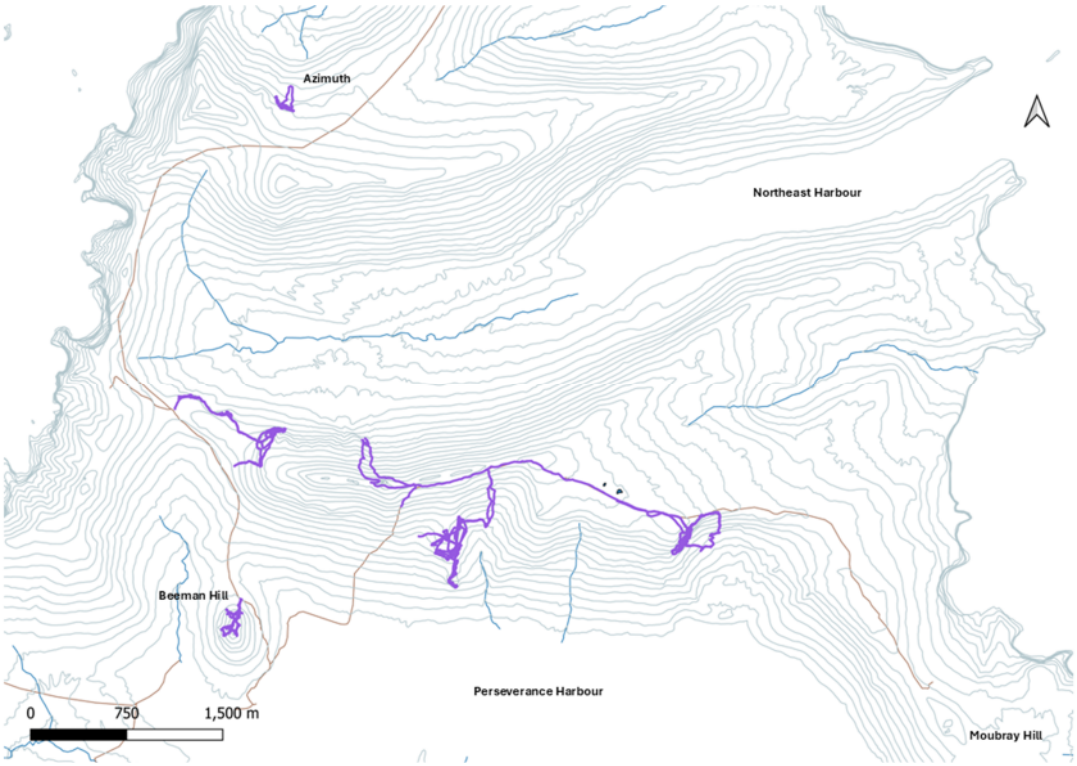

Fig. 24. Map showing track and location of where light-mantled sooty albatross nests were searched for on Campbell Island during 2024/25.

Antipodean albatross (Objective 4a-c)

A total of ten Antipodean albatross were found, all of which were on the Lyall-Moubray ridge and Moubray study area. They were found while carrying out southern royal albatross counts in or west of the Moubray study area in early January (Fig. 25). Six male birds were found sitting on empty nest bowls since the timing was prior to egg laying. Three of the birds were previously banded, but one flew away when approached and was therefore not identified (Table 7 and A2; all banding information has been entered into the FALCON, the New Zealand bird banding database.). There were four nearly fledged chicks, three of which were banded and one was not found the following day and was therefore not banded. The remaining three birds were males, two of which were on empty nest bowls. No eggs were present yet. This count is not

comprehensive as apart from a swath either side of the track along the Lyall-Moubray ridge no other areas outside of the royal albatross study and index areas were searched. No other birds were seen when traveling on walking routes around the island. Moubray was visited only once and therefore partners of birds were not seen.

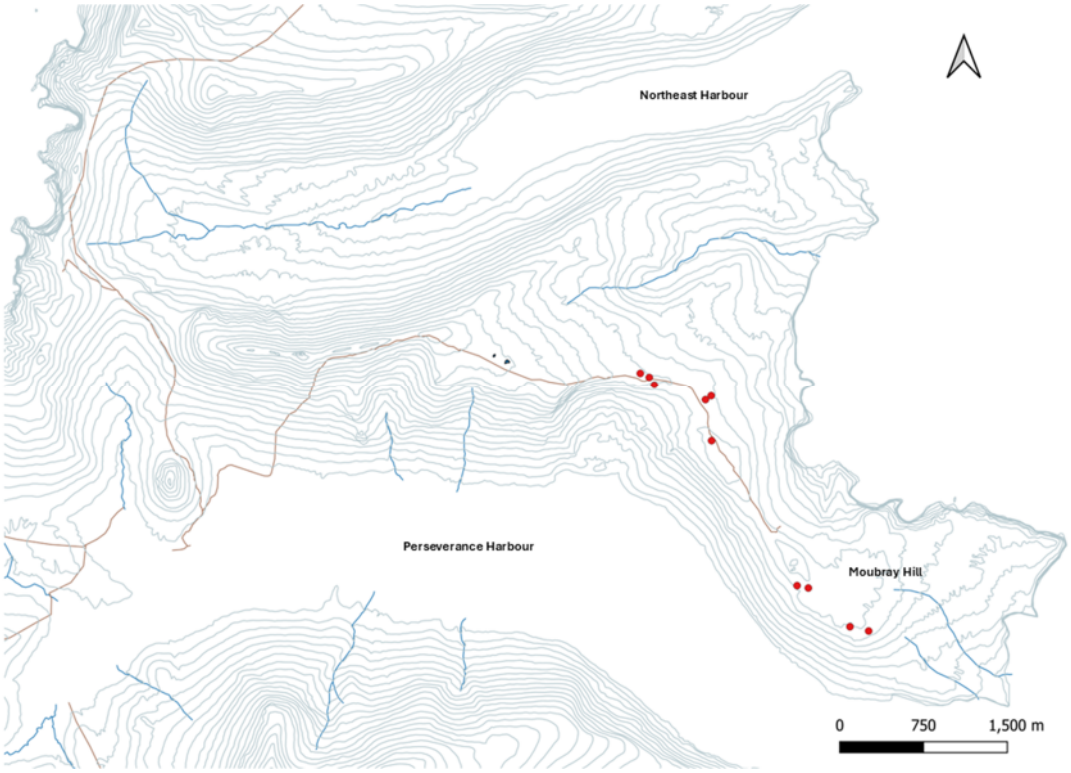

Fig. 25. Map showing locations of Antipodean albatross found on Campbell Island in 2024/25.

Table 7. Antipodean albatross data collected on Campbell Island during 2024/25. 'Band' indicates a bird previously banded, 'new band' indicates a newly banded or rebanded bird (on the right tarsus), 'darvic band (green)' indicates the colour band used on the left tarsus. 'Age' refers to the age of the bird when seen. See Appendix Fig. A2 for details on culmen length and culmen tip bill depth measurements.

Date	Band	Original band date	New band	Darvic band (green)	Culmen length (mm)	Culmen tip bill depth (mm)	Age
1-Jan-24	-	-	R-65574	361	149.0	38.6	Chick
1-Jan-24	-	-	R-65575	362	141.4	35.4	Chick
1-Jan-24	R-44098	1-Sept-92 (chick)	-	379	-	-	Adult
3-Jan-24	R-54369	6-Jan-99 (chick)	R-65456	375	-	-	Adult
4-Jan-24	-	-	R-65576	364	148.4	41.4	Adult
5-Jan-24	-	-	R-65577	365	151.7	43.6	Adult
5-Jan-24	-	-	R-65578	366	149.0	38.3	Chick
5-Jan-24	-	-	R-65579	363	148.4	40.0	Adult

Northern giant petrel (Objective 5a-b)

For the at-sea tracking objective, ten GPS-PTT transmitters were deployed on juveniles to gain short-term high-resolution insight into distribution and fisheries risks and results will be summarized in a separate report. Tracking from four individuals from January to June 2025 is

summarized in Fig. 25. Unfortunately, five transmitters fell off the birds before they fledged, potentially because birds removed the devices, and one device failed to transmit properly. The tracks that were obtained showed movements towards South America, but terminated soon after departure as well, potentially because of birds removing devices. Feathers were collected for sexing from all but one individual.

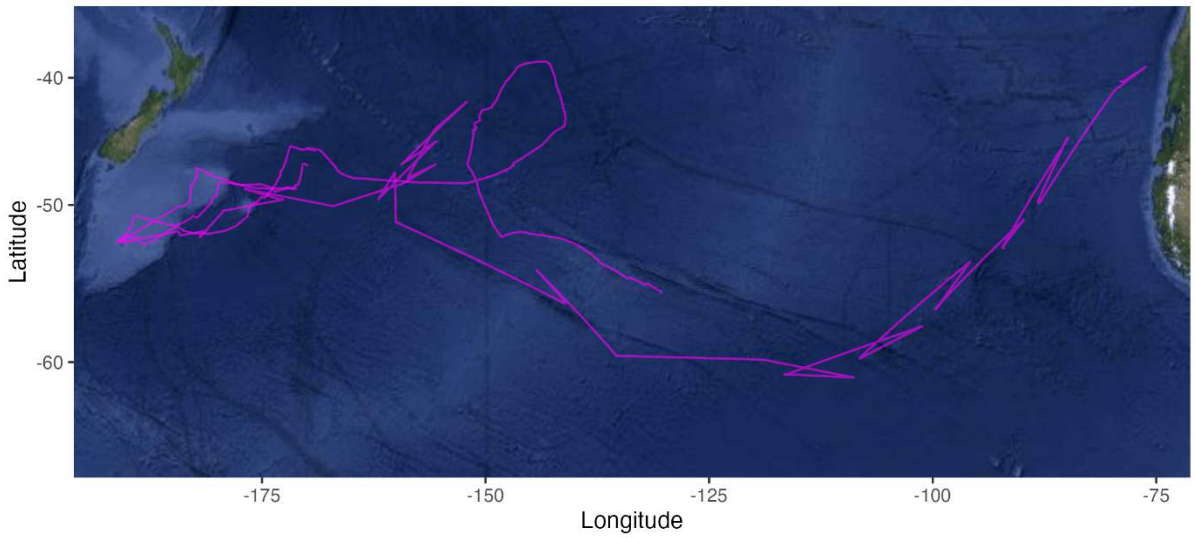

Fig 25. Satellite tracks from devices deployed on four Northern giant petrels on Campbell Island. Tracks cover the period from deployment until mid-June 2025.

A total of 39 chicks were found, ten of which were deployed on with the satellite trackers (Fig. 26). Since it was an opportunistic survey, no comprehensive nest counts were conducted. There were chicks at some of the previously located nesting areas, but not all areas were visited. It is therefore not possible to provide a clear update on population estimates.

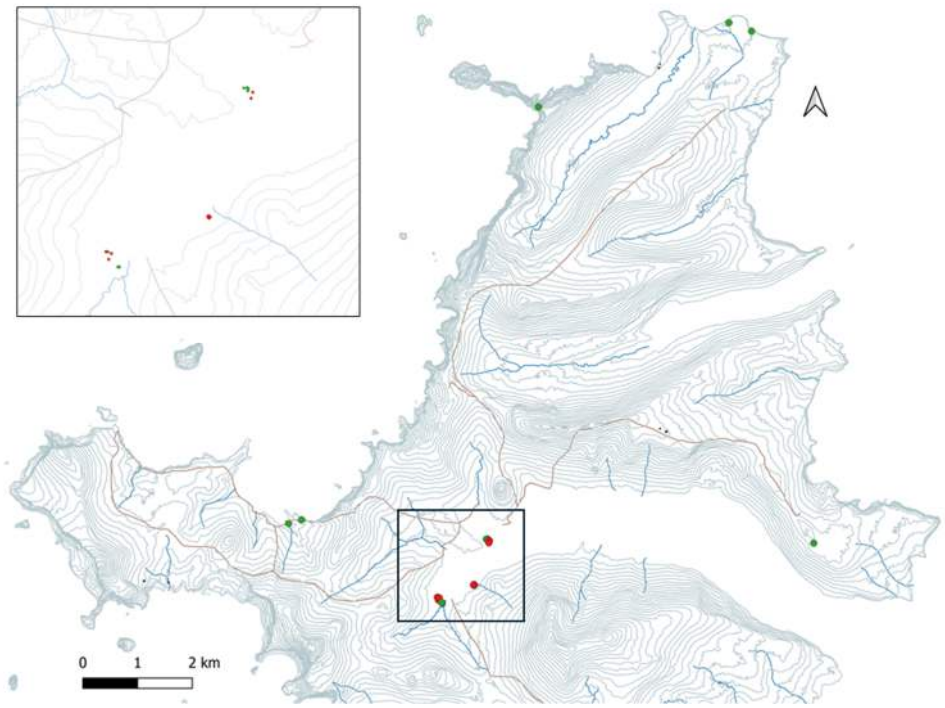

Fig. 26. Map showing locations of northern giant petrel chicks (green) opportunistically found on Campbell Island in 2024/25. Red is indicative of chicks with satellite transmitter deployments.

White-chinned petrel (Objective 6a)

Several burrows were opportunistically located while traveling across the island or surveying albatross (Fig 27). An extensive burrow network was noted in gullies above the cliffs on the Paris-Yvon Villarceau coast as noted previously (K. Rexer-Huber, pers. comm.; Rexer-Huber et al. 2020). One burrow was investigated and an adult was heard calling. Another suspected burrow was found on the northern slope of Hookers Finger.

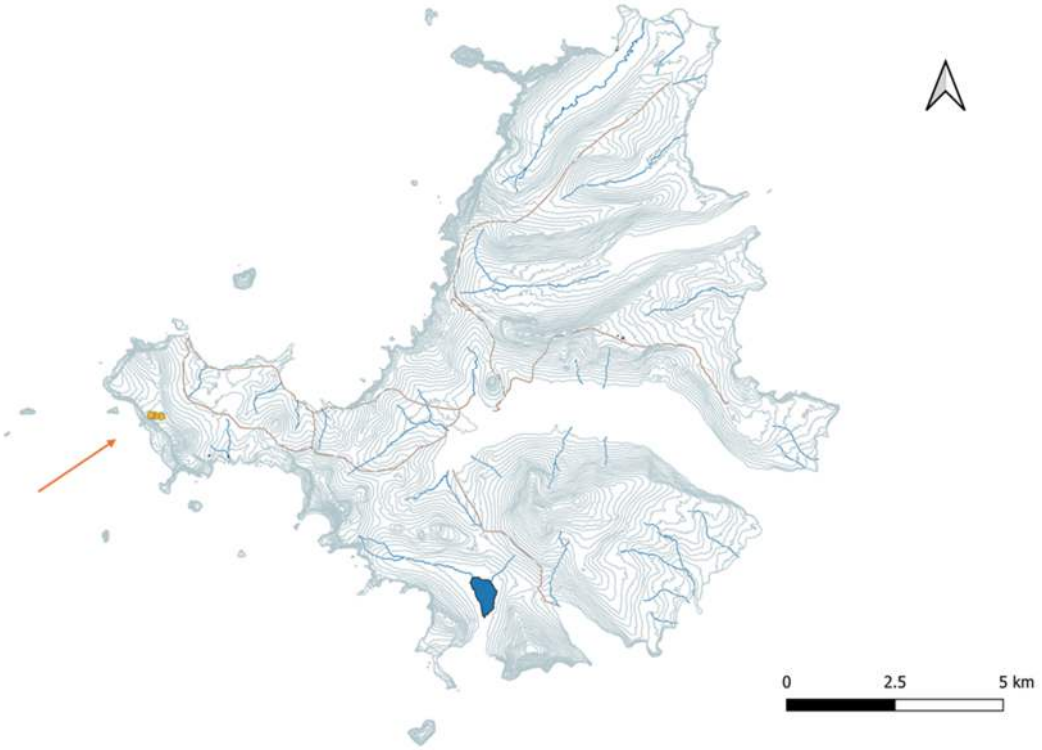

Fig. 27. Map showing locations of white-chinned petrel burrows opportunistically found on Campbell Island in 2024/25. Orange arrow indicates area of locations.

Other opportunistic observations and tasks

Plastics and fishing equipment were opportunistically collected as seen while working and traveling across the island. This was done because plastic ingestion presents a problem for albatross species elsewhere around the world (Provencher et al. 2019, Phillips & Waluda 2020). Moore et al. (2012), Mischler (2020), and Mischler et al. (2024) found small quantities of plastic in regurgitates on Campbell Island. The amount of plastic and fishing equipment which was collected is of great concern (Fig. 28).


a)

b)

Fig. 28. Photos showing opportunistic collections of a) plastic pieces and b) fishing equipment while working and traveling on Campbell Island. All items were presumed to be from southern royal albatross since most were found amongst regurgitated material near nests.

Discussion

Nest numbers of southern royal albatrosses had been increasing overall during the 20th century, probably recovering from depredations and habitat destruction during the 1895-1931 farming era on Campbell Island (Guthrie-Smith 1936, Moore et al. 2012). The first coarse island-wide survey found 2278 nests in 1957/58 (Westerskov 1963), numbers fluctuating from 3216-5336 through the 1960s-1980s (Moore et al. 1997 and references therein) to 6308-7787 in 1994/95 and 1995/96. Early counts were probably underestimates due to the effort and methodology not being standardized. The last comprehensive population survey of southern royal albatross on Campbell Island was conducted between 2004/05-2008/09 with a composite count of 7855 nests representing 8300-8700 nests once survey accuracy and nest failure was taken into account (Moore et al. 2012). It was suggested from the island-wide counts that there had been a levelling in the population since the 2000s estimate was similar to 1995/96 (Moore et al. 1997, 2012). However, in areas where counts of comparable effort were made, one study area had remained stable (Col), and the second study area (Moubray) and three index areas (Faye, Paris, Honey) had all declined by 4-17% (Moore et al. 2012). A nest count done in March 2020 of the Col study area indicated the possibility of a more severe decline (Mischler 2020). The actual March 2020 count for Col was 104 nests, and this was adjusted to a January estimate of 141 nests based on expected nest failure by March, compared to an average nest number of 197 at Col between 2004/05-2008/09 (Mischler 2020). Another count of Col was attempted in February 2023; however, the short duration of the trip did not allow for a full count (Mischler & Wickes 2023). Overlaying of the track surveyed in 2023 and comparing it to nest locations in Col in 2020 and 2004/05-08/09 showed similar nest numbers to 2020 thereby continuing to support the suspected dramatic decline (Mischler & Wickes 2023). Since southern royal albatross are biennial breeders, it was alarming that both cohorts appeared to be undergoing the same decline (as 2019/20 represented one cohort and 2022/23 another). To fully understand the

population trend across Campbell Island, it was highly critical that the other four survey areas be counted.

The decrease in southern royal albatross nest numbers since the 1990s and 2004/05-08/09 across all of Campbell Island is very concerning. Repeating the nest counts across all five areas during the 2024/25 season was important to capture the second cohort of breeders. As discussed in Mischler (2020), the decline could be indicative of a decline in breeders, changes in breeding frequency, or low juvenile recruitment. Albatross are highly vulnerable to bycatch in fisheries, at-sea threats, and changes in food supply due to climatic conditions (Cleeland et al. 2021, Patrick et al. 2020). Southern royal albatross feed on the southern and south-eastern shelf breaks of the Campell Plateau and an area south of the Snares Island along an inner shelf break which may cause overlap with fishing activities (Waugh et al. 2002, Jiménez et al. 2014). Between 2006/07 to 2016/17, southern royal albatross had been placed in the 'negligible' risk category (Richard et al. 2020) with most birds caught in surface- and bottom-longline fisheries between 2002/03 and 2015/16 (Abraham & Richard 2019). However, in the most recent update to the risk assessment from commercial fisheries, southern royal albatross have moved up in risk and are now the 12th species at risk from New Zealand fisheries (Edwards et al. 2023). The highest risk fishery group is 'Small SLL (tuna and Swordfish)' followed by 'Squid' and 'Large freezer' which equates to the highest threats stemming from surface longline and trawl fishing within the New Zealand EEZ (Edwards et al. 2023).

Outside of New Zealand, shelf breaks and deep oceanic waters are the preferred feeding grounds for southern royal albatross (Moore & Bettany 2005). Young birds (2-3 years old) and non-breeders use areas near Chile and the Patagonia Shelf, with older birds (4+ years) traveling back to New Zealand via Australia (Moore & Bettany 2005). All ages are vulnerable to bycatch in pelagic longliners and trawlers in the southwest Atlantic, an area of intense fishing effort. Females are more likely to be caught in subtropical regions and males at subpolar regions due to sexual segregation at sea (Jiménez et al. 2014). Satellite tracking and GLS data from the current study will provide useful information in determining overlap with fisheries within and outside of New Zealand and further identify potential threats.

As discussed in Mischler (2020), two related *Diomedea* species, the Antipodean and Gibson's (*D. antipodensis gibsoni*) albatross, have undergone severe population declines since 2006. High adult mortality, reduced breeding success, and increased recruitment age are attributed to the decline (Elliott & Walker 2019). Antipodean and Gibson's albatross feed primarily over deep oceanic waters and deep shelf slopes as opposed to southern royal albatross which feed over shallow shelf slopes and breaks and occasionally deep oceanic waters (Walker et al. 1995, Nicholls et al. 2002). For the southern royal albatross, it is also not possible to specifically determine when the decline started due to a large gap in nest counts between 2008/09 and 2019/20, yet the similarity in the pattern of decline between Antipodean and Gibson's Albatross and southern royal albatross remains. Re-establishing a banded population for mark-recapture studies and using the remote cameras to gather breeding success data as has been done in the current study will provide insight into mortality, recruitment, and overall breeding success thereby improving the overall understanding of the dynamics of the population.

Photo point counts are challenging as there are many sources of error and bias. These include but are not limited to different timings of surveys in relation to the breeding cycle of the birds, variation in interpretation of each bird's activity, camera type, etc (Moore & Blezard 1999, Moore 2004, Frost 2019). One of the key points here is the timing of the photographs. Nests are nearly fully occupied in October when laying is complete, and the colonies remain busy in November

as failed breeders continue to sit tightly on failed nests (G. Taylor, pers. comm.). Occupancy in colonies begins to decline in December when failed breeders have finished with pair bonding behaviour before departing to sea, or they may be replaced by pre-breeders that sporadically visit the colony (G. Taylor, pers. comm.). With surveys completed in early December, the colonies will have started to appear less populated than would have been the case in October or November. To mitigate this issue, the coefficient calculation was applied to present a more accurate number of breeding birds. It is, however, important to note that the breeding success used to determine the coefficient calculations may have been vastly different from the breeding success in any given year and may therefore not be truly representative of nest numbers. Ideally photo point counts should be completed as close to the mid-October period as possible (Moore 2004, Sagar 2014).

Both Campbell and grey-headed albatross populations at Campbell Island have generally decreased over time (Waugh et al. 1999; Moore 2004; Rexer-Huber et al. 2020; Frost 2019). Campbell albatross numbers appeared to fluctuate over time whereas grey-headed albatross numbers underwent a long-term decrease between the 1940s to 1997 attributed to change in food conditions due to rising sea-surface temperatures or fisheries bycatch in international waters (Waugh et al. 1999; Moore 2004; Rexer-Huber et al. 2020). Campbell albatross have undergone varying trends between 1940s to 1997, but saw a decline between the 1990s and 2006-12 (Sagar 2014). Frost (2019) suggested that Campbell albatross were relatively stable since the 1990s but 20-30% below the numbers in the 1940s and 1960s. For grey-headed albatross, Moore (2004) had suggested that the population decreased by 82-88% over 55 years (1940s to 1997) in some colonies, but Sagar (2014) suggested that the declines stopped and that there was an increase in breeding pairs from 1990s to 2006-12. Frost (2019) suggested a 18-25% decline over the past 25 years. The ongoing percent declines of 11.0% and 2.4% for Campbell and grey-headed albatross, respectively, compared to 2019 is a real concern. For grey-headed albatross breeding at South Georgia, there was an annual rate of decline of 5% and an overall decline of 43% between 2003 and 2014 (Poncet et al. 2017). Numbers appeared stable at Diego Ramirez between 2002 and 2011 (Robertson et al. 2014) but increased by 1.3% per year from 1984 to 2021 at Marion Island with the potential increase dating back to the 1970s (Stevens et al. 2024). The decline at the South Georgia populations was attributed to fisheries bycatch threat during the non-breeding season while foraging at oceanic frontal zones (Poncet et al. 2017). It is not possible to compare Campbell albatross to other areas because they only breed on Campbell Island, but the closely related black-browed albatross (*Thalassarche melanophris*), the overall decline was 19% and 1.9% annually at South Georgia also attributed to fisheries bycatch (Poncet et al. 2017). Within New Zealand, both Campbell and grey-headed albatrosses rank as a low risk from fishing bycatch within the New Zealand EEZ, with the former most commonly caught in “small SLL (tuna and swordfish)” and “large freezer” (trawl), while no clear patterns exist for the latter (Edwards et al. 2023). Both species are likely caught in higher numbers in international waters, yet it should be noted that the population estimates provided here are lower than the numbers used in the most recent risk assessment, potentially elevating the risk of both species in future risk assessment iterations.

While attempts were made to provide updated distributions for northern giant petrels using GPS-PTT transmitters, this largely failed as over half of the devices appeared to be removed by birds before departure and the remaining devices only transmitted data for a short period of time. It is possible that this species is particularly hard on tracking gear, as the same pattern was observed when adults were tracked from Motuhara. While this pattern is not evident in overseas attempts of tracking the species, perhaps future tracking of this species should resort

to the use of GLS tags rather than transmitters. This however would require specific visits in winter to colonies as this species is a winter breeder.

Recommendations

- Deploy tracking devices on southern royal albatrosses breeding in the Paris index area. This area is experiencing the largest decline in nest numbers and it would therefore be helpful to determine if they forage in different areas than the birds at Col.
- Continue the capture-mark-recapture work annually for at least two more years to enable estimates of survival and better understand the drivers of the population decline.
- Repeat the count efforts for southern royal, Campbell, and grey-headed albatross to account for annual variability.
- Deploy tracking devices on grey-headed albatross to better understand what is causing the population declines.
- Re-start the capture-mark-recapture banding study on Campbell and grey-headed albatross to understand the drivers of the population declines.
- For the mollymawk photo points, it is essential to take at least one overview photo of the colonies and then numerous zoomed in photos of individual sections to allow for clearer and more precise counts than when using distant photos.
- Repeat the survey conducted for northern giant petrels following methods used by Rexer-Huber et al. (2020). This would take approximately 5-7 days.
- Fly a drone over the Moubray Index area to find and count all the Antipodean albatross nests. This would also help with southern royal albatross counts.

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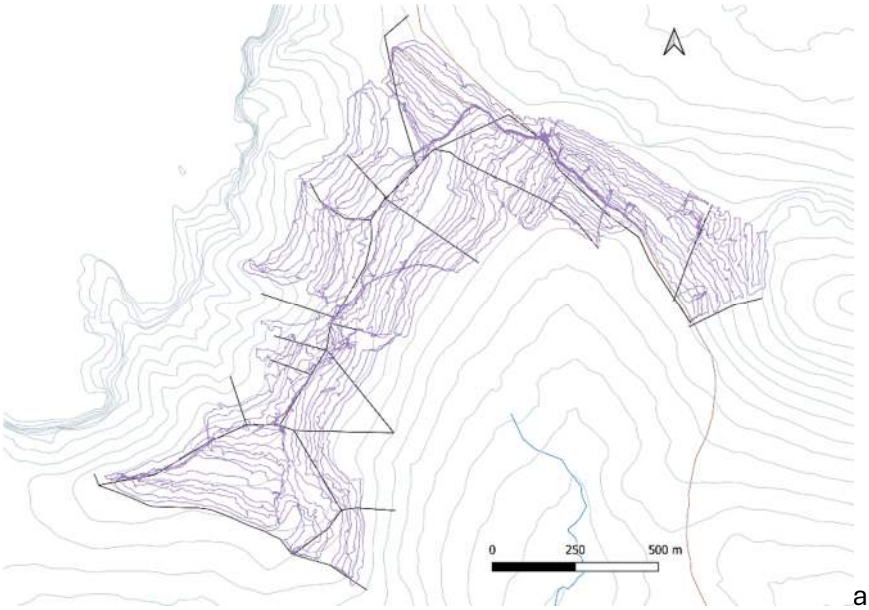
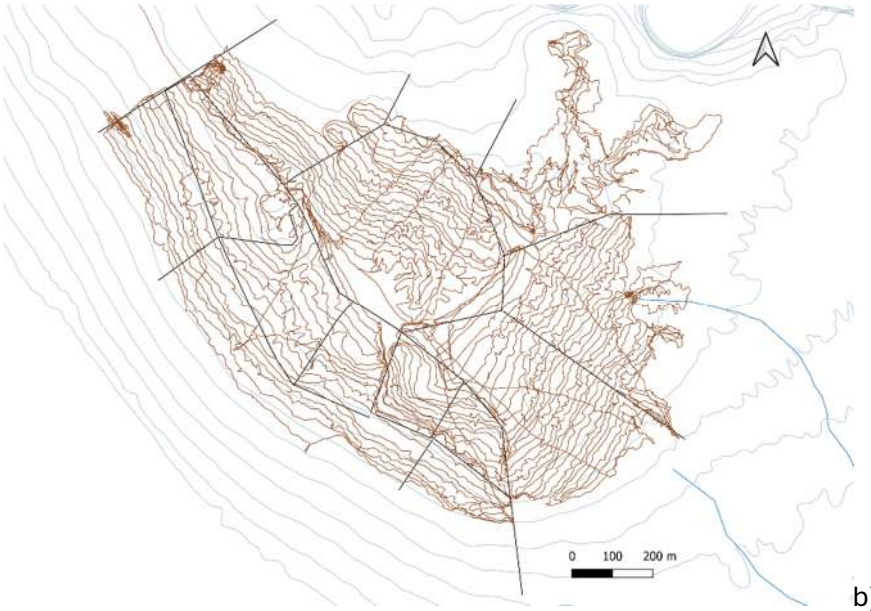
Appendix



a)



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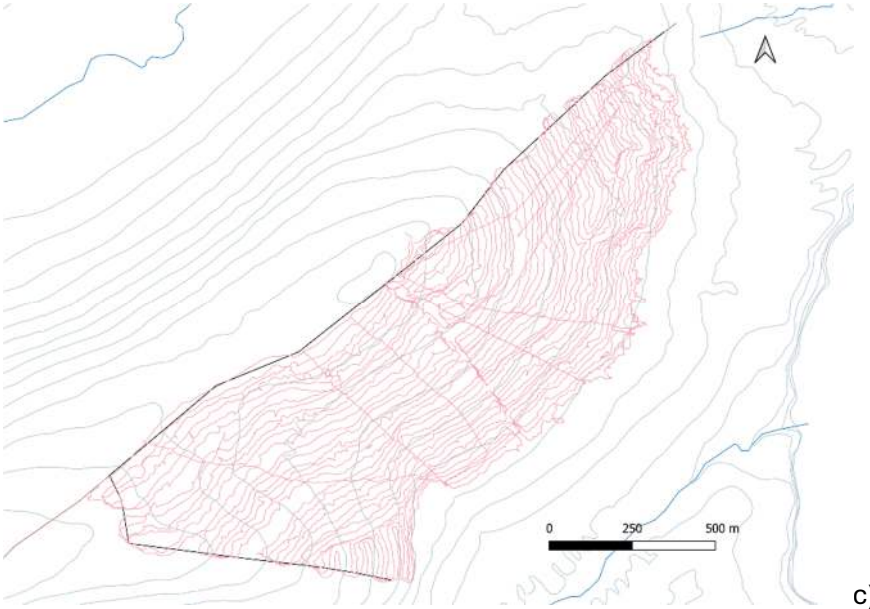
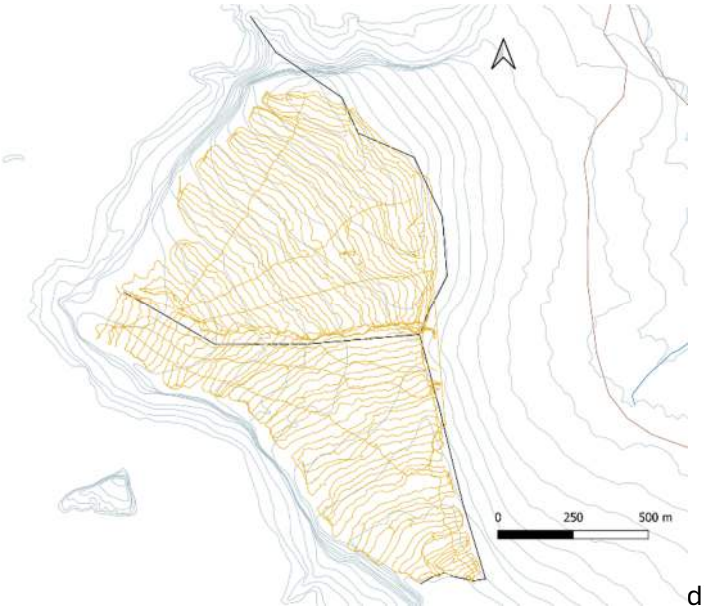
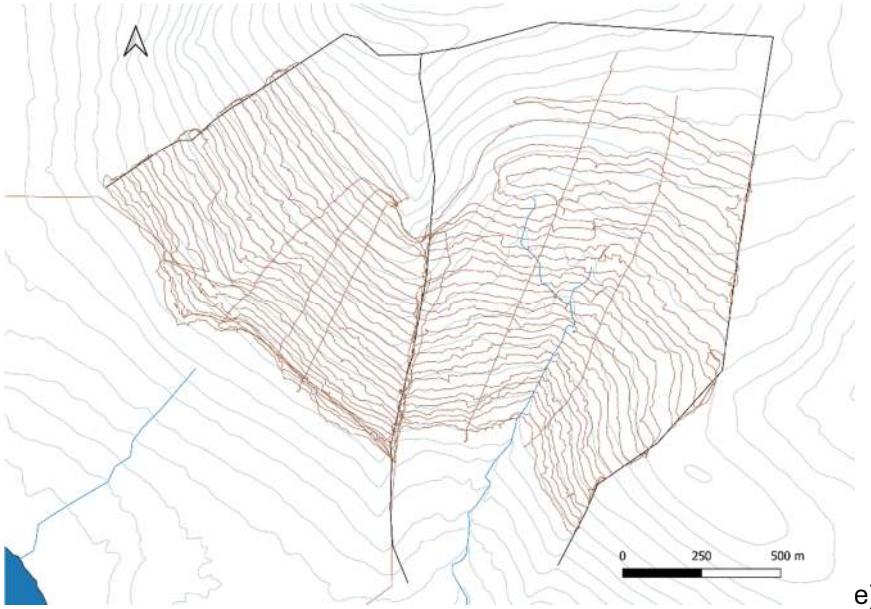


c)



d)



e)

Fig. A1. Enlarged map showing tracks walked by three observers while searching for southern royal albatross nests on Campbell Island in a) Col study area, b) Moubray study area, c) Faye index area, d) Paris index area, and e) Honey index area.

Table A1. Banding information, history, and partner data of previously banded southern royal albatross on Campbell Island. Under 'Breeding & banding history' BS - bred successfully, BF - bred but failed, BU - bred with unknown outcome, UB – unbanded bird.

Current Band	Previous mark	Date seen	Site	Sex	Original band date	Age at first mark	Band age	Breeding & banding history
R-62133		25/01/2025	Col	Female	4/01/2005	Adult	20	BS in 2005, 2007, BU 2009 with RA-2248, BU 2025 with RC-0360
R-62136		20/12/2024	Col	Female	5/08/1994	Chick	31	BS in 2005, BS 2007, BU 2009, BF 2024, BU 2025 with RC-0152
R-62138		19/01/2025	Col	Female	20/01/1999	Adult	34	BU in 1999, BS in 2005, 2007, BU 2009 with RA-2326, BF 2024, BU 2025 with RO-0013
R-62166		23/12/2024	Col	Female	6/01/2005	Adult	20	BF in 2005, 2006, 2007 with RA-2257, BS 2008 with UB, BU 2025 with RC-0310
R-62196		8/01/2025	Col	Female	20/08/1995	Chick	30	BS in 2005 with RA-2434, BU 2025 with RC-0328
R-62200		29/12/2024	Col	Female	13/01/2005	Adult	20	BF in 2005, BS in 2006, 2008 with RC-0354, BU 2025 with RC-0354 (formerly RA-2182)
R-62227		31/01/2025	Col	Female	13/01/2005	Adult	20	BS in 2005, 2007 and BU 2009 with RA-2192, BU 2025 with UB
R-62233		9/01/2025	Col	Female	15/01/2005	Adult	20	BS in 2005, 2007 with RA-2107, BU in 2009 with UB, BU 2025 with RC-0383
R-62277		29/12/2024	Col	Female	16/01/2005	Adult	20	BS in 2005, 2007 with RA-2176, BU in 2009 with UB, BU 2025 with RC-0391
R-62302		10/12/2024	Col	Female	25/01/2005	Adult	28	BF in 2005, BS in 2007, BU in 2009 with RA-2263, BF 2024 with RC-0275, BF 2025
R-62305		25/01/2025	Col	Female	7/12/1996	Adult	29	BF in 1997 with R-43856, BU in 1999, BS 2005, BF 2007, BS 2008 with RA-2269, BU 2025 with RC-0264
R-62350		25/01/2025	Col	Female	15/08/1994	Chick	31	BS in 2005, BF in 2007 with RA-2205, BS in 2008 with UB, BU 2025 with RC-0389
R-62363		23/12/2024	Col	Female	3/01/2006	Adult	27	BS in 2006, 2008, BF 2024 with R-62570, nonbreeder 2025
R-62409		27/12/2024	Col	Female	9/01/2006	Adult	27	BF in 2006, 2007, 2008, BF 2024, BU 2025 with RC-0369
R-62423		25/01/2025	Col	Female	7/01/1996	Adult	29	BS in 1996, 1998, 2006, 2008 with RC-0390, BU 2025 with RC-0390 (formerly RA-2567)
R-62471		20/12/2024	Col	Female	9/12/1996	Adult	28	BF in 1997, BS in 1998, 2006, 2008 with RA-2579, nonbreeder in 2025
R-62570		23/12/2024	Col	Male	30/09/1996	Chick	29	BS in 2006, 2008, BF 2024 with R-62323, nonbreeder in 2025
R-62584		30/01/2025	Col	Female	23/08/1992	Chick	33	BS 2007, BU 2009 with UB, BU 2025
RC-0373	RA-2458	19/01/2025	Col	Male	30/09/1996	Chick	29	nonbreeder in 2006, BU 2025 with RC-0373
RC-0352	RA-2517	8/01/2025	Col	Male	5/08/1994	Chick	31	BS in 2006 with R-62457, probably BF 2024 as R-65371 failed before male was seen, BU 2025 with R-65371
R-44761		3/01/2025	Moubray	Female	30/08/1992	Chick	33	hatched at Moubray, not seen since
R-45640		2/01/2025	Moubray	Female	7/09/1994	Chick	31	hatched at Moubray, not seen since

Current Band	Previous mark	Date seen	Site	Sex	Original band date	Age at first mark	Band age	Breeding & banding history
R-62381		4/01/2025	Moubray	Female	5/06/1985	Chick	40	BU in 1997, 1999, 2005, 2007, 2009
R-62509		2/01/2025	Moubray	Female	28/08/1995	Chick	30	BU in 2006, 2009
R-62517		3/01/2025	Moubray	Female	6/09/1994	Chick	31	BU in 2006, 2008
R-62880		2/01/2025	Moubray	Female	3/10/1997	Chick	28	BU in 2008
R-62902		4/01/2025	Moubray	Female	6/09/1994	Chick	31	BU in 2008
RC-0279	668A089	22/12/2024	Col	Male	18/08/1995	Chick	30	BS in 2006, 2008 with R-62367, BU 2025 with R-65503
RC-0354	668F90B	8/01/2025	Col	Male	29/09/1997	Chick	28	BF in 2005, BS in 2006, 2008 with R-62200, BU 2025 with R-62200
RC-0152	6689DC3	17/01/2025	Col	Male	18/12/1996	Adult	36	BS 1997, BU 1999 with R-43837, BF 2005, BS 2007 with R-62314, BU 2009 with R-62256, BF 2024, BU 2025 with R-62136
RC-0380	668DB20	19/01/2025	Col	Male	28/09/1997	Chick	28	BS in 2008 with UB, BU 2025 with R-65565
RC-0386	668D6E3	25/01/2025	Col	Male	30/09/1996	Chick	29	BS in 2008 with UB. BU 2025 with R-65587
RC-0390	668F207	30/01/2025	Col	Male	30/08/1988	Chick	37	BS 1996, 1998, 2006, 2009 with R-62423, BU 2025 with R-62423

Table A2. Summary of new bands and band sightings of various species on Campbell Island during the 2024/25 season. Letters in second row refer to metal leg band size with the exception of PIT (passive implanted transponder).

Species	Resight without new primary mark*				Resight plus new primary mark*#		First primary mark*			Total
	M	R	RC	RO	RA	PIT	M	R	RC	
Antipodean albatross		2						6		8
Campbell albatross	13						6			19
Grey-headed albatross	10									10
Southern royal albatross		46	17	2	2	9		81	82	239
Total	23	48	17	2	2	9	6	87	82	276

*for southern royal albatross, generally a secondary mark (alpha numeric coloured darvic band) was added.
#new primary mark was an R or RC band.

Table A3. Raw counts done from Campbell and grey-headed albatross photo points as described above in the Methods section. 'Sitting'– birds assumed to be sitting on an egg/chick, 'loafing'– birds assumed to be sitting on an empty nest or birds not sitting on a nest, ' undefined'– unable to determine if sitting or loafing.

Ground level – Hooker's Peninsula	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
1	187	151	9	80	37	7
2a, d	0	0	0	57	18	6
2c, d	-	-	-	-	-	-
3b-e	16	12	4	30	22	11
3a-e	17	12	3	95	35	14
4a, c	-	-	-	14	3	0
5	-	-	-	-	-	-

Ground level – Courrejolles Peninsula	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
Area 1	21	26	208	24	40	713
Area 2	63	218	1697	25	47	563
Area 3a + b	40	464	2053	23	90	1311
Area 4	26	88	1878	9	34	1288

Ground level – Courrejolles Isthmus	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
Courrejolles Isthmus	135	108	8	140	81	4
JDK	-	-	-	-	-	-

Ground level – Hooker's Finger	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
2	65	58	-	163	91	-
2	61	42	-	96	30	-
3	-	-	-	-	-	-
3	80	101	158	88	40	67
5	324	361	24	35	8	10
6	188	153	31	116	42	13

Ground level – Bull Rock North	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
1a	1	0	0	7	2	0
1b	14	15	4	1	4	1
1c	-	-	-	-	-	3
2	16	24	6	5	4	2
3	56	105	1	0	0	0
4	120	130	10	1	1	0
5	176	234	2	6	2	0
5a	28	16	2	0	0	0
6	94	96	4	30	15	0
7	213	211	2	0	0	0
8	142	115	8	28	1	0
9	52	39	0	0	1	0
10a	43	44	5	0	0	0
10b	59	58	1	0	0	0
11	234	117	0	13	0	0
12	362	326	2	123	32	0
13	378	210	5	68	22	0
13a	22	34	10	0	0	0
14	30	40	10	19	3	1
15	56	41	15	64	11	7
16	7	17	1	2	6	1
17	-	-	-	-	-	-
18	-	-	-	-	-	-

Ground level – Bull Rock South	Campbell Mollymawk			Grey-headed Mollymawk		
Colony	sitting	loafing	undefined	sitting	loafing	undefined
1	11	25	7	0	0	0
1a	12	21	5	0	0	0
2	14	5	14	5	0	3
3-4	2	3	517	0	0	42
5a	-	-	196	-	-	44
5b	-	-	483	0	0	0
6	5	17	199	0	0	0
7	4	4	0	0	0	0
9	105	149	28	0	0	0
10	-	-	-	-	-	-
11	96	158	47	0	0	0
12	86	115	110	1	0	0
13	45	65	48	0	1	1
14	104	174	37	1	0	0
15	15	20	107	1	0	0
16	82	65	62	0	0	0
17	18	22	54	0	0	0
18	43	60	65	0	0	0
19	39	50	54	2	1	0
21a	161	238	184	0	0	0
21b	153	356	41	11	6	4
22	70	54	81	28	18	12
bbt	24	31	153	0	0	0
SS, a-c	32	26	29	0	0	0
d	78	55	37	6	1	0
GH-2	11	14	1	0	0	3

Table A4. Banding information for Campbell and grey-headed albatross resighted at Bull Rock South on Campbell Island. BN – breeder on nest, UNK – status not recorded.

Band Prefix	Band Number	Breeder/Loafer	Species	Date banded	Age at banding	Date of sighting
M	49742	UNK	Campbell albatross	10/11/1993		13/12/2024
M	58433	UNK	Campbell albatross	17/03/1994		13/12/2024
M	61296	UNK	Campbell albatross			13/12/2024
M	61728	BN	Grey-headed albatross	20/04/1995	Chick	13/12/2024
M	61737	UNK	Grey-headed albatross	29/04/1995		14/12/2024
M	61920	BN	Grey-headed albatross	07/02/1996	Chick	13/12/2024
M	64698	BN	Campbell albatross	06/02/1996		14/12/2024
M	64769	UNK	Grey-headed albatross	10/02/1997	Chick	13/12/2024
M	64859	BN	Grey-headed albatross	11/02/1997	Chick	13/12/2024
M	65225	BN	Campbell albatross	20/02/1997		14/12/2024
M	87651	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	87652	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	87653	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	87654	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	87655	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	87656	BN	Campbell albatross	14/12/2024	Adult	14/12/2024
M	89130	BN	Campbell albatross	15/10/2011		14/12/2024
M	89134	UNK	Campbell albatross			13/12/2024
M	89366	BN	Grey-headed albatross	15/10/2012	Adult	13/12/2024
M	89447	BN	Grey-headed albatross	21/12/2010	Adult	13/12/2024
M	89500	BN	Campbell albatross			13/12/2024
M	89506	UNK	Campbell albatross			13/12/2024
M	90160	UNK	Campbell albatross	22/10/2009		13/12/2024
M	90374	BN	Campbell albatross	28/11/2010		14/12/2024
M	90401	BN	Grey-headed albatross	22/12/2010	Adult	13/12/2024
M	90460	BN	Campbell albatross			13/12/2024
M	90470	UNK	Grey-headed albatross	15/11/2011	Adult	14/12/2024
M	90520	UNK	Campbell albatross			13/12/2024
M	90584	BN	Grey-headed albatross			13/12/2024

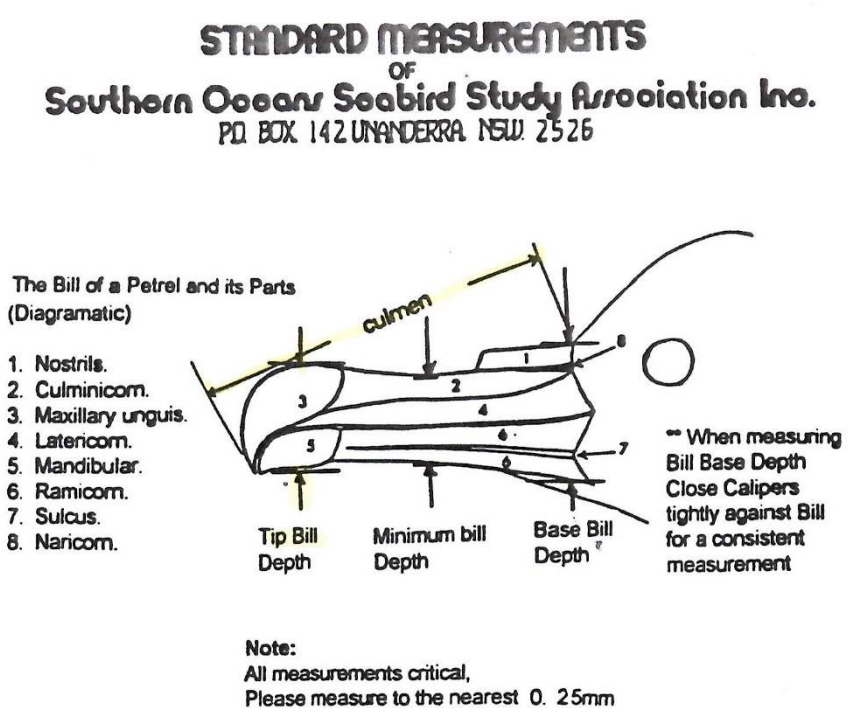


Fig. A2. Image showing standard bill measurements as was used for Antipodean albatross on Campbell Island during 2023/24.

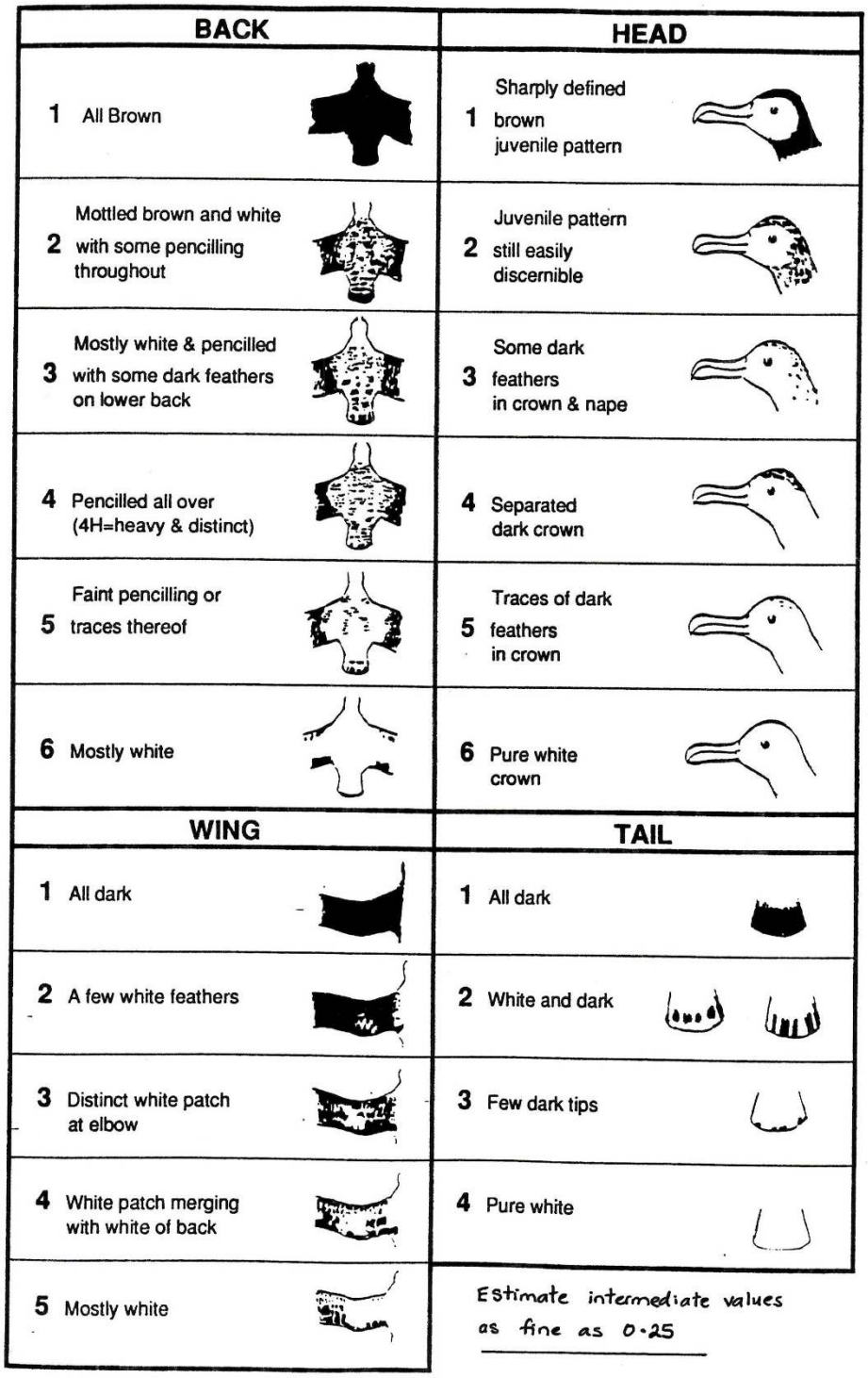


Fig.A.1 Gibson Plumage Index Standard (Gibson Code) for describing *D.exulans* plumage.

Fig. A3. Gibson plumage index standard (Gibson Code) for describing plumage.